Geometry Multiple Choice Regents Exam Questions

1. A student wrote the sentence “4 is an odd integer.”
   What is the negation of this sentence and the truth value of the negation?
   1) 3 is an odd integer; true
   2) 4 is not an odd integer; true
   3) 4 is not an even integer; false
   4) 4 is an even integer; false

2. Which equation represents a line that is parallel to the line whose equation is $y = \frac{3}{2}x - 3$ and passes through the point (1,2)?
   1) $y = \frac{3}{2}x + \frac{1}{2}$
   2) $y = \frac{2}{3}x + \frac{4}{3}$
   3) $y = \frac{3}{2}x - 2$
   4) $y = -\frac{2}{3}x + \frac{8}{3}$

3. Which statement is the negation of “Two is a prime number” and what is the truth value of the negation?
   1) Two is not a prime number; false
   2) Two is not a prime number; true
   3) A prime number is two; false
   4) A prime number is two; true

4. The angles of triangle $ABC$ are in the ratio of $8:3:4$. What is the measure of the smallest angle?
   1) 12°
   2) 24°
   3) 36°
   4) 72°

5. In the diagram below, $AB$, $BC$, and $AC$ are tangents to circle $O$ at points $F$, $E$, and $D$, respectively, $AF = 6$, $CD = 5$, and $BE = 4$.
   ![Diagram](image1)
   What is the perimeter of $\triangle ABC$?
   1) 15
   2) 25
   3) 30
   4) 60

6. In the diagram below, $\triangle ABC$ is circumscribed about circle $O$ and the sides of $\triangle ABC$ are tangent to the circle at points $D$, $E$, and $F$.
   ![Diagram](image2)
   If $AB = 20$, $AE = 12$, and $CF = 15$, what is the length of $AC$?
   1) 8
   2) 15
   3) 23
   4) 27
7 In scalene triangle $ABC$, $m\angle B = 45$ and $m\angle C = 55$. What is the order of the sides in length, from longest to shortest?
1) $AB, BC, AC$
2) $BC, AC, AB$
3) $AC, BC, AB$
4) $BC, AB, AC$

8 As shown in the diagram below, $\overrightarrow{EF}$ intersects planes $P$, $Q$, and $R$.

If $\overrightarrow{EF}$ is perpendicular to planes $P$ and $R$, which statement must be true?
1) Plane $P$ is perpendicular to plane $Q$.
2) Plane $R$ is perpendicular to plane $P$.
3) Plane $P$ is parallel to plane $Q$.
4) Plane $R$ is parallel to plane $P$.

9 The volume of a rectangular prism is 144 cubic inches. The height of the prism is 8 inches. Which measurements, in inches, could be the dimensions of the base?
1) 3.3 by 5.5
2) 2.5 by 7.2
3) 12 by 8
4) 9 by 9

10 Triangle $ABC$ is graphed on the set of axes below.

What are the coordinates of the point of intersection of the medians of $\triangle ABC$?
1) $(-1,2)$
2) $(-3,2)$
3) $(0,2)$
4) $(1,2)$

11 The diameter of a sphere is 15 inches. What is the volume of the sphere, to the nearest tenth of a cubic inch?
1) 706.9
2) 1767.1
3) 2827.4
4) 14,137.2

12 What is the image of the point $(-5,2)$ under the translation $T_{3,-4}$?
1) $(-9,5)$
2) $(-8,6)$
3) $(-2,-2)$
4) $(-15,-8)$
13. For a triangle, which two points of concurrence could be located outside the triangle?
   1) incenter and centroid
   2) centroid and orthocenter
   3) incenter and circumcenter
   4) circumcenter and orthocenter

14. In the diagram below of $\triangle ABC$, $\overrightarrow{TV} || \overrightarrow{BC}$, $AT = 5$, $TB = 7$, and $AV = 10$.

   What is the length of $\overline{VC}$?
   1) $3 \frac{1}{2}$
   2) $7 \frac{1}{7}$
   3) 14
   4) 24

15. In $\triangle RST$, $m \angle R = 58$ and $m \angle S = 73$. Which inequality is true?
   1) $RT < TS < RS$
   2) $RS < RT < TS$
   3) $RT < RS < TS$
   4) $RS < TS < RT$

16. Segment $AB$ is the diameter of circle $M$. The coordinates of $A$ are $(-4,3)$. The coordinates of $M$ are $(1,5)$. What are the coordinates of $B$?
   1) $(6,7)$
   2) $(5,8)$
   3) $(-3,8)$
   4) $(-5,2)$

17. In $\triangle ABC$, $m \angle B < m \angle A < m \angle C$. Which statement is false?
   1) $AC > BC$
   2) $BC > AC$
   3) $AC < AB$
   4) $BC < AB$

18. In the diagram below, $\overline{EF}$ is the median of trapezoid $ABCD$.

   If $AB = 5x - 9$, $DC = x + 3$, and $EF = 2x + 2$, what is the value of $x$?
   1) 5
   2) 2
   3) 7
   4) 8
19. In \(\triangle DEF\), \(m\angle D = 3x + 5\), \(m\angle E = 4x - 15\), and \(m\angle F = 2x + 10\). Which statement is true?
1) \(DF = FE\)
2) \(DE = FE\)
3) \(m\angle E = m\angle F\)
4) \(m\angle D = m\angle F\)

20. In the diagram below, \(LATE\) is an isosceles trapezoid with \(LE \cong AT\), \(LA = 24\), \(ET = 40\), and \(AT = 10\). Altitudes \(LF\) and \(AG\) are drawn.

What is the length of \(LF\)?
1) 6
2) 8
3) 3
4) 4

21. In the diagram below of \(\triangle ABC\), \(\overline{AB} \cong \overline{AC}\), \(m\angle A = 3x\), and \(m\angle B = x + 20\).

What is the value of \(x\)?
1) 10
2) 28
3) 32
4) 40

22. Which graph represents a circle whose equation is \((x + 2)^2 + y^2 = 16\)?

1) 
2) 
3) 
4) 

23. If \(\triangle W'X'Y'\) is the image of \(\triangle WXY\) after the transformation \(R_{90^\circ}\), which statement is false?
1) \(XY = X'Y'\)
2) \(WX \parallel W'X'\)
3) \(\triangle WXY \cong \triangle W'X'Y'\)
4) \(m\angle XWY = m\angle X'W'Y'\)
24 A man wants to place a new bird bath in his yard so that it is 30 feet from a fence, $f$, and also 10 feet from a light pole, $P$. As shown in the diagram below, the light pole is 35 feet away from the fence.

How many locations are possible for the bird bath?
1) 1
2) 2
3) 3
4) 0

25 When a quadrilateral is reflected over the line $y = x$, which geometric relationship is not preserved?
1) congruence
2) orientation
3) parallelism
4) perpendicularity

26 Which reason could be used to prove that a parallelogram is a rhombus?
1) Diagonals are congruent.
2) Opposite sides are parallel.
3) Diagonals are perpendicular.
4) Opposite angles are congruent.

27 In the diagram below of circle $O$, diameter $AOB$ is perpendicular to chord $CD$ at point $E$, $OA = 6$, and $OE = 2$.

What is the length of $CE$?
1) $4\sqrt{3}$
2) $2\sqrt{3}$
3) $8\sqrt{2}$
4) $4\sqrt{2}$

28 What is an equation of circle $O$ shown in the graph below?
1) $(x + 2)^2 + (y - 2)^2 = 9$
2) $(x + 2)^2 + (y - 2)^2 = 3$
3) $(x - 2)^2 + (y + 2)^2 = 9$
4) $(x - 2)^2 + (y + 2)^2 = 3$
29 In the diagram below of circle $O$, $PA$ is tangent to circle $O$ at $A$, and $PBC$ is a secant with points $B$ and $C$ on the circle.

If $PA = 8$ and $PB = 4$, what is the length of $BC$?

1) 20
2) 16
3) 15
4) 12

30 In $\triangle PQR$, $\angle PRQ$ is a right angle and $RT$ is drawn perpendicular to hypotenuse $PQ$. If $PT = x$, $RT = 6$, and $TQ = 4x$, what is the length of $PQ$?

1) 9
2) 12
3) 3
4) 15

31 When solved graphically, what is the solution to the following system of equations?

$$y = x^2 - 4x + 6$$
$$y = x + 2$$

1) (1,4)
2) (4,6)
3) (1,3) and (4,6)
4) (3,1) and (6,4)

32 In the diagram of $\triangle JEA$ below, $m\angle JEA = 90$ and $m\angle EAJ = 48$. Line segment $MS$ connects points $M$ and $S$ on the triangle, such that $m\angle EMS = 59$.

What is $m\angle JSM$?

1) 163
2) 121
3) 42
4) 17

33 In the diagram below, $\triangle ABC \sim \triangle RST$.

Which statement is not true?

1) $\angle A \cong \angle R$
2) $\frac{AB}{RS} = \frac{BC}{ST}$
3) $\frac{AB}{BC} = \frac{ST}{RS}$
4) $\frac{AB + BC + AC}{RS + ST + RT} = \frac{AB}{RS}$
34. In circle $O$, a diameter has endpoints $(-5,4)$ and $(3,-6)$. What is the length of the diameter?
   1) $\sqrt{2}$
   2) $2\sqrt{2}$
   3) $\sqrt{10}$
   4) $2\sqrt{41}$

35. What is the slope of a line perpendicular to the line whose equation is $20x - 2y = 6$?
   1) $-10$
   2) $\frac{1}{10}$
   3) $10$
   4) $\frac{1}{10}$

36. A packing carton in the shape of a triangular prism is shown in the diagram below. What is the volume, in cubic inches, of this carton?
   1) 20
   2) 60
   3) 120
   4) 240

37. The diagram below shows a pair of congruent triangles, with $\angle ADB \cong \angle CDB$ and $\angle ABD \cong \angle CBD$.

Which statement must be true?
   1) $\angle ADB \cong \angle CBD$
   2) $\angle ABC \cong \angle ADC$
   3) $\overline{AB} \cong \overline{CD}$
   4) $\overline{AD} \cong \overline{CD}$

38. Which set of numbers could be the lengths of the sides of an isosceles triangle?
   1) $\{1,1,2\}$
   2) $\{3,3,5\}$
   3) $\{3,4,5\}$
   4) $\{4,4,9\}$

39. If the vertex angles of two isosceles triangles are congruent, then the triangles must be
   1) acute
   2) congruent
   3) right
   4) similar
40 What is the equation of a line passing through 
\((2, -1)\) and parallel to the line represented by the 
equation \(y = 2x + 1\)?
1) \(y = -\frac{1}{2}x\)
2) \(y = -\frac{1}{2}x + 1\)
3) \(y = 2x - 5\)
4) \(y = 2x - 1\)

43 Which equation represents the line that is 
perpendicular to \(2y = x + 2\) and passes through the 
point \((4, 3)\)?
1) \(y = \frac{1}{2}x - 5\)
2) \(y = \frac{1}{2}x + 1\)
3) \(y = -2x + 11\)
4) \(y = -2x - 5\)

41 Which statement is true about every parallelogram?
1) All four sides are congruent.
2) The interior angles are all congruent.
3) Two pairs of opposite sides are congruent.
4) The diagonals are perpendicular to each other.

44 When \(\triangle ABC\) is dilated by a scale factor of 2, its 
image is \(\triangle A'B'C'\). Which statement is true?
1) \(AC \cong A'C'\)
2) \(\angle A \cong \angle A'\)
3) perimeter of \(\triangle ABC = \) perimeter of \(\triangle A'B'C'\)
4) \(2(\text{area of }\triangle ABC) = \text{area of }\triangle A'B'C'\)

42 In the prism shown below, \(\overline{AD} \perp \overline{AE}\) and 
\(\overline{AD} \perp \overline{AB}\).

Which plane is perpendicular to \(\overline{AD}\)?
1) HEA
2) BAD
3) EAB
4) EHG

45 As shown in the diagram below, lines \(m\) and \(n\) are 
cut by transversal \(p\).

If \(m\angle 1 = 4x + 14\) and \(m\angle 2 = 8x + 10\), lines \(m\) and \(n\) 
are parallel when \(x\) equals
1) 1
2) 6
3) 13
4) 17
46. As shown in the diagram of \( \triangle ACD \) below, \( B \) is a point on \( AC \) and \( DB \) is drawn.

If \( \angle A = 66 \), \( \angle CDB = 18 \), and \( \angle C = 24 \), what is the longest side of \( \triangle ABD \)?

1) \( AB \)
2) \( DC \)
3) \( AD \)
4) \( BD \)

47. The angle formed by the radius of a circle and a tangent to that circle has a measure of

1) 45°
2) 90°
3) 135°
4) 180°

48. Parallelogram \( ABCD \) has coordinates \( A(1,5) \), \( B(6,3) \), \( C(3,-1) \), and \( D(-2,1) \). What are the coordinates of \( E \), the intersection of diagonals \( AC \) and \( BD \)?

1) (2,2)
2) (4.5,1)
3) (3.5,2)
4) (-1,3)

49. When a dilation is performed on a hexagon, which property of the hexagon will \textit{not} be preserved in its image?

1) parallelism
2) orientation
3) length of sides
4) measure of angles

50. In the diagram of \( \triangle ABC \) shown below, \( D \) is the midpoint of \( AB \), \( E \) is the midpoint of \( BC \), and \( F \) is the midpoint of \( AC \).

If \( AB = 20 \), \( BC = 12 \), and \( AC = 16 \), what is the perimeter of trapezoid \( ABEF \)?

1) 24
2) 36
3) 40
4) 44

51. In \( \triangle ABC \) and \( \triangle DEF \), \( \frac{AC}{DF} = \frac{CB}{FE} \). Which additional information would prove \( \triangle ABC \sim \triangle DEF \)?

1) \( AC = DF \)
2) \( CB = FE \)
3) \( \angle ACB \cong \angle DFE \)
4) \( \angle BAC \cong \angle EDF \)
52 As shown in the diagram below, $\overline{AC}$ bisects $\angle BAD$ and $\angle B \cong \angle D$.

Which method could be used to prove $\triangle ABC \cong \triangle ADC$?
1) SSS
2) AAA
3) SAS
4) AAS

53 In the diagram below of $\triangle ACE$, medians $\overline{AD}$, $\overline{EB}$, and $\overline{CF}$ intersect at $G$. The length of $\overline{FG}$ is 12 cm.

What is the length, in centimeters, of $\overline{GC}$?
1) 24
2) 12
3) 6
4) 4

54 In the diagram below of circle $O$, radius $\overline{OC}$ is 5 cm. Chord $\overline{AB}$ is 8 cm and is perpendicular to $\overline{OC}$ at point $P$.

What is the length of $\overline{OP}$, in centimeters?
1) 8
2) 2
3) 3
4) 4

55 In the diagram below, $\triangle ABC \cong \triangle XYZ$.

Which statement must be true?
1) $\angle C \cong \angle Y$
2) $\angle A \cong \angle X$
3) $\overline{AC} \cong \overline{YZ}$
4) $\overline{CB} \cong \overline{XZ}$
56 Triangle \(JTM\) is shown on the graph below.

Which transformation would result in an image that is not congruent to \(\triangle JTM\)?
1) \(r_{y=x}\)
2) \(R_{90°}\)
3) \(T_{0,-3}\)
4) \(D_2\)

57 Given three distinct quadrilaterals, a square, a rectangle, and a rhombus, which quadrilaterals must have perpendicular diagonals?
1) the rhombus, only
2) the rectangle and the square
3) the rhombus and the square
4) the rectangle, the rhombus, and the square

58 If \(AB\) is contained in plane \(P\), and \(AB\) is perpendicular to plane \(R\), which statement is true?
1) \(AB\) is parallel to plane \(R\)
2) Plane \(P\) is parallel to plane \(R\)
3) \(AB\) is perpendicular to plane \(P\)
4) Plane \(P\) is perpendicular to plane \(R\)

59 Which equation represents the perpendicular bisector of \(\overline{AB}\) whose endpoints are \(A(8,2)\) and \(B(0,6)\)?
1) \(y = 2x - 4\)
2) \(y = -\frac{1}{2}x + 2\)
3) \(y = -\frac{1}{2}x + 6\)
4) \(y = 2x - 12\)

60 In the diagram below of \(\triangle ABC\), side \(\overline{BC}\) is extended to point \(D\), \(m\angle A = x\), \(m\angle B = 2x + 15\), and \(m\angle ACB = 5x + 5\).

What is \(m\angle B\)?
1) 5
2) 20
3) 25
4) 55

61 Which compound statement is true?
1) A triangle has three sides and a quadrilateral has five sides.
2) A triangle has three sides if and only if a quadrilateral has five sides.
3) If a triangle has three sides, then a quadrilateral has five sides.
4) A triangle has three sides or a quadrilateral has five sides.
62. What is an equation of the circle with a radius of 5 and center at (1, −4)?
   1) \((x + 1)^2 + (y - 4)^2 = 5\)
   2) \((x - 1)^2 + (y + 4)^2 = 5\)
   3) \((x + 1)^2 + (y - 4)^2 = 25\)
   4) \((x - 1)^2 + (y + 4)^2 = 25\)

63. The image of \(\triangle ABC\) after the transformation \(r_{y-axis}\) is \(\triangle A'B'C'\). Which property is not preserved?
   1) distance
   2) orientation
   3) collinearity
   4) angle measure

64. In the diagram below of rhombus \(ABCD\), \(m\angle C = 100\)°.

What is \(m\angle DBC\)?
   1) 40
   2) 45
   3) 50
   4) 80

65. What is the slope of a line that is perpendicular to the line whose equation is \(3x + 5y = 4\)?
   1) \(-\frac{3}{5}\)
   2) \(\frac{3}{5}\)
   3) \(-\frac{5}{3}\)
   4) \(\frac{5}{3}\)

66. In the diagram below, line \(p\) intersects line \(m\) and line \(n\).

If \(m\angle 1 = 7x\) and \(m\angle 2 = 5x + 30\), lines \(m\) and \(n\) are parallel when \(x\) equals
   1) 12.5
   2) 15
   3) 87.5
   4) 105

67. Points \(A, B, C,\) and \(D\) are located on circle \(O\), forming trapezoid \(ABCD\) with \(AB \parallel DC\). Which statement must be true?
   1) \(\overline{AB} \cong \overline{DC}\)
   2) \(\overline{AD} \cong \overline{BC}\)
   3) \(\angle A \cong \angle D\)
   4) \(\overline{AB} \cong \overline{DC}\)
68 In the diagram below of circle $O$, chords $AB$ and $CD$ intersect at $E$.

If $m\angle AEC = 34$ and $m\overarc{AC} = 50$, what is $m\overarc{DB}$?
1) 16
2) 18
3) 68
4) 118

69 In the diagram below, $\triangle LMO$ is isosceles with $LO = MO$.

If $m\angle L = 55$ and $m\angle NOM = 28$, what is $m\angle N$?
1) 27
2) 28
3) 42
4) 70

70 How many points are both 4 units from the origin and also 2 units from the line $y = 4$?
1) 1
2) 2
3) 3
4) 4

71 The diagram below shows the construction of $\overrightarrow{AB}$ through point $P$ parallel to $CD$.

Which theorem justifies this method of construction?
1) If two lines in a plane are perpendicular to a transversal at different points, then the lines are parallel.
2) If two lines in a plane are cut by a transversal to form congruent corresponding angles, then the lines are parallel.
3) If two lines in a plane are cut by a transversal to form congruent alternate interior angles, then the lines are parallel.
4) If two lines in a plane are cut by a transversal to form congruent alternate exterior angles, then the lines are parallel.

72 Lines $a$ and $b$ intersect at point $P$. Line $c$ passes through $P$ and is perpendicular to the plane containing lines $a$ and $b$. Which statement must be true?
1) Lines $a$, $b$, and $c$ are coplanar.
2) Line $a$ is perpendicular to line $b$.
3) Line $c$ is perpendicular to both line $a$ and line $b$.
4) Line $c$ is perpendicular to line $a$ or line $b$, but not both.
73 In the diagram below of \( \triangle ABC \), \( \overline{AE} \cong \overline{BE} \), \( \overline{AF} \cong \overline{CF} \), and \( \overline{CD} \cong \overline{BD} \).

Point \( P \) must be the
1) centroid
2) circumcenter
3) Incenter
4) orthocenter

74 In the diagram below, point \( P \) is the centroid of \( \triangle ABC \).

If \( PM = 2x + 5 \) and \( BP = 7x + 4 \), what is the length of \( PM \)?
1) 9
2) 2
3) 18
4) 27

75 Which pair of edges is not coplanar in the cube shown below?

1) \( \overline{EH} \) and \( \overline{CD} \)
2) \( \overline{AD} \) and \( \overline{FG} \)
3) \( \overline{DH} \) and \( \overline{AE} \)
4) \( \overline{AB} \) and \( \overline{EF} \)

76 The bases of a prism are right trapezoids, as shown in the diagram below.

Which two edges do not lie in the same plane?
1) \( \overline{BC} \) and \( \overline{WZ} \)
2) \( \overline{AW} \) and \( \overline{CY} \)
3) \( \overline{DC} \) and \( \overline{WX} \)
4) \( \overline{BX} \) and \( \overline{AB} \)
77 The vertices of the triangle in the diagram below are \( A(7,9), B(3,3), \) and \( C(11,3) \).

What are the coordinates of the centroid of \( \triangle ABC \)?
1) (5,6)
2) (7,3)
3) (7,5)
4) (9,6)

78 For which polygon does the sum of the measures of the interior angles equal the sum of the measures of the exterior angles?
1) hexagon
2) pentagon
3) quadrilateral
4) triangle

79 The coordinates of the endpoints of \( AB \) are \( A(0,0) \) and \( B(0,6) \). The equation of the perpendicular bisector of \( AB \) is
1) \( x = 0 \)
2) \( x = 3 \)
3) \( y = 0 \)
4) \( y = 3 \)

80 In quadrilateral \( ABCD \), each diagonal bisects opposite angles. If \( m \angle DAB = 70 \), then \( ABCD \) must be a
1) rectangle
2) trapezoid
3) rhombus
4) square

81 Line segment \( AB \) is shown in the diagram below.

Which two sets of construction marks, labeled I, II, III, and IV, are part of the construction of the perpendicular bisector of line segment \( AB \)?
1) I and II
2) I and III
3) II and III
4) II and IV

82 A sphere is inscribed inside a cube with edges of 6 cm. In cubic centimeters, what is the volume of the sphere, in terms of \( \pi \)?
1) \( 12\pi \)
2) \( 36\pi \)
3) \( 48\pi \)
4) \( 288\pi \)
83 In $\triangle ABC$ shown below, $P$ is the centroid and $BF = 18$.

What is the length of $BP$?
1) 6
2) 9
3) 3
4) 12

84 Plane $R$ is perpendicular to line $k$ and plane $D$ is perpendicular to line $k$. Which statement is correct?
1) Plane $R$ is perpendicular to plane $D$.
2) Plane $R$ is parallel to plane $D$.
3) Plane $R$ intersects plane $D$.
4) Plane $R$ bisects plane $D$.

85 A line segment has endpoints $A(7,-1)$ and $B(-3,3)$. What are the coordinates of the midpoint of $AB$?
1) $(1,2)$
2) $(2,1)$
3) $(-5,2)$
4) $(5,-2)$

86 What is the equation of a circle whose center is 4 units above the origin in the coordinate plane and whose radius is 6?
1) $x^2 + (y - 6)^2 = 16$ 
2) $(x - 6)^2 + y^2 = 16$ 
3) $x^2 + (y - 4)^2 = 36$ 
4) $(x - 4)^2 + y^2 = 36$

87 The two lines represented by the equations below are graphed on a coordinate plane.

$x + 6y = 12$
$3(x - 2) = -y - 4$

Which statement best describes the two lines?
1) The lines are parallel.
2) The lines are the same line.
3) The lines are perpendicular.
4) The lines intersect at an angle other than 90°.

88 In the diagram of quadrilateral $ABCD$, $AB \parallel CD$, $\angle ABC \cong \angle CDA$, and diagonal $AC$ is drawn.

Which method can be used to prove $\triangle ABC$ is congruent to $\triangle CDA$?
1) AAS
2) SSA
3) SAS
4) SSS
89 Which construction of parallel lines is justified by the theorem "If two lines are cut by a transversal to form congruent alternate interior angles, then the lines are parallel"?

1) 

2) 

3) 

4) 

90 What is the image of the point (2, −3) after the transformation \( r_{y = -1} \)?

1) (2, 3)
2) (−2, −3)
3) (−2, 3)
4) (−3, 2)

91 The statement "\( x > 5 \) or \( x < 3 \)" is false when \( x \) is equal to

1) 1
2) 2
3) 7
4) 4

92 In the diagram below of \( \triangle ABC \), with \( \overline{CDEA} \) and \( \overline{BGFA} \), \( EF \parallel DG \parallel CB \).

Which statement is false?

1) \( \frac{AC}{AD} = \frac{AB}{AG} \)
2) \( \frac{AE}{AF} = \frac{AC}{AB} \)
3) \( \frac{AE}{AD} = \frac{EC}{AC} \)
4) \( \frac{BG}{BA} = \frac{CD}{CA} \)

93 What is the equation of the line that passes through the point (−9, 6) and is perpendicular to the line \( y = 3x - 5 \)?

1) \( y = 3x + 21 \)
2) \( y = -\frac{1}{3}x - 3 \)
3) \( y = 3x + 33 \)
4) \( y = -\frac{1}{3}x + 3 \)
94 In \( \triangle AED \) with \( \overline{ABCD} \) shown in the diagram below, \( EB \) and \( EC \) are drawn.

If \( AB \cong CD \), which statement could always be proven?

1) \( AC \cong DB \)
2) \( AE \cong ED \)
3) \( AB \cong BC \)
4) \( EC \cong EA \)

95 A straightedge and compass were used to create the construction below. Arc \( EF \) was drawn from point \( B \), and arcs with equal radii were drawn from \( E \) and \( F \).

Which statement is false?

1) \( m\angle ABD = m\angle DBC \)
2) \( \frac{1}{2} (m\angle ABC) = m\angle ABD \)
3) \( 2(m\angle DBC) = m\angle ABC \)
4) \( 2(m\angle ABC) = m\angle CBD \)

96 Point \( P \) lies on line \( m \). Point \( P \) is also included in distinct planes \( Q, R, S, \) and \( T \). At most, how many of these planes could be perpendicular to line \( m \)?

1) 1
2) 2
3) 3
4) 4

97 The equation of line \( k \) is \( y = \frac{1}{3}x - 2 \). The equation of line \( m \) is \( -2x + 6y = 18 \). Lines \( k \) and \( m \) are

1) parallel
2) perpendicular
3) the same line
4) neither parallel nor perpendicular

98 In the diagram below of \( \triangle DAE \) and \( \triangle BCE \), \( AB \) and \( CD \) intersect at \( E \), such that \( AE \cong CE \) and \( \angle BCE \cong \angle DAE \).

Triangle \( DAE \) can be proved congruent to triangle \( BCE \) by

1) ASA
2) SAS
3) SSS
4) HL
99 When writing a geometric proof, which angle relationship could be used alone to justify that two angles are congruent?
1) supplementary angles
2) linear pair of angles
3) adjacent angles
4) vertical angles

100 What is an equation of the line that passes through the point (−2,3) and is parallel to the line whose equation is \( y = \frac{3}{2} x - 4 \)?
1) \( y = \frac{-2}{3} x \)
2) \( y = \frac{-2}{3} x + \frac{5}{3} \)
3) \( y = \frac{3}{2} x \)
4) \( y = \frac{3}{2} x + 6 \)

101 The coordinates of point A are (−3a,4b). If point A’ is the image of point A reflected over the line \( y = x \), the coordinates of A’ are
1) (4b,−3a)
2) (3a,4b)
3) (−3a,−4b)
4) (−4b,−3a)

102 Scalene triangle \( ABC \) is similar to triangle \( DEF \). Which statement is false?
1) \( AB : BC = DE : EF \)
2) \( AC : DF = BC : EF \)
3) \( \angle ACB \cong \angle DFE \)
4) \( \angle ABC \cong \angle EDF \)

103 Which quadrilateral has diagonals that are always perpendicular bisectors of each other?
1) square
2) rectangle
3) trapezoid
4) parallelogram

104 What is the length of the line segment whose endpoints are (1,−4) and (9,2)?
1) 5
2) \( 2\sqrt{17} \)
3) 10
4) \( 2\sqrt{26} \)

105 As shown in the diagram below, \( FJ \) is contained in plane \( R \), \( BC \) and \( DE \) are contained in plane \( S \), and \( FJ, BC, \) and \( DE \) intersect at \( A \).

Which fact is sufficient to show that planes \( R \) and \( S \) are perpendicular?
1) \( FA \perp DE \)
2) \( AD \perp AF \)
3) \( BC \perp FJ \)
4) \( DE \perp BC \)
106 Which graph represents a circle with the equation $(x - 3)^2 + (y + 1)^2 = 4$?

1)  

2)  

3)  

4)  

107 In the diagram below of right triangle $ABC$, $CD$ is the altitude to hypotenuse $AB$, $CB = 6$, and $AD = 5$.

What is the length of $BD$?
1) 5  
2) 9  
3) 3  
4) 4  

108 The diagram below shows a rectangular prism.

Which pair of edges are segments of lines that are coplanar?
1) $AB$ and $DH$  
2) $AE$ and $DC$  
3) $BC$ and $EH$  
4) $CG$ and $EF$
109 If two distinct planes, \( \mathcal{A} \) and \( \mathcal{B} \), are perpendicular to line \( c \), then which statement is true?
1) Planes \( \mathcal{A} \) and \( \mathcal{B} \) are parallel to each other.
2) Planes \( \mathcal{A} \) and \( \mathcal{B} \) are perpendicular to each other.
3) The intersection of planes \( \mathcal{A} \) and \( \mathcal{B} \) is a line parallel to line \( c \).
4) The intersection of planes \( \mathcal{A} \) and \( \mathcal{B} \) is a line perpendicular to line \( c \).

110 In the diagram below of circle \( O \), chord \( \overline{AB} \) is parallel to chord \( \overline{CD} \).

Which statement must be true?
1) \( \overparen{AC} \cong \overparen{BD} \)
2) \( \overparen{AB} \cong \overparen{CD} \)
3) \( \overparen{AB} \cong \overparen{CD} \)
4) \( \overparen{ABD} \cong \overparen{CDB} \)

111 A line segment has endpoints \((4, 7)\) and \((1, 11)\). What is the length of the segment?
1) 5
2) 7
3) 16
4) 25

112 Which diagram represents a correct construction of equilateral \( \triangle ABC \), given side \( AB \)?

1) 
2) 
3) 
4)
113 In the diagram below of $\triangle PAO$, $AP$ is tangent to circle $O$ at point $A$, $OB = 7$, and $BP = 18$.

What is the length of $AP$?
1) 10
2) 12
3) 17
4) 24

114 As shown on the graph below, $\triangle R'S'T'$ is the image of $\triangle RST$ under a single transformation.

Which transformation does this graph represent?
1) glide reflection
2) line reflection
3) rotation
4) translation

115 Point M is the midpoint of $AB$. If the coordinates of $A$ are $(-3,6)$ and the coordinates of $M$ are $(-5,2)$, what are the coordinates of $B$?
1) (1,2)
2) (7,10)
3) (-4,4)
4) (-7,-2)

116 In the diagram below of circle $O$, chord $AB$ is parallel to chord $GH$. Chord $CD$ intersects $AB$ at $E$ and $GH$ at $F$.

Which statement must always be true?
1) $AC \cong CB$
2) $DH \cong BH$
3) $AB \cong GH$
4) $AG \cong BH$

117 If two sides of a triangle have lengths of 4 and 10, the third side could be
1) 8
2) 2
3) 16
4) 4
118 Which equation represents circle O with center (2, −8) and radius 9?
1) \((x + 2)^2 + (y - 8)^2 = 9\)
2) \((x - 2)^2 + (y + 8)^2 = 9\)
3) \((x + 2)^2 + (y - 8)^2 = 81\)
4) \((x - 2)^2 + (y + 8)^2 = 81\)

119 In the diagram below of \(\triangle ABC\), \(BC\) is extended to \(D\).

If \(m\angle A = x^2 - 6x\), \(m\angle B = 2x - 3\), and \(m\angle ACD = 9x + 27\), what is the value of \(x\)?
1) 10
2) 2
3) 3
4) 15

120 The statement "\(x\) is a multiple of 3, and \(x\) is an even integer" is true when \(x\) is equal to
1) 9
2) 8
3) 3
4) 6

121 In the diagram below, \(\overline{AB}\) is perpendicular to plane \(AEFG\).

Which plane must be perpendicular to plane \(AEFG\)?
1) \(ABCE\)
2) \(BCDH\)
3) \(CDEF\)
4) \(HDFG\)

122 In \(\triangle ABC\) shown below with \(\overline{ADC}, \overline{AEB}, \overline{CFE}\), and \(\overline{BFD}\), \(\triangle ACE \cong \triangle ABD\).

Which statement must be true?
1) \(\angle ACF \cong \angle BCF\)
2) \(\angle DAE \cong \angle DFE\)
3) \(\angle BCD \cong \angle ABD\)
4) \(\angle AEF \cong \angle ADF\)
123 The equations of lines $k$, $m$, and $n$ are given below.

$k$: $3y + 6 = 2x$

$m$: $3y + 2x + 6 = 0$

$n$: $2y = 3x + 6$

Which statement is true?

1) $k \parallel m$
2) $n \parallel m$
3) $m \perp k$
4) $m \perp n$

124 Triangle $ABC$ is graphed on the set of axes below.

Which transformation produces an image that is similar to, but not congruent to, $\triangle ABC$?

1) $T_{2,3}$
2) $D_2$
3) $r_{y=x}$
4) $R_{90}$

125 Line $n$ intersects lines $l$ and $m$, forming the angles shown in the diagram below.

Which value of $x$ would prove $l \parallel m$?

1) 2.5
2) 4.5
3) 6.25
4) 8.75

126 What is the length of $AB$ with endpoints $A(-1,0)$ and $B(4,-3)$?

1) $\sqrt{66}$
2) $\sqrt{18}$
3) $\sqrt{34}$
4) $\sqrt{50}$

127 In rhombus $ABCD$, the diagonals $\overline{AC}$ and $\overline{BD}$ intersect at $E$. If $AE = 5$ and $BE = 12$, what is the length of $AB$?

1) 7
2) 10
3) 13
4) 17
128 Lines \( m \) and \( n \) intersect at point \( A \). Line \( k \) is perpendicular to both lines \( m \) and \( n \) at point \( A \). Which statement must be true?
1) Lines \( m \), \( n \), and \( k \) are in the same plane.
2) Lines \( m \) and \( n \) are in two different planes.
3) Lines \( m \) and \( n \) are perpendicular to each other.
4) Line \( k \) is perpendicular to the plane containing lines \( m \) and \( n \).

129 In the diagram below, quadrilateral \( JUMP \) is inscribed in a circle.

![Quadrilateral JUMP inscribed in a circle](image)

Opposite angles \( J \) and \( M \) must be
1) right
2) complementary
3) congruent
4) supplementary

130 In \( \triangle ABC \), \( AB = 5 \) feet and \( BC = 3 \) feet. Which inequality represents all possible values for the length of \( AC \), in feet?
1) \( 2 \leq AC \leq 8 \)
2) \( 2 < AC < 8 \)
3) \( 3 \leq AC \leq 7 \)
4) \( 3 < AC < 7 \)

131 Pentagon \( PQRST \) has \( PQ \) parallel to \( TS \). After a translation of \( T_{2,-5} \), which line segment is parallel to \( P'Q' \)?
1) \( R'Q' \)
2) \( R'S' \)
3) \( T'S' \)
4) \( T'P' \)

132 As shown in the diagram below of \( \triangle ABC \), a compass is used to find points \( D \) and \( E \), equidistant from point \( A \). Next, the compass is used to find point \( F \), equidistant from points \( D \) and \( E \). Finally, a straightedge is used to draw \( \overrightarrow{AF} \). Then, point \( G \), the intersection of \( \overrightarrow{AF} \) and side \( BC \) of \( \triangle ABC \), is labeled.

![Diagram of \( \triangle ABC \) with points D, E, F, and G marked](image)

Which statement must be true?
1) \( \overrightarrow{AF} \) bisects side \( BC \)
2) \( \overrightarrow{AF} \) bisects \( \triangle BAC \)
3) \( \overrightarrow{AF} \perp BC \)
4) \( \triangle ABG \sim \triangle ACG \)
133 In the diagram below of $ABCD$, $AC \cong BD$.

Using this information, it could be proven that
1) $BC = AB$
2) $AB = CD$
3) $AD - BC = CD$
4) $AB + CD = AD$

134 Point $A$ lies in plane $B$. How many lines can be drawn perpendicular to plane $B$ through point $A$?
1) one
2) two
3) zero
4) infinite

135 In $\triangle ABC$, $AB = 4$, $BC = 7$, and $AC = 10$. Which statement is true?
1) $m\angle B > m\angle C > m\angle A$
2) $m\angle B > m\angle A > m\angle C$
3) $m\angle C > m\angle B > m\angle A$
4) $m\angle C > m\angle A > m\angle B$

136 Which type of triangle can be drawn using the points $(-2,3)$, $(-2,-7)$, and $(4,-5)$?
1) scalene
2) isosceles
3) equilateral
4) no triangle can be drawn

137 What is the volume, in cubic centimeters, of a cylinder that has a height of 15 cm and a diameter of 12 cm?
1) $180\pi$
2) $540\pi$
3) $675\pi$
4) $2,160\pi$

138 Triangle $ABC$ has vertices $A(0,0)$, $B(3,2)$, and $C(0,4)$. The triangle may be classified as
1) equilateral
2) isosceles
3) right
4) scalene

139 In the diagram below of right triangle $ABC$, altitude $BD$ is drawn to hypotenuse $AC$, $AC = 16$, and $CD = 7$.

What is the length of $BD$?
1) $3\sqrt{7}$
2) $4\sqrt{7}$
3) $7\sqrt{3}$
4) 12
140 In the diagram below of \( \triangle ABC \), \( D \) is the midpoint of \( AB \), and \( E \) is the midpoint of \( BC \).

If \( AC = 4x + 10 \), which expression represents \( DE \)?
1) \( x + 2.5 \)
2) \( 2x + 5 \)
3) \( 2x + 10 \)
4) \( 8x + 20 \)

141 In all isosceles triangles, the exterior angle of a base angle must always be
1) a right angle
2) an acute angle
3) an obtuse angle
4) equal to the vertex angle

142 The diagonals of a quadrilateral are congruent but do not bisect each other. This quadrilateral is
1) an isosceles trapezoid
2) a parallelogram
3) a rectangle
4) a rhombus

143 What is an equation of the line that is perpendicular to the line whose equation is \( y = \frac{3}{5}x - 2 \) and that passes through the point \((3, -6)\)?
1) \( y = \frac{5}{3}x - 11 \)
2) \( y = -\frac{5}{3}x + 11 \)
3) \( y = -\frac{5}{3}x - 1 \)
4) \( y = \frac{5}{3}x + 1 \)

144 A circle has the equation \((x - 2)^2 + (y + 3)^2 = 36\). What are the coordinates of its center and the length of its radius?
1) \((-2, 3)\) and 6
2) \((2, -3)\) and 6
3) \((-2, 3)\) and 36
4) \((2, -3)\) and 36

145 In parallelogram \( ABCD \) shown below, diagonals \( AC \) and \( BD \) intersect at \( E \).

Which statement must be true?
1) \( AC \cong DB \)
2) \( \angle ABD \cong \angle CBD \)
3) \( \triangle AED \cong \triangle CEB \)
4) \( \triangle DCE \cong \triangle BCE \)
146 Plane $A$ is parallel to plane $B$. Plane $C$ intersects plane $A$ in line $m$ and intersects plane $B$ in line $n$. Lines $m$ and $n$ are
1) intersecting
2) parallel
3) perpendicular
4) skew

147 As shown in the diagram below, $\triangle ABC \sim \triangle DEF$, $AB = 7x$, $BC = 4$, $DE = 7$, and $EF = x$.

What is the length of $AB$?
1) 28
2) 2
3) 14
4) 4

148 Quadrilateral $ABCD$ undergoes a transformation, producing quadrilateral $A'B'C'D'$. For which transformation would the area of $A'B'C'D'$ not be equal to the area of $ABCD$?
1) a rotation of $90^\circ$ about the origin
2) a reflection over the $y$-axis
3) a dilation by a scale factor of 2
4) a translation defined by $(x,y) \rightarrow (x + 4, y - 1)$

149 The graph below shows $\overrightarrow{JT}$ and its image, $\overrightarrow{J'T'}$, after a transformation.

Which transformation would map $\overrightarrow{JT}$ onto $\overrightarrow{J'T'}$?
1) translation
2) glide reflection
3) rotation centered at the origin
4) reflection through the origin

150 The diagram below represents a rectangular solid.

Which statement must be true?
1) $\overrightarrow{EH}$ and $BC$ are coplanar
2) $\overrightarrow{FG}$ and $AB$ are coplanar
3) $\overrightarrow{EH}$ and $AD$ are skew
4) $\overrightarrow{FG}$ and $CG$ are skew
151 Which quadrilateral has diagonals that always bisect its angles and also bisect each other?
   1) rhombus
   2) rectangle
   3) parallelogram
   4) isosceles trapezoid

152 The slope of line $\ell$ is $-\frac{1}{3}$. What is an equation of a line that is perpendicular to line $\ell$?
   1) $y + 2 = \frac{1}{3} x$
   2) $-2x + 6 = 6y$
   3) $9x - 3y = 27$
   4) $3x + y = 0$

153 In the diagram of $\triangle ABC$ shown below, $\overline{DE} \parallel \overline{BC}$.

If $AB = 10$, $AD = 8$, and $AE = 12$, what is the length of $EC$?
   1) 6
   2) 2
   3) 3
   4) 15

154 As shown in the diagram below, when hexagon $ABCDEF$ is reflected over line $m$, the image is hexagon $A'B'C'D'E'F'$.

Under this transformation, which property is not preserved?
   1) area
   2) distance
   3) orientation
   4) angle measure

155 Triangle $A'B'C'$ is the image of $\triangle ABC$ after a dilation of 2. Which statement is true?
   1) $AB = A'B'$
   2) $BC = 2(B'C')$
   3) $m\angle B = m\angle B'$
   4) $m\angle A = \frac{1}{2} (m\angle A')$

156 The lines represented by the equations $4x + 6y = 6$ and $y = \frac{2}{3} x - 1$ are
   1) parallel
   2) the same line
   3) perpendicular
   4) intersecting, but not perpendicular
157. The sum of the interior angles of a polygon of \(n\) sides is
1) \(360\)
2) \(\frac{360}{n}\)
3) \((n - 2) \cdot 180\)
4) \(\frac{(n - 2) \cdot 180}{n}\)

158. In circle \(O\) shown below, diameter \(DB\) is perpendicular to chord \(AC\) at \(E\).

![Diagram](image)

If \(DB = 34\), \(AC = 30\), and \(DE > BE\), what is the length of \(BE\)?
1) 8
2) 9
3) 16
4) 25

159. Triangle \(PQR\) has angles in the ratio of \(2:3:5\). Which type of triangle is \(\Delta PQR\)?
1) acute
2) isosceles
3) obtuse
4) right

160. Which diagram shows the construction of the perpendicular bisector of \(AB\)?

![Diagrams](image)
161 Which line is parallel to the line whose equation is \( 4x + 3y = 7 \) and also passes through the point \((-5,2)\)?

1) \( 4x + 3y = -26 \)
2) \( 4x + 3y = -14 \)
3) \( 3x + 4y = -7 \)
4) \( 3x + 4y = 14 \)

162 Which graph represents a circle whose equation is \((x - 2)^2 + (y + 4)^2 = 4\)?

1) 
2) 
3) 
4) 

163 In a given triangle, the point of intersection of the three medians is the same as the point of intersection of the three altitudes. Which classification of the triangle is correct?

1) scalene triangle
2) isosceles triangle
3) equilateral triangle
4) right isosceles triangle

164 In the diagram of \( \triangle KLM \) below, \( \angle L = 70^\circ \), \( \angle M = 50^\circ \), and \( MK \) is extended through \( N \).

What is the measure of \( \angle LKN \)?

1) \( 60^\circ \)
2) \( 120^\circ \)
3) \( 180^\circ \)
4) \( 300^\circ \)

165 What is the measure of each interior angle of a regular hexagon?

1) \( 60^\circ \)
2) \( 120^\circ \)
3) \( 135^\circ \)
4) \( 270^\circ \)
166 Parallelogram $ABCD$ with diagonals $AC$ and $BD$ intersecting at $E$ is shown below.

Which statement must be true?
1) $BE \cong CE$
2) $\angle BAE \cong \angle DCE$
3) $AB \cong BC$
4) $\angle DAE \cong \angle CBE$

167 Which equation of a circle will have a graph that lies entirely in the first quadrant?
1) $(x - 4)^2 + (y - 5)^2 = 9$
2) $(x + 4)^2 + (y + 5)^2 = 9$
3) $(x + 4)^2 + (y + 5)^2 = 25$
4) $(x - 5)^2 + (y - 4)^2 = 25$

168 What is the length of the line segment whose endpoints are $A(-1, 9)$ and $B(7, 4)$?
1) $\sqrt{61}$
2) $\sqrt{89}$
3) $\sqrt{205}$
4) $\sqrt{233}$

169 What is an equation of the circle shown in the graph below?

1) $(x - 3)^2 + (y - 4)^2 = 25$
2) $(x + 3)^2 + (y + 4)^2 = 25$
3) $(x - 3)^2 + (y - 4)^2 = 10$
4) $(x + 3)^2 + (y + 4)^2 = 10$

170 An equation of the line that passes through $(2, -1)$ and is parallel to the line $2y + 3x = 8$ is
1) $y = \frac{3}{2}x - 4$
2) $y = \frac{3}{2}x + 4$
3) $y = -\frac{3}{2}x - 2$
4) $y = -\frac{3}{2}x + 2$
171 In the diagram below, parallelogram $ABCD$ has diagonals $AC$ and $BD$ that intersect at point $E$.

Which expression is not always true?
1) $\angle DAE \cong \angle BCE$
2) $\angle DEC \cong \angle BEA$
3) $AC \cong DB$
4) $DE \cong EB$

172 In the diagram below, $DE$ joins the midpoints of two sides of $\triangle ABC$.

Which statement is not true?
1) $CE = \frac{1}{2} CB$
2) $DE = \frac{1}{2} AB$
3) area of $\triangle CDE = \frac{1}{2}$ area of $\triangle CAB$
4) perimeter of $\triangle CDE = \frac{1}{2}$ perimeter of $\triangle CAB$

173 The number of degrees in the sum of the interior angles of a pentagon is
1) 72
2) 360
3) 540
4) 720

174 Given that $ABCD$ is a parallelogram, a student wrote the proof below to show that a pair of its opposite angles are congruent.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. $ABCD$ is a parallelogram.</td>
<td>1. Given</td>
</tr>
<tr>
<td>2. $BC \cong AD$</td>
<td>2. Opposite sides of a parallelogram are congruent.</td>
</tr>
<tr>
<td>$AB \cong CD$</td>
<td>3. Reflexive Postulate of Congruency</td>
</tr>
<tr>
<td>3. $AD \cong CA$</td>
<td>4. Side-Side-Side</td>
</tr>
<tr>
<td>4. $\triangle ABC \cong \triangle CDA$</td>
<td></td>
</tr>
<tr>
<td>5. $\angle A \cong \angle D$</td>
<td>5.</td>
</tr>
</tbody>
</table>

What is the reason justifying that $\angle B \cong \angle D$?
1) Opposite angles in a quadrilateral are congruent.
2) Parallel lines have congruent corresponding angles.
3) Corresponding parts of congruent triangles are congruent.
4) Alternate interior angles in congruent triangles are congruent.
175 The point (3, -2) is rotated 90° about the origin and then dilated by a scale factor of 4. What are the coordinates of the resulting image?
1) (-12, 8)
2) (12, -8)
3) (8, 12)
4) (-8, -12)

176 In the diagram below, lines n and m are cut by transversals p and q.

What value of x would make lines n and m parallel?
1) 110
2) 80
3) 70
4) 50

177 The equation of a circle with its center at (-3, 5) and a radius of 4 is
1) \((x + 3)^2 + (y - 5)^2 = 4\)
2) \((x - 3)^2 + (y + 5)^2 = 4\)
3) \((x + 3)^2 + (y - 5)^2 = 16\)
4) \((x - 3)^2 + (y + 5)^2 = 16\)

178 What is an equation of circle O shown in the graph below?
1) \((x + 1)^2 + (y - 3)^2 = 25\)
2) \((x - 1)^2 + (y + 3)^2 = 25\)
3) \((x - 5)^2 + (y + 6)^2 = 25\)
4) \((x + 5)^2 + (y - 6)^2 = 25\)

179 Which equation represents the line parallel to the line whose equation is \(4x + 2y = 14\) and passing through the point (2, 2)?
1) \(y = -2x\)
2) \(y = -2x + 6\)
3) \(y = \frac{1}{2}x\)
4) \(y = \frac{1}{2}x + 1\)
180 As shown in the diagram below, a kite needs a vertical and a horizontal support bar attached at opposite corners. The upper edges of the kite are 7 inches, the side edges are \( x \) inches, and the vertical support bar is \((x + 1)\) inches.

What is the measure, in inches, of the vertical support bar?
1) 23
2) 24
3) 25
4) 26

181 What is an equation of a circle with center \((7,-3)\) and radius 4?
1) \((x - 7)^2 + (y + 3)^2 = 4\)
2) \((x + 7)^2 + (y - 3)^2 = 4\)
3) \((x - 7)^2 + (y + 3)^2 = 16\)
4) \((x + 7)^2 + (y - 3)^2 = 16\)

182 Quadrilateral \(MNOP\) is a trapezoid with \(MN \parallel OP\). If \(M'N'O'P'\) is the image of \(MNOP\) after a reflection over the \(x\)-axis, which two sides of quadrilateral \(M'N'O'P'\) are parallel?
1) \(M'N'\) and \(O'P'\)
2) \(M'N'\) and \(N'O'\)
3) \(P'M'\) and \(O'P'\)
4) \(P'M'\) and \(N'O'\)

183 The vertices of parallelogram \(ABCD\) are \(A(2,0), B(0,-3), C(3,-3),\) and \(D(5,0)\). If \(ABCD\) is reflected over the \(x\)-axis, how many vertices remain invariant?
1) 1
2) 2
3) 3
4) 0

184 A student used a compass and a straightedge to construct \(CE\) in \(\triangle ABC\) as shown below.

Which statement must always be true for this construction?
1) \(\angle CEA \cong \angle CEB\)
2) \(\angle ACE \cong \angle BCE\)
3) \(AE \cong BE\)
4) \(EC \cong AC\)
185 If $\triangle JKL \cong \triangle MNO$, which statement is always true?
1) $\angle KLI \cong \angle NMO$
2) $\angle KJI \cong \angle MON$
3) $\overline{JL} \cong \overline{MO}$
4) $\overline{JK} \cong \overline{ON}$

186 Which set of numbers does not represent the sides of a right triangle?
1) {6, 8, 10}
2) {8, 15, 17}
3) {8, 24, 25}
4) {15, 36, 39}

187 A right rectangular prism is shown in the diagram below.
Which line segments are coplanar?
1) $\overline{EF}$ and $\overline{BC}$
2) $\overline{HD}$ and $\overline{FG}$
3) $\overline{GH}$ and $\overline{FB}$
4) $\overline{EA}$ and $\overline{GC}$

188 In the diagram below, $MATH$ is a rhombus with diagonals $\overline{AH}$ and $\overline{MT}$.

If $\angle HAM = 12$, what is $\angle AMT$?
1) 12
2) 78
3) 84
4) 156

189 In the diagram below of $\triangle BCD$, side $\overline{DB}$ is extended to point $A$.
Which statement must be true?
1) $\angle C > \angle D$
2) $\angle ABC < \angle D$
3) $\angle ABC > \angle C$
4) $\angle ABC > \angle C + \angle D$
190 In the diagram below of isosceles trapezoid $ABCD$, $AB = CD = 25$, $AD = 26$, and $BC = 12$.

What is the length of an altitude of the trapezoid?
1) 7
2) 14
3) 19
4) 24

191 In the diagram below, $\triangle A'B'C'$ is a transformation of $\triangle ABC$, and $\triangle A''B''C''$ is a transformation of $\triangle A'B'C'$.

The composite transformation of $\triangle ABC$ to $\triangle A''B''C''$ is an example of a
1) reflection followed by a rotation
2) reflection followed by a translation
3) translation followed by a rotation
4) translation followed by a reflection

192 Which diagram illustrates a correct construction of an altitude of $\triangle ABC$?

193 The volume, in cubic centimeters, of a sphere whose diameter is 6 centimeters is
1) $\pi$
2) $3\pi$
3) $4\pi$
4) $8\pi$

194 In $\triangle FGH$, $m\angle F = 42$ and an exterior angle at vertex $H$ has a measure of 104. What is $m\angle G$?
1) 34
2) 62
3) 76
4) 146
195 What are the center and the radius of the circle whose equation is \((x - 5)^2 + (y + 3)^2 = 16\)?

1) \((-5,3)\) and 16  
2) \((5,-3)\) and 16  
3) \((-5,3)\) and 4  
4) \((5,-3)\) and 4  

196 What is the slope of a line that is perpendicular to the line represented by the equation \(x + 2y = 3\)?

1) \(-2\)  
2) 2  
3) \(-\frac{1}{2}\)  
4) \(\frac{1}{2}\)  

197 In the diagram below of circle \(O\), diameter \(AB\) is parallel to chord \(CD\).

If \(m\angle CD = 70\), what is \(m\angle AC\)?

1) 110  
2) 70  
3) 55  
4) 35

198 The diagram below is a graph of circle \(O\).

Which equation represents circle \(O\)?

1) \((x - 5)^2 + (y + 3)^2 = 4\)  
2) \((x + 5)^2 + (y - 3)^2 = 4\)  
3) \((x - 5)^2 + (y + 3)^2 = 16\)  
4) \((x + 5)^2 + (y - 3)^2 = 16\)

199 In the diagram of \(\triangle ABC\) below, \(BD\) is drawn to side \(AC\).

If \(m\angle A = 35\), \(m\angle ABD = 25\), and \(m\angle C = 60\), which type of triangle is \(\triangle BCD\)?

1) equilateral  
2) scalene  
3) obtuse  
4) right
200 Which set of numbers could not represent the lengths of the sides of a right triangle?

1) \{1, 3, \sqrt{10}\}
2) \{2, 3, 4\}
3) \{3, 4, 5\}
4) \{8, 15, 17\}

201 A circle with the equation \((x + 6)^2 + (y - 7)^2 = 64\) does not include points in Quadrant

1) I
2) II
3) III
4) IV

202 In the diagram below, under which transformation is \(\triangle A'B'C'\) the image of \(\triangle ABC\)?

1) \(D_2\)
2) \(r_{x\text{-axis}}\)
3) \(r_{y\text{-axis}}\)
4) \((x,y) \rightarrow (x-2,y)\)

203 Quadrilateral \(ABCD\) is graphed on the set of axes below.

Which quadrilateral best classifies \(ABCD\)?

1) trapezoid
2) rectangle
3) rhombus
4) square

204 In the diagram below, \(\triangle AEC \cong \triangle BED\).

Which statement is not always true?

1) \(\overline{AC} \cong \overline{BD}\)
2) \(\overline{CE} \cong \overline{DE}\)
3) \(\angle EAC \cong \angle EBD\)
4) \(\angle ACE \cong \angle DBE\)
205 Which graph represents a circle whose equation is \( x^2 + (y - 1)^2 = 9 \)?

1)  

2)  

3)  

4)  

206 A rectangular prism has a base with a length of 25, a width of 9, and a height of 12. A second prism has a square base with a side of 15. If the volumes of the two prisms are equal, what is the height of the second prism?

1) 6  
2) 8  
3) 12  
4) 15

207 In the diagram below, point \( P \) is not on line \( \ell \).

How many distinct planes that contain point \( P \) are also perpendicular to line \( \ell \)?

1) 1  
2) 2  
3) 0  
4) an infinite amount

208 Which compound statement is true?

1) A square has four sides or a hexagon has eight sides.  
2) A square has four sides and a hexagon has eight sides.  
3) If a square has four sides, then a hexagon has eight sides.  
4) A square has four sides if and only if a hexagon has eight sides.
209 Triangle $PQT$ with $RS \parallel QT$ is shown below.

If $PR = 12$, $RQ = 8$, and $PS = 21$, what is the length of $PT$?

1) 14
2) 17
3) 35
4) 38

210 In the diagram of $\triangle UVW$ below, $A$ is the midpoint of $UV$, $B$ is the midpoint of $UW$, $C$ is the midpoint of $VW$, and $AB$ and $AC$ are drawn.

If $VW = 7x - 3$ and $AB = 3x + 1$, what is the length of $VC$?

1) 5
2) 13
3) 16
4) 32

211 In $\triangle ABC$, $D$ is the midpoint of $AB$ and $E$ is the midpoint of $BC$. If $AC = 3x - 15$ and $DE = 6$, what is the value of $x$?

1) 6
2) 7
3) 9
4) 12

212 In the diagram of the circle shown below, chords $AC$ and $BD$ intersect at $Q$, and chords $AE$ and $BD$ are parallel.

Which statement must always be true?

1) $\overline{AB} \cong \overline{CD}$
2) $\overline{DE} \cong \overline{CD}$
3) $\overline{AB} \cong \overline{DE}$
4) $\overline{BD} \cong \overline{AE}$
213 What are the coordinates of \( A' \), the image of \( A(-3,4) \), after a rotation of 180º about the origin?
1) \((4,-3)\)
2) \((-4,-3)\)
3) \((3,4)\)
4) \((3,-4)\)

214 Which quadrilateral does not always have congruent diagonals?
1) isosceles trapezoid
2) rectangle
3) rhombus
4) square

215 The diagram below shows \( \triangle ABD \), with \( \overrightarrow{AB} \), \( BE \perp AD \), and \( \angle EBD \cong \angle CBD \).

If \( m\angle ABE = 52 \), what is \( m\angle D \)?
1) 26
2) 38
3) 52
4) 64

216 In the diagram below of circle \( O \) with radius \( OA \), tangent \( CA \) and secant \( COB \) are drawn.

If \( AC = 20 \) cm and \( OA = 7 \) cm, what is the length of \( OC \), to the nearest centimeter?
1) 19
2) 20
3) 21
4) 27

217 Which equation represents a line that is parallel to the line whose equation is \( 3x - 2y = 7 \)?
1) \( y = -\frac{3}{2}x + 5 \)
2) \( y = \frac{2}{3}x + 4 \)
3) \( y = \frac{3}{2}x - 5 \)
4) \( y = \frac{2}{3}x - 4 \)

218 The solution of the system of equations \( y = x^2 - 2 \) and \( y = x \) is
1) \((1,1) \) and \((-2,-2)\)
2) \((2,2) \) and \((-1,-1)\)
3) \((1,1) \) and \((2,2)\)
4) \((-2,-2) \) and \((-1,-1)\)
219 In the diagram below of right triangle $ABC$, $\overline{CD}$ is the altitude to hypotenuse $AB$, $AD = 3$, and $DB = 4$.

What is the length of $\overline{CB}$?

1) $2\sqrt{3}$
2) $\sqrt{21}$
3) $2\sqrt{7}$
4) $4\sqrt{3}$

220 In circle $R$ shown below, diameter $\overline{DE}$ is perpendicular to chord $\overline{ST}$ at point $L$.

Which statement is not always true?

1) $\overline{SL} \cong \overline{TL}$
2) $RS = DR$
3) $\overline{RL} \cong \overline{LE}$
4) $(DL)(LE) = (SL)(LT)$

221 In circle $O$ shown in the diagram below, chords $\overline{AB}$ and $\overline{CD}$ are parallel.

If $m\overline{AB} = 104$ and $m\overline{CD} = 168$, what is $m\overline{BD}$?

1) 38
2) 44
3) 88
4) 96

222 In isosceles trapezoid $QRST$ shown below, $\overline{QR}$ and $\overline{TS}$ are bases.

If $m\angle Q = 5x + 3$ and $m\angle R = 7x - 15$, what is $m\angle Q$?

1) 83
2) 48
3) 16
4) 9
223 The diagram below shows the construction of an equilateral triangle.

Which statement justifies this construction?
1) \( \angle A + \angle B + \angle C = 180 \)
2) \( m\angle A = m\angle B = m\angle C \)
3) \( AB = AC = BC \)
4) \( AB + BC > AC \)

224 As shown in the diagram below, \( \overline{CD} \) is a median of \( \triangle ABC \).

Which statement is always true?
1) \( \overline{AD} \cong \overline{DB} \)
2) \( \overline{AC} \cong \overline{AD} \)
3) \( \angle ACD \cong \angle CDB \)
4) \( \angle BCD \cong \angle ACD \)

225 The sum of the interior angles of a regular polygon is 720°. How many sides does the polygon have?
1) 8
2) 6
3) 5
4) 4

226 The equation of a circle is \((x - 2)^2 + (y + 5)^2 = 32\). What are the coordinates of the center of this circle and the length of its radius?
1) (−2, 5) and 16
2) (2, −5) and 16
3) (−2, 5) and 4√2
4) (2, −5) and 4√2

227 In the diagram below of \( \triangle MAR \), medians \( \overline{MN} \), \( \overline{AT} \), and \( \overline{RH} \) intersect at \( O \).

If \( TO = 10 \), what is the length of \( TA \)?
1) 30
2) 25
3) 20
4) 15

228 The equation of a line is \( y = \frac{2}{3}x + 5 \). What is an equation of the line that is perpendicular to the given line and that passes through the point (4,2)?
1) \( y = \frac{2}{3}x - \frac{2}{3} \)
2) \( y = \frac{3}{2}x - 4 \)
3) \( y = -\frac{3}{2}x + 7 \)
4) \( y = -\frac{3}{2}x + 8 \)
229 Which statement has the same truth value as the statement “If a quadrilateral is a square, then it is a rectangle”?
1) If a quadrilateral is a rectangle, then it is a square.
2) If a quadrilateral is a rectangle, then it is not a square.
3) If a quadrilateral is not a square, then it is not a rectangle.
4) If a quadrilateral is not a rectangle, then it is not a square.

230 In the diagram of $\triangle PQR$ shown below, $\overline{PR}$ is extended to $S$, $m\angle P = 110$, $m\angle Q = 4x$, and $m\angle QRS = x^2 + 5x$.

What is $m\angle Q$?
1) 44
2) 40
3) 11
4) 10

231 What is the difference between the sum of the measures of the interior angles of a regular pentagon and the sum of the measures of the exterior angles of a regular pentagon?
1) 36
2) 72
3) 108
4) 180

232 Chords $\overline{AB}$ and $\overline{CD}$ intersect at point $E$ in a circle with center at $O$. If $AE = 8$, $AB = 20$, and $DE = 16$, what is the length of $CE$?
1) 6
2) 9
3) 10
4) 12

233 What is the equation of a line passing through the point (6,1) and parallel to the line whose equation is $3x = 2y + 4$?
1) $y = -\frac{2}{3}x + 5$
2) $y = -\frac{2}{3}x - 3$
3) $y = -\frac{3}{2}x - 8$
4) $y = -\frac{3}{2}x - 5$

234 In the diagram below of quadrilateral $ABCD$, diagonals $\overline{AEC}$ and $\overline{BED}$ are perpendicular at $E$.

Which statement is always true based on the given information?
1) $\overline{DE} \cong \overline{EB}$
2) $\overline{AD} \cong \overline{AB}$
3) $\angle DAC \cong \angle BAC$
4) $\angle AED \cong \angle CED$
235 Triangle $ABC$ is similar to triangle $DEF$. The lengths of the sides of $\triangle ABC$ are 5, 8, and 11.
What is the length of the shortest side of $\triangle DEF$ if its perimeter is 60?
1) 10
2) 12.5
3) 20
4) 27.5

236 The equations of lines $k$, $p$, and $m$ are given below: 
$k: x + 2y = 6$
$p: 6x + 3y = 12$
$m: -x + 2y = 10$
Which statement is true?
1) $p \perp m$
2) $m \perp k$
3) $k \parallel p$
4) $m \parallel k$

237 Which equation represents a circle whose center is the origin and that passes through the point $(-4,0)$?
1) $x^2 + y^2 = 8$
2) $x^2 + y^2 = 16$
3) $(x + 4)^2 + y^2 = 8$
4) $(x + 4)^2 + y^2 = 16$

238 Line segment $AB$ has endpoint $A$ located at the origin. Line segment $AB$ is longest when the coordinates of $B$ are
1) $(3,7)$
2) $(2,-8)$
3) $(-6,4)$
4) $(-5,-5)$

239 Circle $O$ is represented by the equation 
$(x + 3)^2 + (y - 5)^2 = 48$. The coordinates of the center and the length of the radius of circle $O$ are
1) $(-3,5)$ and $4\sqrt{3}$
2) $(-3,5)$ and 24
3) $(3,-5)$ and $4\sqrt{3}$
4) $(3,-5)$ and 24

240 What is an equation of the line that passes through the point $(-2,1)$ and is parallel to the line whose equation is $4x - 2y = 8$?
1) $y = \frac{1}{2}x + 2$
2) $y = \frac{1}{2}x - 2$
3) $y = 2x + 5$
4) $y = 2x - 5$

241 As shown in the diagram of rectangle $ABCD$ below, diagonals $AC$ and $BD$ intersect at $E$.

If $AE = x + 2$ and $BD = 4x - 16$, then the length of $AC$ is
1) 6
2) 10
3) 12
4) 24
242 In circle $O$, diameter $AB$ intersects chord $CD$ at $E$. If $CE = ED$, then $\angle CEA$ is which type of angle?
1) straight
2) obtuse
3) acute
4) right

243 In the diagram below, point $K$ is in plane $\mathcal{P}$.

![Diagram](image)

How many lines can be drawn through $K$, perpendicular to plane $\mathcal{P}$?
1) 1
2) 2
3) 0
4) an infinite number

244 Triangle $ABC$ has the coordinates $A(1,2), B(5,2),$ and $C(5,5)$. Triangle $ABC$ is rotated 180° about the origin to form triangle $A'B'C'$. Triangle $A'B'C'$ is
1) acute
2) isosceles
3) obtuse
4) right

245 Point $W$ is located in plane $\mathcal{R}$. How many distinct lines passing through point $W$ are perpendicular to plane $\mathcal{R}$?
1) one
2) two
3) zero
4) infinite

246 What is an equation of the line that passes through the point $(2,4)$ and is perpendicular to the line whose equation is $3y = 6x + 3$?
1) $y = -\frac{1}{2}x + 5$
2) $y = -\frac{1}{2}x + 4$
3) $y = 2x - 6$
4) $y = 2x$

247 Which set of equations represents two circles that have the same center?
1) $x^2 + (y + 4)^2 = 16$ and $(x + 4)^2 + y^2 = 16$
2) $(x + 3)^2 + (y - 3)^2 = 16$ and $(x - 3)^2 + (y + 3)^2 = 25$
3) $(x - 7)^2 + (y - 2)^2 = 16$ and $(x + 7)^2 + (y + 2)^2 = 25$
4) $(x - 2)^2 + (y - 5)^2 = 16$ and $(x - 2)^2 + (y - 5)^2 = 25$

248 In trapezoid $RSTV$ with bases $RS$ and $VT$, diagonals $RT$ and $SV$ intersect at $Q$.

![Diagram](image)

If trapezoid $RSTV$ is not isosceles, which triangle is equal in area to $\triangle RSV$?
1) $\triangle RQV$
2) $\triangle RST$
3) $\triangle RVT$
4) $\triangle SVT$
249 Parallel secants $FH$ and $GJ$ intersect circle $O$, as shown in the diagram below.

If $m\overline{FH} = 106$ and $m\overline{GJ} = 24$, then $m\overline{FG}$ equals
1) 106
2) 115
3) 130
4) 156

250 A rectangular right prism is shown in the diagram below.

Which pair of edges are not coplanar?
1) $BF$ and $CG$
2) $BF$ and $DH$
3) $EF$ and $CD$
4) $EF$ and $BC$

251 In $\triangle JKL$, $\overrightarrow{JL} \cong \overrightarrow{KL}$. If $m\angle J = 58$, then $m\angle L$ is
1) 61
2) 64
3) 116
4) 122

252 Line $m$ and point $P$ are shown in the graph below.

Which equation represents the line passing through $P$ and parallel to line $m$?
1) $y - 3 = 2(x + 2)$
2) $y + 2 = 2(x - 3)$
3) $y - 3 = -\frac{1}{2}(x + 2)$
4) $y + 2 = -\frac{1}{2}(x - 3)$

253 What is the equation of the circle with its center at $(-1,2)$ and that passes through the point $(1,2)$?
1) $(x + 1)^2 + (y - 2)^2 = 4$
2) $(x - 1)^2 + (y + 2)^2 = 4$
3) $(x + 1)^2 + (y - 2)^2 = 2$
4) $(x - 1)^2 + (y + 2)^2 = 2$
254 As shown in the diagram below, a landscaper uses a cylindrical lawn roller on a lawn. The roller has a radius of 9 inches and a width of 42 inches.

To the nearest square inch, the area the roller covers in one complete rotation is

1) 2,374
2) 2,375
3) 10,682
4) 10,688

255 In the diagram below, line $l$ is parallel to line $m$, and line $w$ is a transversal.

If $m\angle 2 = 3x + 17$ and $m\angle 3 = 5x - 21$, what is $m\angle 1$?

1) 19
2) 23
3) 74
4) 86

256 What is the equation of circle $O$ shown in the diagram below?

1) $(x + 4)^2 + (y - 1)^2 = 3$
2) $(x - 4)^2 + (y + 1)^2 = 3$
3) $(x + 4)^2 + (y - 1)^2 = 9$
4) $(x - 4)^2 + (y + 1)^2 = 9$

257 Secants $JKL$ and $JMN$ are drawn to circle $O$ from an external point, $J$. If $JK = 8$, $LK = 4$, and $JM = 6$, what is the length of $JN$?

1) 16
2) 12
3) 10
4) 8

258 In parallelogram $QRST$, diagonal $QS$ is drawn.
Which statement must always be true?

1) $\triangle QRS$ is an isosceles triangle.
2) $\triangle STQ$ is an acute triangle.
3) $\triangle STQ \cong \triangle QRS$
4) $QS \cong QT$
259 What are the coordinates of the image of point $A(2,-7)$ under the translation $(x, y) \rightarrow (x - 3, y + 5)$?

1) $(-1, -2)$
2) $(-1, 2)$
3) $(5, -12)$
4) $(5, 12)$

260 How many common tangent lines can be drawn to the circles shown below?

1) 1
2) 2
3) 3
4) 4

261 In $\triangle ABC$, $m\angle A = 65$ and $m\angle B$ is greater than $m\angle A$. The lengths of the sides of $\triangle ABC$ in order from smallest to largest are

1) $AB, BC, AC$
2) $BC, AB, AC$
3) $AC, BC, AB$
4) $AB, AC, BC$

262 What is the length of a line segment whose endpoints have coordinates $(5, 3)$ and $(1, 6)$?

1) 5
2) 25
3) $\sqrt{17}$
4) $\sqrt{29}$

263 What is the length of $\overline{RS}$ with $R(-2, 3)$ and $S(4, 5)$?

1) $2\sqrt{2}$
2) 40
3) $2\sqrt{10}$
4) $2\sqrt{17}$

264 In the diagram below, $\overline{AC}$ and $\overline{BC}$ are tangent to circle $O$ at $A$ and $B$, respectively, from external point $C$.

If $m\angle ACB = 38$, what is $m\angle AOB$?

1) 71
2) 104
3) 142
4) 161

265 In a coordinate plane, the locus of points 5 units from the $x$-axis is the

1) lines $x = 5$ and $x = -5$
2) lines $y = 5$ and $y = -5$
3) line $x = 5$, only
4) line $y = 5$, only
266 From external point $A$, two tangents to circle $O$ are drawn. The points of tangency are $B$ and $C$. Chord $BC$ is drawn to form $\triangle ABC$. If $m\angle ABC = 66$, what is $m\angle A$?

1) 33
2) 48
3) 57
4) 66

267 What are the coordinates of the center of a circle if the endpoints of its diameter are $A(8, -4)$ and $B(-3, 2)$?

1) $(2.5, 1)$
2) $(2.5, -1)$
3) $(5.5, -3)$
4) $(5.5, 3)$

268 In a circle whose equation is $(x - 1)^2 + (y + 3)^2 = 9$, the coordinates of the center and length of its radius are

1) $(1, -3)$ and $r = 3$
2) $(-1, 3)$ and $r = 3$
3) $(1, -3)$ and $r = 9$
4) $(-1, 3)$ and $r = 9$

269 Given: "If a polygon is a triangle, then the sum of its interior angles is $180^\circ$." What is the contrapositive of this statement?

1) "If the sum of the interior angles of a polygon is not $180^\circ$, then it is not a triangle."
2) "A polygon is a triangle if and only if the sum of its interior angles is $180^\circ"."
3) "If a polygon is not a triangle, then the sum of the interior angles is not $180^\circ."
4) "If the sum of the interior angles of a polygon is $180^\circ$, then it is a triangle."

270 In the diagram below of rhombus $ABCD$, the diagonals $AC$ and $BD$ intersect at $E$.

If $AC = 18$ and $BD = 24$, what is the length of one side of rhombus $ABCD$?

1) 15
2) 18
3) 24
4) 30

271 Trapezoid $QRST$ is graphed on the set of axes below.

Under which transformation will there be no invariant points?

1) $r_y = 0$
2) $r_x = 0$
3) $r_{(0,0)}$
4) $r_{y=x}$
272 In the diagram below, under which transformation is \( \triangle X'Y'Z' \) the image of \( \triangle XYZ \)?

1) dilation
2) reflection
3) rotation
4) translation

273 In the diagram of circle \( O \) below, chord \( CD \) is parallel to diameter \( AOB \) and \( m\overset{rown}{CD} = 110 \).

What is \( m\overset{rown}{DB} \)?
1) 35
2) 55
3) 70
4) 110

274 Which numbers could represent the lengths of the sides of a triangle?

1) 5, 9, 14
2) 7, 7, 15
3) 1, 2, 4
4) 3, 6, 8

275 For which diagram is the statement \( \triangle ABC \sim \triangle ADE \) not always true??

1) 2) 3) 4)

276 Square \( ABCD \) has vertices \( A(-2,-3), B(4,-1), C(2,5), \) and \( D(-4,3) \). What is the length of a side of the square?

1) \( 2\sqrt{5} \)
2) \( 2\sqrt{10} \)
3) \( 4\sqrt{5} \)
4) \( 10\sqrt{2} \)
277 What is an equation of the line that passes through the point (4,5) and is parallel to the line whose equation is \( y = \frac{2}{3} x - 4 \)?

1) \( 2y + 3x = 11 \)
2) \( 2y + 3x = 22 \)
3) \( 3y - 2x = 2 \)
4) \( 3y - 2x = 7 \)

278 The lateral area of a right circular cone is equal to 120\(\pi\) cm\(^2\). If the base of the cone has a diameter of 24 cm, what is the length of the slant height, in centimeters?

1) 2.5
2) 5
3) 10
4) 15.7

279 Which statement is the inverse of “If \( x + 3 = 7 \), then \( x = 4 \)”?

1) If \( x = 4 \), then \( x + 3 = 7 \).
2) If \( x \neq 4 \), then \( x + 3 \neq 7 \).
3) If \( x + 3 \neq 7 \), then \( x \neq 4 \).
4) If \( x + 3 = 7 \), then \( x \neq 4 \).

280 A circle whose center has coordinates \((-3,4)\) passes through the origin. What is the equation of the circle?

1) \( (x + 3)^2 + (y - 4)^2 = 5 \)
2) \( (x + 3)^2 + (y - 4)^2 = 25 \)
3) \( (x - 3)^2 + (y + 4)^2 = 5 \)
4) \( (x - 3)^2 + (y + 4)^2 = 25 \)

281 Line segment \( AB \) is a diameter of circle \( O \) whose center has coordinates \((6,8)\). What are the coordinates of point \( B \) if the coordinates of point \( A \) are \((4,2)\)?

1) \((1,3)\)
2) \((5,5)\)
3) \((8,14)\)
4) \((10,10)\)

282 Peach Street and Cherry Street are parallel. Apple Street intersects them, as shown in the diagram below.

If \( m\angle 1 = 2x + 36 \) and \( m\angle 2 = 7x - 9 \), what is \( m\angle 1 \)?

1) 9
2) 17
3) 54
4) 70

283 The measures of the angles of a triangle are in the ratio \( 2:3:4 \). In degrees, the measure of the largest angle of the triangle is

1) 20
2) 40
3) 80
4) 100
284 The measure of an interior angle of a regular polygon is 120°. How many sides does the polygon have?
1) 5  
2) 6  
3) 3  
4) 4

285 The coordinates of point P are (7,1). What are the coordinates of the image of P after $R_{90°}$ about the origin?
1) (1,7)  
2) (−7,−1)  
3) (1,−7)  
4) (−1,7)

286 What are the coordinates of the midpoint of the line segment with endpoints (2,−5) and (8,3)?
1) (3,−4)  
2) (3,−1)  
3) (5,−4)  
4) (5,−1)

287 Plane $P$ is parallel to plane $Q$. If plane $P$ is perpendicular to line $ℓ$, then plane $Q$
1) contains line $ℓ$  
2) is parallel to line $ℓ$  
3) is perpendicular to line $ℓ$  
4) intersects, but is not perpendicular to line $ℓ$

288 In quadrilateral $ABCD$, the diagonals bisect its angles. If the diagonals are not congruent, quadrilateral $ABCD$ must be a
1) square  
2) rectangle  
3) rhombus  
4) trapezoid

289 Given the statement: One is a prime number. What is the negation and the truth value of the negation?
1) One is not a prime number; true  
2) One is not a prime number; false  
3) One is a composite number; true  
4) One is a composite number; false

290 In the diagram below, $RCBT$ and $\triangle ABC$ are shown with $m∠A = 60$ and $m∠ABT = 125$.

What is $m∠ACR$?
1) 125  
2) 115  
3) 65  
4) 55
291 If the surface area of a sphere is $144\pi$ square centimeters, what is the length of the diameter of the sphere, in centimeters?

1) 36  
2) 18  
3) 12  
4) 6

292 What are the coordinates of $P'$, the image of point $P(x,y)$ after translation $T_{4,4}$?

1) $(x-4,y-4)$  
2) $(x+4,y+4)$  
3) $(4x,4y)$  
4) $(4,4)$

293 The coordinates of the endpoints of the diameter of a circle are $(2,0)$ and $(2,-8)$. What is the equation of the circle?

1) $(x-2)^2 + (y+4)^2 = 16$  
2) $(x+2)^2 + (y-4)^2 = 16$  
3) $(x-2)^2 + (y+4)^2 = 8$  
4) $(x+2)^2 + (y-4)^2 = 8$

294 In triangles $ABC$ and $DEF$, $AB = 4$, $AC = 5$, $DE = 8$, $DF = 10$, and $\angle A \cong \angle D$. Which method could be used to prove $\triangle ABC \sim \triangle DEF$?

1) AA  
2) SAS  
3) SSS  
4) ASA

295 Points $A$ and $B$ are on line $\ell$, and line $\ell$ is parallel to line $m$, as shown in the diagram below.

How many points are in the same plane as $\ell$ and $m$ and equidistant from $\ell$ and $m$, and also equidistant from $A$ and $B$?

1) 1  
2) 2  
3) 3  
4) 0

296 In the diagram below of isosceles $\triangle ABC$, the measure of vertex angle $B$ is $80^\circ$. If $\overline{AC}$ extends to point $D$, what is $m\angle BCD$?

1) 50  
2) 80  
3) 100  
4) 130

297 If distinct planes $\mathcal{R}$ and $\mathcal{S}$ are both perpendicular to line $\ell$, which statement must always be true?

1) Plane $\mathcal{R}$ is parallel to plane $\mathcal{S}$.  
2) Plane $\mathcal{R}$ is perpendicular to plane $\mathcal{S}$.  
3) Planes $\mathcal{R}$ and $\mathcal{S}$ and line $\ell$ are all parallel.  
4) The intersection of planes $\mathcal{R}$ and $\mathcal{S}$ is perpendicular to line $\ell$.  

55
298 In the diagram below, parallelogram $ABCD$ has vertices $A(1,3)$, $B(5,7)$, $C(10,7)$, and $D(6,3)$. Diagonals $AC$ and $BD$ intersect at $E$.

What are the coordinates of point $E$?
1) $(0.5, 2)$
2) $(4.5, 2)$
3) $(5.5, 5)$
4) $(7.5, 7)$

299 Based on the construction below, which conclusion is not always true?

1) $AB \perp CD$
2) $AB = CD$
3) $AE = EB$
4) $CE = DE$

300 The equations $y = 2x + 3$ and $y = -x^2 - x + 1$ are graphed on the same set of axes. The coordinates of a point in the solution of this system of equations are
1) $(0, 1)$
2) $(1, 5)$
3) $(-1,-2)$
4) $(-2,-1)$

301 As shown in the diagram below, when right triangle $DAB$ is reflected over the $x$-axis, its image is triangle $DCB$.

Which statement justifies why $AB \cong CB$?
1) Distance is preserved under reflection.
2) Orientation is preserved under reflection.
3) Points on the line of reflection remain invariant.
4) Right angles remain congruent under reflection.
302. In \( \triangle ABC \) shown below, \( L \) is the midpoint of \( BC \), \( M \) is the midpoint of \( AB \), and \( N \) is the midpoint of \( AC \).

If \( MN = 8 \), \( ML = 5 \), and \( NL = 6 \), the perimeter of trapezoid \( BMNC \) is
1) 26
2) 28
3) 30
4) 35

303. Transversal \( EF \) intersects \( AB \) and \( CD \), as shown in the diagram below.

Which statement could always be used to prove \( AB \parallel CD \)?
1) \( \angle 2 \equiv \angle 4 \)
2) \( \angle 7 \equiv \angle 8 \)
3) \( \angle 3 \) and \( \angle 6 \) are supplementary
4) \( \angle 1 \) and \( \angle 5 \) are supplementary

304. In the diagram of trapezoid \( ABCD \) below, \( AB \parallel DC \), \( AD \equiv BC \), \( m\angle A = 4x + 20 \), and \( m\angle C = 3x - 15 \).

What is \( m\angle D \)?
1) 25
2) 35
3) 60
4) 90

305. Point \( A \) lies on plane \( P \). How many distinct lines passing through point \( A \) are perpendicular to plane \( P \)?
1) 1
2) 2
3) 0
4) infinite

306. Plane \( A \) and plane \( B \) are two distinct planes that are both perpendicular to line \( \ell \). Which statement about planes \( A \) and \( B \) is true?
1) Planes \( A \) and \( B \) have a common edge, which forms a line.
2) Planes \( A \) and \( B \) are perpendicular to each other.
3) Planes \( A \) and \( B \) intersect each other at exactly one point.
4) Planes \( A \) and \( B \) are parallel to each other.
307 In the diagram below, $\overline{AB}'$ is the image of $\overline{AB}$ under which single transformation?

1) dilation
2) rotation
3) translation
4) glide reflection

308 The vertex angle of an isosceles triangle measures 15 degrees more than one of its base angles. How many degrees are there in a base angle of the triangle?

1) 50
2) 55
3) 65
4) 70

309 Point $M$ is the midpoint of $\overline{AB}$. If the coordinates of $M$ are (2,8) and the coordinates of $A$ are (10,12), what are the coordinates of $B$?

1) (6,10)
2) (−6,4)
3) (−8,−4)
4) (18,16)

310 The diameter of a sphere is 12 inches. What is the volume of the sphere to the nearest cubic inch?

1) 288
2) 452
3) 905
4) 7,238

311 If line $\ell$ is perpendicular to distinct planes $P$ and $Q$, then planes $P$ and $Q$

1) are parallel
2) contain line $\ell$
3) are perpendicular
4) intersect, but are not perpendicular

312 In the diagram below, transversal $TU$ intersects $PQ$ and $RS$ at $V$ and $W$, respectively.

If $m\angle TVQ = 5x - 22$ and $m\angle VWS = 3x + 10$, for which value of $x$ is $PQ \parallel RS$?

1) 6
2) 16
3) 24
4) 28
313 The image of rhombus $VWXYZ$ preserves which properties under the transformation $T_{2,-3}$?
1) parallelism, only
2) orientation, only
3) both parallelism and orientation
4) neither parallelism nor orientation

314 When the system of equations $y + 2x = x^2$ and $y = x$ is graphed on a set of axes, what is the total number of points of intersection?
1) 1
2) 2
3) 3
4) 0

315 In the diagram below of $\triangle ABC$, point $H$ is the intersection of the three medians.

If $DH$ measures 2.4 centimeters, what is the length, in centimeters, of $AD$?
1) 3.6
2) 4.8
3) 7.2
4) 9.6

316 In the diagram below of circle $O$, chord $AB$ is parallel to chord $CD$.

A correct justification for $m\widehat{AC} = m\widehat{BD}$ in circle $O$ is
1) parallel chords intercept congruent arcs
2) congruent chords intercept congruent arcs
3) if two chords are parallel, then they are congruent
4) if two chords are equidistant from the center, then the arcs they intercept are congruent

317 What is an equation of circle $O$ shown in the graph below?

1) $(x - 2)^2 + (y + 4)^2 = 4$
2) $(x - 2)^2 + (y + 4)^2 = 16$
3) $(x + 2)^2 + (y - 4)^2 = 4$
4) $(x + 2)^2 + (y - 4)^2 = 16$
318 Circle \( O \) is graphed on the set of axes below. Which equation represents circle \( O \)?

1) \((x + 1)^2 + (y - 3)^2 = 9\)
2) \((x - 1)^2 + (y + 3)^2 = 9\)
3) \((x + 1)^2 + (y - 3)^2 = 6\)
4) \((x - 1)^2 + (y + 3)^2 = 6\)

319 In the diagram below of circle \( O \), \( PAC \) and \( PBD \) are secants.

If \( m\angle D = 70 \) and \( m\angle AB = 20 \), what is the degree measure of \( \angle P \)?

1) 25
2) 35
3) 45
4) 50

320 In the diagram of the circle below, \( AD \parallel BC \), \( AB = (5x + 30) \), and \( CD = (9x - 10) \).

What is \( m\angle AB \)?
1) 5
2) 10
3) 55
4) 80

321 The lengths of two sides of a triangle are 7 and 11. Which inequality represents all possible values for \( x \), the length of the third side of the triangle?
1) \( 4 \leq x \leq 18 \)
2) \( 4 < x \leq 18 \)
3) \( 4 \leq x < 18 \)
4) \( 4 < x < 18 \)

322 What is the slope of the line perpendicular to the line represented by the equation \( 2x + 4y = 12 \)?
1) \(-2\)
2) \(2\)
3) \(-\frac{1}{2}\)
4) \(\frac{1}{2}\)
323 Given: \( \triangle ABD, \overline{BC} \) is the perpendicular bisector of \( AD \)

Which statement can *not* always be proven?

1) \( \overline{AC} \cong \overline{DC} \)
2) \( \overline{BC} \cong \overline{CD} \)
3) \( \angle ACB \cong \angle DCB \)
4) \( \triangle ABC \cong \triangle DBC \)

324 As shown in the diagram below, \( AB \) is a diameter of circle \( O \), and chord \( \overline{AC} \) is drawn.

If \( \angle BAC = 70 \), then \( \overline{AC} \) is

1) 40
2) 70
3) 110
4) 140

325 In \( \triangle ABC \) shown below, \( L \) is the midpoint of \( \overline{BC} \), \( M \) is the midpoint of \( \overline{AB} \), and \( N \) is the midpoint of \( \overline{AC} \).

If \( MN = 8 \), \( ML = 5 \), and \( NL = 6 \), the perimeter of trapezoid \( BMNC \) is

1) 35
2) 31
3) 28
4) 26

326 In the diagram below of right triangle \( ABC \), an altitude is drawn to the hypotenuse \( \overline{AB} \).

Which proportion would always represent a correct relationship of the segments?

1) \( \frac{c}{z} = \frac{z}{y} \)
2) \( \frac{c}{a} = \frac{a}{y} \)
3) \( \frac{x}{z} = \frac{z}{y} \)
4) \( \frac{y}{b} = \frac{b}{x} \)
327 Which graph represents the graph of the equation \((x - 1)^2 + y^2 = 4\)?

1) 

2) 

3) 

4) 

328 In \(\triangle FGH\), \(m\angle F = m\angle H\), \(GF = x + 40\), \(HF = 3x - 20\), and \(GH = 2x + 20\). The length of \(GH\) is

1) 20
2) 40
3) 60
4) 80

329 What is the solution of the system of equations graphed below?

\[y = 2x + 1\]
\[y = x^2 + 2x - 3\]

1) \((0, -3)\)
2) \((-1, -4)\)
3) \((-3, 0)\) and \((1, 0)\)
4) \((-2, -3)\) and \((2, 5)\)

330 How many points are 5 units from a line and also equidistant from two points on the line?

1) 1
2) 2
3) 3
4) 0
331 In the diagram of $\triangle ABC$ below, $DE \parallel AB$.

If $CD = 4$, $CA = 10$, $CE = x + 2$, and $EB = 4x - 7$, what is the length of $CE$?

1) 10
2) 8
3) 6
4) 4

332 In $\triangle ABC$, $\angle A \cong \angle B$ and $\angle C$ is an obtuse angle. Which statement is true?

1) $AC \cong AB$ and $BC$ is the longest side.
2) $AC \cong BC$ and $AB$ is the longest side.
3) $AC \cong AB$ and $BC$ is the shortest side.
4) $AC \cong BC$ and $AB$ is the shortest side.

333 If the vertices of $\triangle ABC$ are $A(-2,4), B(-2,8)$, and $C(-5,6)$, then $\triangle ABC$ is classified as

1) right
2) scalene
3) isosceles
4) equilateral

334 What are the truth values of the statement "Opposite angles of a trapezoid are always congruent" and its negation?

1) The statement is true and its negation is true.
2) The statement is true and its negation is false.
3) The statement is false and its negation is true.
4) The statement is false and its negation is false.

335 Which equation represents circle $O$ shown in the graph below?

1) $x^2 + (y - 2)^2 = 10$
2) $x^2 + (y + 2)^2 = 10$
3) $x^2 + (y - 2)^2 = 25$
4) $x^2 + (y + 2)^2 = 25$

336 In the diagram below, $QM$ is an altitude of right triangle $PQR$, $PM = 8$, and $RM = 18$.

What is the length of $QM$?

1) 20
2) 16
3) 12
4) 10
337 What is the equation for circle $O$ shown in the graph below?

1) $(x - 3)^2 + (y + 1)^2 = 6$
2) $(x + 3)^2 + (y - 1)^2 = 6$
3) $(x - 3)^2 + (y + 1)^2 = 9$
4) $(x + 3)^2 + (y - 1)^2 = 9$

338 When the system of equations $y + 2 = (x - 4)^2$ and $2x + y - 6 = 0$ is solved graphically, the solution is

1) $(-4,-2)$ and $(-2,2)$
2) $(4,-2)$ and $(2,2)$
3) $(-4,2)$ and $(-6,6)$
4) $(4,2)$ and $(6,6)$

339 The sides of a triangle are 8, 12, and 15. The longest side of a similar triangle is 18. What is the ratio of the perimeter of the smaller triangle to the perimeter of the larger triangle?

1) $2:3$
2) $4:9$
3) $5:6$
4) $25:36$

340 In $\triangle ABC$, $m\angle A = 3x + 1$, $m\angle B = 4x - 17$, and $m\angle C = 5x - 20$. Which type of triangle is $\triangle ABC$?

1) right
2) scalene
3) isosceles
4) equilateral

341 In $\triangle CAT$, $m\angle C = 65$, $m\angle A = 40$, and $B$ is a point on side $CA$, such that $TB \perp CA$. Which line segment is shortest?

1) $CT$
2) $BC$
3) $TB$
4) $AT$

342 In the diagram below, quadrilateral $ABCD$ has vertices $A(-5,1)$, $B(6,-1)$, $C(3,5)$, and $D(-2,7)$.

What are the coordinates of the midpoint of diagonal $AC$?

1) $(-1,3)$
2) $(1,3)$
3) $(1,4)$
4) $(2,3)$
343 What is an equation of the line that passes through 
\((-9, 12)\) and is perpendicular to the line whose 
equation is \(y = \frac{1}{3} x + 6\)?

1) \(y = \frac{1}{3} x + 15\)  
2) \(y = -3x - 15\)  
3) \(y = \frac{1}{3} x - 13\)  
4) \(y = -3x + 27\)

344 The diameter of the base of a right circular cylinder 
is 6 cm and its height is 15 cm. In square 
centimeters, the lateral area of the cylinder is 
1) \(180\pi\)  
2) \(135\pi\)  
3) \(90\pi\)  
4) \(45\pi\)

345 In the diagram below of circle \(O\), \(m\angle ABC = 24\). 
![Diagram of circle O with points A, B, C, and O]

What is the \(m\angle AOC\)?

1) 12  
2) 24  
3) 48  
4) 60

346 In \(\triangle ABC\), an exterior angle at \(C\) measures 50°. If 
\(m\angle A > 30\), which inequality must be true?

1) \(m\angle B < 20\)  
2) \(m\angle B > 20\)  
3) \(m\angle BCA < 130\)  
4) \(m\angle BCA > 130\)

347 Given the statement, "If a number has exactly two 
factors, it is a prime number," what is the 
contrapositive of this statement?

1) If a number does not have exactly two factors, 
then it is not a prime number.  
2) If a number is not a prime number, then it does 
not have exactly two factors.  
3) If a number is a prime number, then it has 
exactly two factors.  
4) A number is a prime number if it has exactly 
two factors.

348 Triangle \(ABC\) has vertices \(A(0, 0)\), \(B(6, 8)\), and 
\(C(8, 4)\). Which equation represents the 
perpendicular bisector of \(BC\)?

1) \(y = 2x - 6\)  
2) \(y = -2x + 4\)  
3) \(y = \frac{1}{2} x + \frac{5}{2}\)  
4) \(y = -\frac{1}{2} x + \frac{19}{2}\)

349 Which set of numbers could represent the lengths 
of the sides of a right triangle?

1) \{2, 3, 4\}  
2) \{5, 9, 13\}  
3) \{7, 7, 12\}  
4) \{8, 15, 17\}
350 In the diagram below of quadrilateral $ABCD$, $E$ and $F$ are points on $AB$ and $CD$, respectively, $BE \cong DF$, and $AE \cong CF$.

Which conclusion can be proven?
1) $ED \cong FB$
2) $AB \cong CD$
3) $\angle A \cong \angle C$
4) $\angle AED \cong \angle CFB$

351 Line $l$ passes through the point (5,3) and is parallel to line $k$ whose equation is $5x + y = 6$. An equation of line $l$ is
1) $y = \frac{1}{5}x + 2$
2) $y = -5x + 28$
3) $y = \frac{1}{5}x - 2$
4) $y = -5x - 28$

353 A regular polygon has an exterior angle that measures $45^\circ$. How many sides does the polygon have?
1) 10
2) 8
3) 6
4) 4

354 As shown in the diagram below, $FD$ and $CB$ intersect at point $A$ and $ET$ is perpendicular to both $FD$ and $CB$ at $A$.

Which statement is not true?
1) $ET$ is perpendicular to plane $BAD$.
2) $ET$ is perpendicular to plane $FAB$.
3) $ET$ is perpendicular to plane $CAD$.
4) $ET$ is perpendicular to plane $BAT$.

355 In a park, two straight paths intersect. The city wants to install lampposts that are both equidistant from each path and also 15 feet from the intersection of the paths. How many lampposts are needed?
1) 1
2) 2
3) 3
4) 4
356 If \( \triangle MNP \cong \triangle VWX \) and \( PM \) is the shortest side of \( \triangle MNP \), what is the shortest side of \( \triangle VWX \)?

1) \( XV \)
2) \( WX \)
3) \( VW \)
4) \( NP \)

357 What is the converse of “If an angle measures 90 degrees, then it is a right angle”?

1) If an angle is a right angle, then it measures 90 degrees.
2) An angle is a right angle if it measures 90 degrees.
3) If an angle is not a right angle, then it does not measure 90 degrees.
4) If an angle does not measure 90 degrees, then it is not a right angle.

358 As shown below, the medians of \( \triangle ABC \) intersect at \( D \).

If the length of \( BE \) is 12, what is the length of \( BD \)?

1) 8
2) 9
3) 3
4) 4

359 Which diagram shows the construction of a 45° angle?
360 The equation of a line is $3y + 2x = 12$. What is the slope of the line perpendicular to the given line?

1) $\frac{2}{3}$
2) $\frac{3}{2}$
3) $-\frac{2}{3}$
4) $-\frac{3}{2}$

361 Consider the relationship between the two statements below.

If $\sqrt{16 + 9} \neq 4 + 3$, then $5 \neq 4 + 3$

If $\sqrt{16 + 9} = 4 + 3$, then $5 = 4 + 3$

These statements are

1) inverses
2) converses
3) contrapositives
4) biconditionals

363 Students made four statements about a circle.

- $A$: The coordinates of its center are $(4,-3)$.
- $B$: The coordinates of its center are $(-4,3)$.
- $C$: The length of its radius is $5\sqrt{2}$.
- $D$: The length of its radius is 25.

If the equation of the circle is $(x + 4)^2 + (y - 3)^2 = 50$, which statements are correct?

1) $A$ and $C$
2) $A$ and $D$
3) $B$ and $C$
4) $B$ and $D$

364 If $\triangle ABC \cong \triangle JKL \cong \triangle RST$, then $\overline{BC}$ must be congruent to

1) $\overline{JL}$
2) $\overline{JK}$
3) $\overline{ST}$
4) $\overline{RS}$

365 For which measures of the sides of $\triangle ABC$ is angle $B$ the largest angle of the triangle?

1) $AB = 2, BC = 6, AC = 7$
2) $AB = 6, BC = 12, AC = 8$
3) $AB = 16, BC = 9, AC = 10$
4) $AB = 18, BC = 14, AC = 5$

366 How many points in the coordinate plane are 3 units from the origin and also equidistant from both the x-axis and the y-axis?

1) 1
2) 2
3) 8
4) 4
367 What is the measure of the largest exterior angle that any regular polygon can have?
1) 60º
2) 90º
3) 120º
4) 360º

368 Which graph represents a circle whose equation is \( x^2 + (y - 2)^2 = 4 \)?

369 In the diagram of \( WXYZ \) below, \( WY \cong XZ \).

Which reasons can be used to prove \( WX \cong YZ \)?
1) reflexive property and addition postulate
2) reflexive property and subtraction postulate
3) transitive property and addition postulate
4) transitive property and subtraction postulate

370 In the diagram below of circle \( O \), diameter \( AB \) and chord \( CD \) intersect at \( E \).

If \( AB \perp CD \), which statement is always true?
1) \( AC \cong BD \)
2) \( BD \cong DA \)
3) \( AD \cong BC \)
4) \( CB \cong BD \)

371 What is the perimeter of a square whose diagonal is \( 3\sqrt{2} \)?
1) 18
2) 12
3) 9
4) 6
372 A regular polygon with an exterior angle of 40° is a
1) pentagon
2) hexagon
3) nonagon
4) decagon

373 In the diagram below, four pairs of triangles are shown. Congruent corresponding parts are labeled in each pair.

Using only the information given in the diagrams, which pair of triangles can not be proven congruent?
1) A
2) B
3) C
4) D

374 The corresponding medians of two similar triangles are 8 and 20. If the perimeter of the larger triangle is 45, what is the perimeter of the smaller triangle?
1) 14
2) 18
3) 33
4) 37

375 Point A is on line m. How many distinct planes will be perpendicular to line m and pass through point A?
1) one
2) two
3) zero
4) infinite

376 The equation of a circle is \((x - 3)^2 + y^2 = 8\). The coordinates of its center and the length of its radius are
1) \((-3,0)\) and 4
2) \((3,0)\) and 4
3) \((-3,0)\) and \(2\sqrt{2}\)
4) \((3,0)\) and \(2\sqrt{2}\)

377 In rhombus \(ABCD\), with diagonals \(AC\) and \(DB\), \(AD = 10\).

If the length of diagonal \(AC\) is 12, what is the length of \(DB\)?
1) 8
2) 16
3) \(\sqrt{44}\)
4) \(\sqrt{136}\)
378 Which graph could be used to find the solution to the following system of equations?
\[ y = (x + 3)^2 - 1 \]
\[ x + y = 2 \]

1) 

2) 

3) 

4) 

379 Triangle $ABC$ is shown in the diagram below.

![Diagram of triangle ABC with DE joining midpoints of AD and AE]

If $DE$ joins the midpoints of $ADC$ and $AEB$, which statement is not true?
1) $DE = \frac{1}{2} CB$
2) $DE \parallel CB$
3) $\frac{AD}{DC} = \frac{DE}{CB}$
4) $\triangle ABC \sim \triangle AED$

380 In parallelogram $JKLM$, $m\angle L$ exceeds $m\angle M$ by 30 degrees. What is the measure of $m\angle J$?
1) $75^\circ$
2) $105^\circ$
3) $165^\circ$
4) $195^\circ$

381 What is an equation of the circle with center $(-5,4)$ and a radius of 7?
1) $(x - 5)^2 + (y + 4)^2 = 14$
2) $(x - 5)^2 + (y + 4)^2 = 49$
3) $(x + 5)^2 + (y - 4)^2 = 14$
4) $(x + 5)^2 + (y - 4)^2 = 49$
382 In $\triangle ABC$, $m\angle A = 60$, $m\angle B = 80$, and $m\angle C = 40$. Which inequality is true?
1) $AB > BC$
2) $AC > BC$
3) $AC < BA$
4) $BC < BA$

383 If $\triangle ABC \sim \triangle LMN$, which statement is not always true?
1) $m\angle A \cong m\angle N$
2) $m\angle B \cong m\angle M$
3) $\frac{\text{area of } \triangle ABC}{\text{area of } \triangle LMN} = \frac{(AC)^2}{(LN)^2}$
4) $\frac{\text{perimeter of } \triangle ABC}{\text{perimeter of } \triangle LMN} = \frac{AB}{LM}$

384 In the diagram below, $\triangle XYV \cong \triangle TSV$.

Which statement can not be proven?
1) $\angle XY \cong \angle TVS$
2) $\angle YXV \cong \angle VUT$
3) $\overline{XY} \cong \overline{TS}$
4) $\overline{VV} \cong \overline{SV}$

385 In the diagram of $\triangle ABC$ below, $\overline{AB}$ is extended to point $D$.

If $m\angle CAB = x + 40$, $m\angle ACB = 3x + 10$, $m\angle CBD = 6x$, what is $m\angle CAB$?
1) 13
2) 25
3) 53
4) 65

386 Two prisms have equal heights and equal volumes. The base of one is a pentagon and the base of the other is a square. If the area of the pentagonal base is 36 square inches, how many inches are in the length of each side of the square base?
1) 6
2) 9
3) 24
4) 36

387 The equations $x^2 + y^2 = 25$ and $y = 5$ are graphed on a set of axes. What is the solution of this system?
1) $(0,0)$
2) $(5,0)$
3) $(0,5)$
4) $(5,5)$
388 What are the truth values of the statement “Two is prime” and its negation?
1) The statement is false and its negation is true.
2) The statement is false and its negation is false.
3) The statement is true and its negation is true.
4) The statement is true and its negation is false.

389 What is the measure of each interior angle in a regular octagon?
1) 108°
2) 135°
3) 144°
4) 1080°

390 What are the coordinates of the center and the length of the radius of the circle whose equation is \((x + 1)^2 + (y - 5)^2 = 16\)?
1) (1,−5) and 16
2) (−1,5) and 16
3) (1,−5) and 4
4) (−1,5) and 4

391 Lines \(m\) and \(n\) are in plane \(A\). What is the converse of the statement “If lines \(m\) and \(n\) are parallel, then lines \(m\) and \(n\) do not intersect”?
1) If lines \(m\) and \(n\) are not parallel, then lines \(m\) and \(n\) intersect.
2) If lines \(m\) and \(n\) are not parallel, then lines \(m\) and \(n\) do not intersect.
3) If lines \(m\) and \(n\) intersect, then lines \(m\) and \(n\) are not parallel.
4) If lines \(m\) and \(n\) do not intersect, then lines \(m\) and \(n\) are parallel.

392 What is the perimeter of a rhombus whose diagonals are 16 and 30?
1) 92
2) 68
3) 60
4) 17

393 What is the equation of a line passing through the point \((4,−1)\) and parallel to the line whose equation is \(2y - x = 8\)?
1) \(y = \frac{1}{2}x - 3\)
2) \(y = \frac{1}{2}x - 1\)
3) \(y = -2x + 7\)
4) \(y = -2x + 2\)

394 As shown in the diagram below, a right pyramid has a square base, \(ABCD\), and \(EF\) is the slant height.

Which statement is not true?
1) \(EA \cong EC\)
2) \(EB \cong EF\)
3) \(\triangle AEB \cong \triangle BEC\)
4) \(\triangle CED\) is isosceles
395 Which equation represents the circle whose center is \((-5,3)\) and that passes through the point \((-1,3)\)?

1) \((x + 1)^2 + (y - 3)^2 = 16\)
2) \((x - 1)^2 + (y + 3)^2 = 16\)
3) \((x + 5)^2 + (y - 3)^2 = 16\)
4) \((x - 5)^2 + (y + 3)^2 = 16\)

396 The volume of a sphere is approximately 44.6022 cubic centimeters. What is the radius of the sphere, to the nearest tenth of a centimeter?

1) 2.2
2) 3.3
3) 4.4
4) 4.7

397 Right triangle \(ABC\) is shown in the graph below.

After a reflection over the \(y\)-axis, the image of \(\triangle ABC\) is \(\triangle A'B'C'\). Which statement is not true?

1) \(BC \cong B'C'\)
2) \(A'B' \perp B'C'\)
3) \(AB = A'B'\)
4) \(AC \parallel A'C'\)

398 What is the solution of the system of equations \(y - x = 5\) and \(y = x^2 + 5\)?

1) (0,5) and (1,6)
2) (0,5) and (-1,6)
3) (2,9) and (-1,4)
4) (-2,9) and (-1,4)

399 The midpoint of \(AB\) is \(M(4,2)\). If the coordinates of \(A\) are \((6,-4)\), what are the coordinates of \(B\)?

1) (1,-3)
2) (2,8)
3) (5,-1)
4) (14,0)

400 Points \(A(5,3)\) and \(B(7,6)\) lie on \(AB\). Points \(C(6,4)\) and \(D(9,0)\) lie on \(CD\). Which statement is true?

1) \(AB \parallel CD\)
2) \(AB \perp CD\)
3) \(AB\) and \(CD\) are the same line.
4) \(AB\) and \(CD\) intersect, but are not perpendicular.

401 A carpenter made a storage container in the shape of a rectangular prism. It is 5 feet high and has a volume of 720 cubic feet. He wants to make a second container with the same height and volume as the first one, but in the shape of a triangular prism. What will be the number of square feet in the area of the base of the new container?

1) 36
2) 72
3) 144
4) 288
402 In the diagram of \( \triangle ABC \) below, \( DE \parallel BC \), 
\( AD = 3 \), \( DB = 2 \), and \( DE = 6 \).

What is the length of \( BC \)?
1) 12
2) 10
3) 8
4) 4

403 Lines \( p \) and \( q \) are intersected by line \( r \), as shown below.

If \( m\angle 1 = 7x - 36 \) and \( m\angle 2 = 5x + 12 \), for which value of \( x \) would \( p \parallel q \)?
1) 17
2) 24
3) 83
4) 97

404 In the diagram below, diameter \( AB \) bisects chord \( CD \) at point \( E \) in circle \( F \).

If \( AE = 2 \) and \( FB = 17 \), then the length of \( CE \) is
1) 7
2) 8
3) 15
4) 16

405 Triangle \( ABC \) shown below is a right triangle with altitude \( AD \) drawn to the hypotenuse \( BC \).

If \( BD = 2 \) and \( DC = 10 \), what is the length of \( AB \)?
1) \( 2\sqrt{2} \)
2) \( 2\sqrt{5} \)
3) \( 2\sqrt{6} \)
4) \( 2\sqrt{30} \)
406 In the diagram below of right triangle $ABC$, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$.

If $AD = 3$ and $DB = 12$, what is the length of altitude $\overline{CD}$?

1) $6$
2) $6\sqrt{5}$
3) $3$
4) $3\sqrt{5}$

407 Which equation represents the circle shown in the graph below?

1) $(x - 2)^2 + y^2 = 9$
2) $(x + 2)^2 + y^2 = 9$
3) $(x - 2)^2 + y^2 = 3$
4) $(x + 2)^2 + y^2 = 3$

408 In the diagram below, $\overline{AC}$ and $\overline{AD}$ are tangent to circle $B$ at points $C$ and $D$, respectively, and $\overline{BC}$, $\overline{BD}$, and $\overline{BA}$ are drawn.

If $AC = 12$ and $AB = 15$, what is the length of $\overline{BD}$?

1) $5.5$
2) $9$
3) $12$
4) $18$

409 A rectangular prism is shown in the diagram below.

Which pair of line segments would always be both congruent and parallel?

1) $\overline{AC}$ and $\overline{FB}$
2) $\overline{FB}$ and $\overline{DB}$
3) $\overline{HF}$ and $\overline{AC}$
4) $\overline{DB}$ and $\overline{HF}$
410 The diagram below shows the construction of line $m$, parallel to line $\ell$, through point $P$.

Which theorem was used to justify this construction?
1) If two lines are cut by a transversal and the alternate interior angles are congruent, the lines are parallel.
2) If two lines are cut by a transversal and the interior angles on the same side are supplementary, the lines are parallel.
3) If two lines are perpendicular to the same line, they are parallel.
4) If two lines are cut by a transversal and the corresponding angles are congruent, they are parallel.

411 In the diagram of $\triangle ABC$ below, medians $AD$ and $BE$ intersect at point $F$.

If $AF = 6$, what is the length of $FD$?
1) 6
2) 2
3) 3
4) 9

412 The bases of a right triangular prism are $\triangle ABC$ and $\triangle DEF$. Angles $A$ and $D$ are right angles, $AB = 6$, $AC = 8$, and $AD = 12$. What is the length of edge $BE$?
1) 10
2) 12
3) 14
4) 16

413 A regular pyramid has a height of 12 centimeters and a square base. If the volume of the pyramid is 256 cubic centimeters, how many centimeters are in the length of one side of its base?
1) 8
2) 16
3) 32
4) 64

414 Which equation represents circle $A$ shown in the diagram below?

1) $(x - 4)^2 + (y - 1)^2 = 3$
2) $(x + 4)^2 + (y + 1)^2 = 3$
3) $(x - 4)^2 + (y - 1)^2 = 9$
4) $(x + 4)^2 + (y + 1)^2 = 9$
415 Which equation represents the circle shown in the graph below?

1) \((x - 5)^2 + (y + 3)^2 = 1\)
2) \((x + 5)^2 + (y - 3)^2 = 1\)
3) \((x - 5)^2 + (y + 3)^2 = 2\)
4) \((x + 5)^2 + (y - 3)^2 = 2\)

416 In the diagram below, \(AB\) and \(CD\) are bases of trapezoid \(ABCD\).

If \(m\angle B = 123\) and \(m\angle D = 75\), what is \(m\angle C\)?

1) 57
2) 75
3) 105
4) 123

417 In right triangle \(ABC\) shown in the diagram below, altitude \(BD\) is drawn to hypotenuse \(AC\), \(CD = 12\), and \(AD = 3\).

What is the length of \(AB\)?

1) \(5\sqrt{3}\)
2) 6
3) \(3\sqrt{5}\)
4) 9

418 If \(\triangle ABC\) and its image, \(\triangle A'B'C'\), are graphed on a set of axes, \(\triangle ABC \cong \triangle A'B'C'\) under each transformation except

1) \(D_2\)
2) \(R_{90^\circ}\)
3) \(r_{y=x}\)
4) \(T_{(-2,3)}\)

419 A student wrote the following equations:

\[3y + 6 = 2x\]
\[2y - 3x = 6\]

The lines represented by these equations are

1) parallel
2) the same line
3) perpendicular
4) intersecting, but not perpendicular
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420 In the diagram below, which transformation was used to map \( \triangle ABC \) to \( \triangle A'B'C' \)?

1) dilation  
2) rotation  
3) reflection  
4) glide reflection

421 In the diagram below of circle \( O \), chord \( AB \parallel \) chord \( CD \), and chord \( CD \parallel \) chord \( EF \).

Which statement must be true?

1) \( \overline{CE} \parallel \overline{DF} \)  
2) \( \overline{AC} \parallel \overline{DF} \)  
3) \( \overline{AC} \parallel \overline{CE} \)  
4) \( \overline{EF} \parallel \overline{CD} \)

422 A transversal intersects two lines. Which condition would always make the two lines parallel?

1) Vertical angles are congruent.  
2) Alternate interior angles are congruent.  
3) Corresponding angles are supplementary.  
4) Same-side interior angles are complementary.

423 Which transformation is not always an isometry?

1) rotation  
2) dilation  
3) reflection  
4) translation

424 In the diagram below, \( \triangle ABC \) is inscribed in circle \( P \). The distances from the center of circle \( P \) to each side of the triangle are shown.

Which statement about the sides of the triangle is true?

1) \( AB > AC > BC \)  
2) \( AB < AC \) and \( AC > BC \)  
3) \( AC > AB > BC \)  
4) \( AC = AB \) and \( AB > BC \)
425. The endpoints of $\overline{CD}$ are $C(-2,-4)$ and $D(6,2)$. What are the coordinates of the midpoint of $\overline{CD}$?

1) $(2,3)$  
2) $(2,-1)$  
3) $(4,-2)$  
4) $(4,3)$

426. If the surface area of a sphere is represented by $144\pi$, what is the volume in terms of $\pi$?

1) $36\pi$  
2) $48\pi$  
3) $216\pi$  
4) $288\pi$

427. Given the equations: $y = x^2 - 6x + 10$ and $y + x = 4$

What is the solution to the given system of equations?

1) $(2,3)$  
2) $(3,2)$  
3) $(2,2)$ and $(1,3)$  
4) $(2,2)$ and $(3,1)$

428. What is an equation of the line that contains the point $(3,-1)$ and is perpendicular to the line whose equation is $y = -3x + 2$?

1) $y = -3x + 8$  
2) $y = -3x$  
3) $y = \frac{1}{3}x$  
4) $y = \frac{1}{3}x - 2$

429. In the diagram below, $\triangle ABC \cong \triangle XYZ$.

Which two statements identify corresponding congruent parts for these triangles?

1) $\overline{AB} \cong \overline{XY}$ and $\angle C \cong \angle Y$  
2) $\overline{AB} \cong \overline{YZ}$ and $\angle C \cong \angle X$  
3) $\overline{BC} \cong \overline{XY}$ and $\angle A \cong \angle Y$  
4) $\overline{BC} \cong \overline{YZ}$ and $\angle A \cong \angle X$

430. In the diagram below, tangent $\overline{AB}$ and secant $\overline{ACD}$ are drawn to circle $O$ from an external point $A$, $AB = 8$, and $AC = 4$.

What is the length of $\overline{CD}$?

1) 16  
2) 13  
3) 12  
4) 10
431 What are the center and the radius of the circle whose equation is \((x - 3)^2 + (y + 3)^2 = 36\)?
1) center = (3, -3); radius = 6
2) center = (-3, 3); radius = 6
3) center = (3, -3); radius = 36
4) center = (-3, 3); radius = 36

432 In \(\triangle ABC\), \(AB \parallel BC\). An altitude is drawn from \(B\) to \(AC\) and intersects \(AC\) at \(D\). Which conclusion is not always true?
1) \(\angle ABD \cong \angle CBD\)
2) \(\angle BDA \cong \angle BDC\)
3) \(AD \cong BD\)
4) \(AD \cong DC\)

433 What is the negation of the statement “I am not going to eat ice cream”?
1) I like ice cream.
2) I am going to eat ice cream.
3) If I eat ice cream, then I like ice cream.
4) If I don’t like ice cream, then I don’t eat ice cream.

434 What is the solution of the following system of equations?
\[
y = (x + 3)^2 - 4 \\
y = 2x + 5
\]
1) \((0, -4)\)
2) \((-4, 0)\)
3) \((-4, -3)\) and \((0, 5)\)
4) \((-3, -4)\) and \((5, 0)\)

435 In the diagram below, \(\triangle ABC\) is shown with \(AC\) extended through point \(D\).

If \(m\angle BCD = 6x + 2\), \(m\angle BAC = 3x + 15\), and \(m\angle ABC = 2x - 1\), what is the value of \(x\)?
1) 12
2) \(14 \frac{10}{11}\)
3) 16
4) \(18 \frac{1}{9}\)

436 Which equation represents circle \(K\) shown in the graph below?

1) \((x + 5)^2 + (y - 1)^2 = 3\)
2) \((x + 5)^2 + (y - 1)^2 = 9\)
3) \((x - 5)^2 + (y + 1)^2 = 3\)
4) \((x - 5)^2 + (y + 1)^2 = 9\)
437 Which graph represents a circle with the equation 
\[(x - 5)^2 + (y + 1)^2 = 9?\]

1)  

2)  

3)  

4)  

438 In the diagram below of \(\triangle ADB\), \(m\angle BDA = 90\), \(AD = 5\sqrt{2}\), and \(AB = 2\sqrt{15}\).

What is the length of \(BD\)?
1) \(\sqrt{10}\)  
2) \(\sqrt{20}\)  
3) \(\sqrt{50}\)  
4) \(\sqrt{110}\)

439 Which transformation of the line \(x = 3\) results in an image that is perpendicular to the given line?
1) \(r_{x}\)-axis  
2) \(r_{y}\)-axis  
3) \(r_{y=x}\)  
4) \(r_{x=1}\)

440 What is the slope of a line perpendicular to the line whose equation is \(2y = -6x + 8\)?
1) \(-3\)  
2) \(\frac{1}{6}\)  
3) \(\frac{1}{3}\)  
4) \(-6\)
441 In the diagram below of circle $O$, chords $AB$ and $CD$ intersect at $E$.

If $CE = 10$, $ED = 6$, and $AE = 4$, what is the length of $EB$?
1) 15
2) 12
3) 6.7
4) 2.4

442 A transformation of a polygon that always preserves both length and orientation is
1) dilation
2) translation
3) line reflection
4) glide reflection

443 Line $k$ is drawn so that it is perpendicular to two distinct planes, $P$ and $R$. What must be true about planes $P$ and $R$?
1) Planes $P$ and $R$ are skew.
2) Planes $P$ and $R$ are parallel.
3) Planes $P$ and $R$ are perpendicular.
4) Plane $P$ intersects plane $R$ but is not perpendicular to plane $R$.

444 After a composition of transformations, the coordinates $A(4,2)$, $B(4,6)$, and $C(2,6)$ become $A''(-2,-1)$, $B''(-2,-3)$, and $C''(-1,-3)$, as shown on the set of axes below.

Which composition of transformations was used?
1) $R_{180°} \circ D_2$
2) $R_{90°} \circ D_2$
3) $D_{\frac{1}{2}} \circ R_{180°}$
4) $D_{\frac{1}{2}} \circ R_{90°}$

445 Two lines are represented by the equations $\frac{1}{2}y = 6x + 10$ and $y = mx$. For which value of $m$ will the lines be parallel?
1) $-12$
2) $-3$
3) 3
4) 12
446 On the set of axes below, Geoff drew rectangle \(ABCD\). He will transform the rectangle by using the translation \((x, y) \rightarrow (x + 2, y + 1)\) and then will reflect the translated rectangle over the \(x\)-axis.

What will be the area of the rectangle after these transformations?
1) exactly 28 square units
2) less than 28 square units
3) greater than 28 square units
4) It cannot be determined from the information given.

447 If two different lines are perpendicular to the same plane, they are
1) collinear
2) coplanar
3) congruent
4) consecutive

448 Side \(PQ\) of \(\Delta PQR\) is extended through \(Q\) to point \(T\). Which statement is not always true?
1) \(\angle RQT > \angle R\)
2) \(\angle RQT > \angle P\)
3) \(\angle RQT = \angle P + \angle R\)
4) \(\angle RQT > \angle PQR\)

449 Lines \(k_1\) and \(k_2\) intersect at point \(E\). Line \(m\) is perpendicular to lines \(k_1\) and \(k_2\) at point \(E\).

Which statement is always true?
1) Lines \(k_1\) and \(k_2\) are perpendicular.
2) Line \(m\) is parallel to the plane determined by lines \(k_1\) and \(k_2\).
3) Line \(m\) is perpendicular to the plane determined by lines \(k_1\) and \(k_2\).
4) Line \(m\) is coplanar with lines \(k_1\) and \(k_2\).

450 In \(\Delta ABC\), \(\angle A = x\), \(\angle B = 2x + 2\), and \(\angle C = 3x + 4\). What is the value of \(x\)?
1) 29
2) 31
3) 59
4) 61

451 Which equation represents a line perpendicular to the line whose equation is \(2x + 3y = 12\)?
1) \(6y = -4x + 12\)
2) \(2y = 3x + 6\)
3) \(2y = -3x + 6\)
4) \(3y = -2x + 12\)
452 Square $LMNO$ is shown in the diagram below.

What are the coordinates of the midpoint of diagonal $LN$?

1) $\left(\frac{4}{2}, -\frac{1}{2}\right)$
2) $\left(-\frac{3}{2}, \frac{1}{2}\right)$
3) $\left(-\frac{1}{2}, \frac{3}{2}\right)$
4) $\left(-\frac{1}{2}, 4\frac{1}{2}\right)$

453 $\triangle ABC$ is similar to $\triangle DEF$. The ratio of the length of $AB$ to the length of $DE$ is 3:1. Which ratio is also equal to 3:1?

1) $\frac{m\angle A}{m\angle D}$
2) $\frac{m\angle B}{m\angle F}$
3) $\frac{\text{area of } \triangle ABC}{\text{area of } \triangle DEF}$
4) $\frac{\text{perimeter of } \triangle ABC}{\text{perimeter of } \triangle DEF}$

454 In the diagram of $\triangle ABC$ below, $\overline{AB} \cong \overline{AC}$. The measure of $\angle B$ is $40^\circ$.

What is the measure of $\angle A$?

1) $40^\circ$
2) $50^\circ$
3) $70^\circ$
4) $100^\circ$

455 Which expression represents the volume, in cubic centimeters, of the cylinder represented in the diagram below?

1) $\frac{1}{6} \cdot \frac{2}{3} \pi$
2) $\frac{3}{8} \cdot \frac{4}{8} \pi$
3) $\frac{9}{2} \cdot \frac{7}{2} \pi$
4) $\frac{3}{2}, \frac{8}{8} \pi$

1) $162\pi$
2) $324\pi$
3) $972\pi$
4) $3,888\pi$
456 The rectangle $ABCD$ shown in the diagram below will be reflected across the $x$-axis.

What will not be preserved?
1) slope of $AB$
2) parallelism of $AB$ and $CD$
3) length of $AB$
4) measure of $\angle A$

457 Juliann plans on drawing $\triangle ABC$, where the measure of $\angle A$ can range from $50^\circ$ to $60^\circ$ and the measure of $\angle B$ can range from $90^\circ$ to $100^\circ$. Given these conditions, what is the correct range of measures possible for $\angle C$?
1) $20^\circ$ to $40^\circ$
2) $30^\circ$ to $50^\circ$
3) $80^\circ$ to $90^\circ$
4) $120^\circ$ to $130^\circ$

458 In $\triangle PQR$, $PQ = 8$, $QR = 12$, and $RP = 13$. Which statement about the angles of $\triangle PQR$ must be true?
1) $m\angle Q > m\angle P > m\angle R$
2) $m\angle Q > m\angle R > m\angle P$
3) $m\angle R > m\angle P > m\angle Q$
4) $m\angle P > m\angle R > m\angle Q$

459 In the diagram below of $\triangle ABC$, medians $\overline{AD}$, $\overline{BE}$, and $\overline{CF}$ intersect at $G$.

If $CF = 24$, what is the length of $FG$?
1) 8
2) 10
3) 12
4) 16

460 Which expression best describes the transformation shown in the diagram below?

1) same orientation; reflection
2) opposite orientation; reflection
3) same orientation; translation
4) opposite orientation; translation
461 The diagram below illustrates the construction of \( \overrightarrow{PS} \parallel \overrightarrow{RQ} \) through point \( P \).

Which statement justifies this construction?
1) \( m\angle 1 = m\angle 2 \)
2) \( m\angle 1 = m\angle 3 \)
3) \( PR \cong RQ \)
4) \( PS \cong RQ \)

462 In the diagram below of trapezoid \( RSUT, RS \parallel TU \), \( X \) is the midpoint of \( RT \), and \( V \) is the midpoint of \( SU \).

If \( RS = 30 \) and \( XV = 44 \), what is the length of \( TU \)?
1) 37
2) 58
3) 74
4) 118

463 The lines \( 3y + 1 = 6x + 4 \) and \( 2y + 1 = x - 9 \) are
1) parallel
2) perpendicular
3) the same line
4) neither parallel nor perpendicular

464 In the diagram below, line \( k \) is perpendicular to plane \( P \) at point \( T \).

Which statement is true?
1) Any point in plane \( P \) also will be on line \( k \).
2) Only one line in plane \( P \) will intersect line \( k \).
3) All planes that intersect plane \( P \) will pass through \( T \).
4) Any plane containing line \( k \) is perpendicular to plane \( P \).

465 Isosceles trapezoid \( ABCD \) has diagonals \( AC \) and \( BD \). If \( AC = 5x + 13 \) and \( BD = 11x - 5 \), what is the value of \( x \)?
1) 28
2) \( 10 \frac{3}{4} \)
3) 3
4) \( \frac{1}{2} \)
In the diagram below, circle $A$ and circle $B$ are shown.

What is the total number of lines of tangency that are common to circle $A$ and circle $B$?

1) 1  
2) 2  
3) 3  
4) 4

What is the slope of a line perpendicular to the line whose equation is $y = -\frac{2}{3}x - 5$?

1) $-\frac{3}{2}$  
2) $\frac{2}{3}$  
3) $\frac{2}{3}$  
4) $\frac{3}{2}$

Line segment $AB$ is tangent to circle $O$ at $A$. Which type of triangle is always formed when points $A$, $B$, and $O$ are connected?

1) right  
2) obtuse  
3) scalene  
4) isosceles

The vertices of $\triangle ABC$ are $A(-1,-2)$, $B(-1,2)$ and $C(6,0)$. Which conclusion can be made about the angles of $\triangle ABC$?

1) $m\angle A = m\angle B$  
2) $m\angle A = m\angle C$  
3) $m\angle ACB = 90$  
4) $m\angle ABC = 60$

What is the slope of a line perpendicular to the line whose equation is $y = 3x + 4$?

1) $\frac{1}{3}$  
2) $-\frac{1}{3}$  
3) $3$  
4) $-3$

Tangents $\overline{PA}$ and $\overline{PB}$ are drawn to circle $O$ from an external point, $P$, and radii $\overline{OA}$ and $\overline{OB}$ are drawn. If $m\angle APB = 40$, what is the measure of $\angle AOB$?

1) 140°  
2) 100°  
3) 70°  
4) 50°
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472 What is the converse of the statement "If Bob does his homework, then George gets candy"?
1) If George gets candy, then Bob does his homework.
2) Bob does his homework if and only if George gets candy.
3) If George does not get candy, then Bob does not do his homework.
4) If Bob does not do his homework, then George does not get candy.

473 How many common tangent lines can be drawn to the two externally tangent circles shown below?
1) 1 2) 2 3) 3 4) 4

474 Given: \( y = \frac{1}{4} x - 3 \)
\[ y = x^2 + 8x + 12 \]
In which quadrant will the graphs of the given equations intersect?
1) I 2) II 3) III 4) IV

475 The endpoints of \( \overline{AB} \) are \( A(3,2) \) and \( B(7,1) \). If \( \overline{A''B''} \) is the result of the transformation of \( \overline{AB} \) under \( D_2 \circ T_{-4,3} \) what are the coordinates of \( A'' \) and \( B'' \)?
1) \( A''(-2,10) \) and \( B''(6,8) \)
2) \( A''(-1,5) \) and \( B''(3,4) \)
3) \( A''(2,7) \) and \( B''(10,5) \)
4) \( A''(14,-2) \) and \( B''(22,-4) \)

476 Which geometric principle is used in the construction shown below?
1) The intersection of the angle bisectors of a triangle is the center of the inscribed circle.
2) The intersection of the angle bisectors of a triangle is the center of the circumscribed circle.
3) The intersection of the perpendicular bisectors of the sides of a triangle is the center of the inscribed circle.
4) The intersection of the perpendicular bisectors of the sides of a triangle is the center of the circumscribed circle.
477 In the diagram of \( \triangle ABC \) below, Jose found centroid \( P \) by constructing the three medians. He measured \( CF \) and found it to be 6 inches.

If \( PF = x \), which equation can be used to find \( x \)?

1) \( x + x = 6 \)
2) \( 2x + x = 6 \)
3) \( 3x + 2x = 6 \)
4) \( x + \frac{2}{3}x = 6 \)

480 In the diagram below of \( \triangle ACT \), \( BE \parallel AT \).

If \( CB = 3 \), \( CA = 10 \), and \( CE = 6 \), what is the length of \( ET \)?

1) 5
2) 14
3) 20
4) 26

478 What is the slope of a line that is perpendicular to the line whose equation is \( 3x + 4y = 12 \)?

1) \( \frac{3}{4} \)
2) \( -\frac{3}{4} \)
3) \( \frac{4}{3} \)
4) \( \frac{4}{3} \)

481 Which illustration shows the correct construction of an angle bisector?

1)  
2)  
3)  
4)  

479 Two triangles are similar, and the ratio of each pair of corresponding sides is 2:1. Which statement regarding the two triangles is not true?

1) Their areas have a ratio of 4:1.
2) Their altitudes have a ratio of 2:1.
3) Their perimeters have a ratio of 2:1.
4) Their corresponding angles have a ratio of 2:1.
482 The diagram below shows the construction of a line through point \( P \) perpendicular to line \( m \).

Which statement is demonstrated by this construction?

1) If a line is parallel to a line that is perpendicular to a third line, then the line is also perpendicular to the third line.
2) The set of points equidistant from the endpoints of a line segment is the perpendicular bisector of the segment.
3) Two lines are perpendicular if they are equidistant from a given point.
4) Two lines are perpendicular if they intersect to form a vertical line.

483 Which transformation can map the letter \( S \) onto itself?

1) glide reflection
2) translation
3) line reflection
4) rotation

484 What is the length of the line segment with endpoints \((-6,4)\) and \((2,-5)\)?

1) \( \sqrt{13} \)
2) \( \sqrt{17} \)
3) \( \sqrt{72} \)
4) \( \sqrt{145} \)

485 What is an equation of the line that passes through the point \((-2,5)\) and is perpendicular to the line whose equation is \( y = \frac{1}{2}x + 5 \)?

1) \( y = 2x + 1 \)
2) \( y = -2x + 1 \)
3) \( y = 2x + 9 \)
4) \( y = -2x - 9 \)

486 In the diagram below of circle \( O \), chords \( \overline{AE} \) and \( \overline{DC} \) intersect at point \( B \), such that \( \angle AC = 36 \) and \( \angle DE = 20 \).

What is \( m\angle ABC \)?

1) 56
2) 36
3) 28
4) 8
487 If \( \triangle ABC \sim \triangle ZXY \), \( m\angle A = 50 \), and \( m\angle C = 30 \), what is \( m\angle X \)?
1) 30
2) 50
3) 80
4) 100

488 Circle \( O \) with \( \angle AOC \) and \( \angle ABC \) is shown in the diagram below.

![Diagram of circle with angles AOC and ABC](image)

What is the ratio of \( m\angle AOC \) to \( m\angle ABC \)?
1) 1 : 1
2) 2 : 1
3) 3 : 1
4) 1 : 2

489 Towns \( A \) and \( B \) are 16 miles apart. How many points are 10 miles from town \( A \) and 12 miles from town \( B \)?
1) 1
2) 2
3) 3
4) 0

490 What is the equation of a line that is parallel to the line whose equation is \( y = x + 2 \)?
1) \( x + y = 5 \)
2) \( 2x + y = -2 \)
3) \( y - x = -1 \)
4) \( y - 2x = 3 \)

491 In which polygon does the sum of the measures of the interior angles equal the sum of the measures of the exterior angles?
1) triangle
2) hexagon
3) octagon
4) quadrilateral

492 In an equilateral triangle, what is the difference between the sum of the exterior angles and the sum of the interior angles?
1) 180°
2) 120°
3) 90°
4) 60°

493 If the diagonals of a quadrilateral do not bisect each other, then the quadrilateral could be a
1) rectangle
2) rhombus
3) square
4) trapezoid
494 The equation of a circle is \( x^2 + (y - 7)^2 = 16 \). What are the center and radius of the circle?
1) center = (0, 7); radius = 4
2) center = (0, 7); radius = 16
3) center = (0, -7); radius = 4
4) center = (0, -7); radius = 16

495 If the endpoints of \( \overline{AB} \) are \( A(-4, 5) \) and \( B(2, -5) \), what is the length of \( \overline{AB} \)?
1) \( 2\sqrt{34} \)
2) 2
3) \( \sqrt{61} \)
4) 8

496 Point \( A \) is located at (4, -7). The point is reflected in the \( x \)-axis. Its image is located at
1) (-4, 7)
2) (-4, -7)
3) (4, 7)
4) (7, -4)

497 What is the contrapositive of the statement, “If I am tall, then I will bump my head”?
1) If I bump my head, then I am tall.
2) If I do not bump my head, then I am tall.
3) If I am tall, then I will not bump my head.
4) If I do not bump my head, then I am not tall.

498 The coordinates of the vertices of parallelogram \( ABCD \) are \( A(-3, 2), B(-2, -1), C(4, 1) \), and \( D(3, 4) \). The slopes of which line segments could be calculated to show that \( ABCD \) is a rectangle?
1) \( \overline{AB} \) and \( \overline{DC} \)
2) \( \overline{AB} \) and \( \overline{BC} \)
3) \( \overline{AD} \) and \( \overline{BC} \)
4) \( \overline{AC} \) and \( \overline{BD} \)

499 What is the length, to the nearest tenth, of the line segment joining the points (-4, 2) and (146, 52)?
1) 141.4
2) 150.5
3) 151.9
4) 158.1

500 Given the system of equations: \( y = x^2 - 4x \)
\[ \begin{align*}
x &= 4
\end{align*} \]
The number of points of intersection is
1) 1
2) 2
3) 3
4) 0

501 A right circular cylinder has an altitude of 11 feet and a radius of 5 feet. What is the lateral area, in square feet, of the cylinder, to the nearest tenth?
1) 172.7
2) 172.8
3) 345.4
4) 345.6
502 Given \( \triangle ABC \sim \triangle DEF \) such that \( \frac{AB}{DE} = \frac{3}{2} \). Which statement is not true?
1) \( \frac{BC}{EF} = \frac{3}{2} \)
2) \( \frac{m\angle A}{m\angle D} = \frac{3}{2} \)
3) \( \frac{\text{area of } \triangle ABC}{\text{area of } \triangle DEF} = \frac{9}{4} \)
4) \( \frac{\text{perimeter of } \triangle ABC}{\text{perimeter of } \triangle DEF} = \frac{3}{2} \)

503 The pentagon in the diagram below is formed by five rays.

What is the degree measure of angle \( x \)?
1) 72
2) 96
3) 108
4) 112

504 In three-dimensional space, two planes are parallel and a third plane intersects both of the parallel planes. The intersection of the planes is a
1) plane
2) point
3) pair of parallel lines
4) pair of intersecting lines

505 In \( \triangle ABC \), point \( D \) is on \( \overline{AB} \), and point \( E \) is on \( \overline{BC} \) such that \( \overline{DE} \parallel \overline{AC} \). If \( DB = 2 \), \( DA = 7 \), and \( DE = 3 \), what is the length of \( AC \)?
1) 8
2) 9
3) 10.5
4) 13.5

506 What is an equation of a circle with its center at \((-3,5)\) and a radius of 4?
1) \((x - 3)^2 + (y + 5)^2 = 16\)
2) \((x + 3)^2 + (y - 5)^2 = 16\)
3) \((x - 3)^2 + (y + 5)^2 = 4\)
4) \((x + 3)^2 + (y - 5)^2 = 4\)

507 Lines \( j \) and \( k \) intersect at point \( P \). Line \( m \) is drawn so that it is perpendicular to lines \( j \) and \( k \) at point \( P \). Which statement is correct?
1) Lines \( j \) and \( k \) are in perpendicular planes.
2) Line \( m \) is in the same plane as lines \( j \) and \( k \).
3) Line \( m \) is parallel to the plane containing lines \( j \) and \( k \).
4) Line \( m \) is perpendicular to the plane containing lines \( j \) and \( k \).

508 What is an equation of the line that passes through the point \((7,3)\) and is parallel to the line \(4x + 2y = 10\)?
1) \( y = \frac{1}{2} x - \frac{1}{2} \)
2) \( y = -\frac{1}{2} x + \frac{13}{2} \)
3) \( y = 2x - 11 \)
4) \( y = -2x + 17 \)
509 In the diagram below, the vertices of \( \triangle DEF \) are the midpoints of the sides of equilateral triangle \( \triangle ABC \), and the perimeter of \( \triangle ABC \) is 36 cm. What is the length, in centimeters, of \( EF \)?

1) 6  
2) 12  
3) 18  
4) 4

510 In the diagram of trapezoid \( ABCD \) below, diagonals \( AC \) and \( BD \) intersect at \( E \) and \( \triangle ABC \cong \triangle DCB \).

Which statement is true based on the given information?

1) \( AC \cong BC \)  
2) \( CD \cong AD \)  
3) \( \angle CDE \cong \angle BAD \)  
4) \( \angle CDB \cong \angle BAC \)

511 Point \( A \) is not contained in plane \( B \). How many lines can be drawn through point \( A \) that will be perpendicular to plane \( B \)?

1) one  
2) two  
3) zero  
4) infinite

512 A support beam between the floor and ceiling of a house forms a 90º angle with the floor. The builder wants to make sure that the floor and ceiling are parallel. Which angle should the support beam form with the ceiling?

1) 45º  
2) 60º  
3) 90º  
4) 180º

513 In the diagram below, under which transformation will \( \triangle A'B'C' \) be the image of \( \triangle ABC \)?

1) rotation  
2) dilation  
3) translation  
4) glide reflection
514 In the diagram below of circle $C$, $m\overline{QT} = 140$, and \(m\angle P = 40\).

What is \(m\overline{RS}\)?

1) 50
2) 60
3) 90
4) 110

515 In the diagram below of $\triangle ABC$, $D$ is a point on \(\overline{AB}\), $AC = 7$, $AD = 6$, and $BC = 18$.

The length of $\overline{DB}$ could be

1) 5
2) 12
3) 19
4) 25

516 A quadrilateral whose diagonals bisect each other and are perpendicular is a

1) rhombus
2) rectangle
3) trapezoid
4) parallelogram

517 The lateral faces of a regular pyramid are composed of

1) squares
2) rectangles
3) congruent right triangles
4) congruent isosceles triangles

518 Which statement is logically equivalent to "If it is warm, then I go swimming"

1) If I go swimming, then it is warm.
2) If it is warm, then I do not go swimming.
3) If I do not go swimming, then it is not warm.
4) If it is not warm, then I do not go swimming.

519 In the diagram below of $\triangle AGE$ and $\triangle OLD$, \(\angle GAE \cong \angle LOD\), and \(\overline{AE} \cong \overline{OD}\).

To prove that $\triangle AGE$ and $\triangle OLD$ are congruent by SAS, what other information is needed?

1) \(\overline{GE} \cong \overline{LD}\)
2) \(\overline{AG} \cong \overline{OL}\)
3) \(\angle AGE \cong \angle OLD\)
4) \(\angle AEG \cong \angle ODL\)
520 The diagram below shows the construction of the bisector of \( \angle ABC \).

Which statement is not true?
1) \( m\angle EBF = \frac{1}{2} m\angle ABC \)
2) \( m\angle DBF = \frac{1}{2} m\angle ABC \)
3) \( m\angle EBF = m\angle ABC \)
4) \( m\angle DBF = m\angle EBF \)

521 In \( \triangle ABC \), \( m\angle A = 95 \), \( m\angle B = 50 \), and \( m\angle C = 35 \). Which expression correctly relates the lengths of the sides of this triangle?
1) \( AB < BC < CA \)
2) \( AB < AC < BC \)
3) \( AC < BC < AB \)
4) \( BC < AC < AB \)

522 What is the image of point \( A(4,2) \) after the composition of transformations defined by \( R_{90^\circ} \circ r_{y=x} \)?
1) \((-4,2)\)
2) \((4,-2)\)
3) \((-4,-2)\)
4) \((2,-4)\)

523 Based on the construction below, which statement must be true?
1) \( m\angle ABD = \frac{1}{2} m\angle CBD \)
2) \( m\angle ABD = m\angle CBD \)
3) \( m\angle ABD = m\angle ABC \)
4) \( m\angle CBD = \frac{1}{2} m\angle ABD \)

524 Through a given point, \( P \), on a plane, how many lines can be drawn that are perpendicular to that plane?
1) 1
2) 2
3) more than 2
4) none

525 What is the measure of an interior angle of a regular octagon?
1) \( 45^\circ \)
2) \( 60^\circ \)
3) \( 120^\circ \)
4) \( 135^\circ \)
526 In isosceles trapezoid $ABCD$, $AB \cong CD$. If $BC = 20$, $AD = 36$, and $AB = 17$, what is the length of the altitude of the trapezoid?

1) 10  
2) 12  
3) 15  
4) 16

527 Line segment $AB$ has endpoints $A(2, -3)$ and $B(-4, 6)$. What are the coordinates of the midpoint of $AB$?

1) $(-2, 3)$  
2) $(-1, 1 \frac{1}{2})$  
3) $(−1, 3)$  
4) $(3, 4 \frac{1}{2})$

528 In the diagram below of $\triangle ABC$, $CD$ is the bisector of $\angle BCA$, $AE$ is the bisector of $\angle CAB$, and $BG$ is drawn. Which statement must be true?

1) $DG = EG$  
2) $AG = BG$  
3) $\angle AEB \cong \angle AEC$  
4) $\angle DBG \cong \angle EBG$

529 What is the negation of the statement “The Sun is shining”?

1) It is cloudy.  
2) It is daytime.  
3) It is not raining.  
4) The Sun is not shining.

530 In the diagram below, circle $O$ has a radius of 5, and $CE = 2$. Diameter $AC$ is perpendicular to chord $BD$ at $E$.

What is the length of $BD$?

1) 12  
2) 10  
3) 8  
4) 4

531 A rectangular prism has a volume of $3x^2 + 18x + 24$. Its base has a length of $x + 2$ and a width of 3. Which expression represents the height of the prism?

1) $x + 4$  
2) $x + 2$  
3) 3  
4) $x^2 + 6x + 8$
532 In the diagram below of parallelogram $ABCD$ with diagonals $AC$ and $BD$, $m\angle 1 = 45$ and $m\angle DCB = 120$.

What is the measure of $\angle 2$?
1) 15°
2) 30°
3) 45°
4) 60°

533 Which transformation produces a figure similar but not congruent to the original figure?
1) $T_{1,3}$
2) $D_{1/2}$
3) $R_{90°}$
4) $r_{y=x}$

534 Which set of numbers represents the lengths of the sides of a triangle?
1) {5, 18, 13}
2) {6, 17, 22}
3) {16, 24, 7}
4) {26, 8, 15}

535 In a coordinate plane, how many points are both 5 units from the origin and 2 units from the $x$-axis?
1) 1
2) 2
3) 3
4) 4

536 In the diagram below, $SQ$ and $PR$ intersect at $T$, $PQ$ is drawn, and $PS \parallel QR$.

What technique can be used to prove that $\triangle PST \sim \triangle RQT$?
1) SAS
2) SSS
3) ASA
4) AA

537 A right circular cylinder has a volume of 1,000 cubic inches and a height of 8 inches. What is the radius of the cylinder to the nearest tenth of an inch?
1) 6.3
2) 11.2
3) 19.8
4) 39.8
538 Based on the diagram below, which statement is true?

1) $a \parallel b$
2) $a \parallel c$
3) $b \parallel c$
4) $d \parallel e$

539 In the diagram below of circle $O$, chords $AD$ and $BC$ intersect at $E$.

Which relationship must be true?
1) $\triangle CAE \cong \triangle DBE$
2) $\triangle AEC \sim \triangle BED$
3) $\angle ACB \cong \angle CBD$
4) $\overline{CA} \cong \overline{DB}$

540 In the diagram below, the length of the legs $\overline{AC}$ and $\overline{BC}$ of right triangle $ABC$ are 6 cm and 8 cm, respectively. Altitude $CD$ is drawn to the hypotenuse of $\triangle ABC$.

What is the length of $\overline{AD}$ to the nearest tenth of a centimeter?
1) 3.6
2) 6.0
3) 6.4
4) 4.0

541 In the diagram below, a right circular cone has a diameter of 8 inches and a height of 12 inches.

What is the volume of the cone to the nearest cubic inch?
1) 201
2) 481
3) 603
4) 804
542 The diagram below shows the construction of the center of the circle circumscribed about \( \triangle ABC \).

This construction represents how to find the intersection of
1) the angle bisectors of \( \triangle ABC \)
2) the medians to the sides of \( \triangle ABC \)
3) the altitudes to the sides of \( \triangle ABC \)
4) the perpendicular bisectors of the sides of \( \triangle ABC \)

543 In the diagram below, tangent \( PA \) and secant \( PBC \) are drawn to circle \( O \) from external point \( P \).

If \( PB = 4 \) and \( BC = 5 \), what is the length of \( PA \)?
1) 20
2) 9
3) 8
4) 6

544 In the diagram below, \( PS \) is a tangent to circle \( O \) at point \( S \), \( PQR \) is a secant, \( PS = x \), \( PQ = 3 \), and \( PR = x + 18 \).

What is the length of \( PS \)?
1) 6
2) 9
3) 3
4) 27

545 What is the negation of the statement “Squares are parallelograms”?
1) Parallelograms are squares.
2) Parallelograms are not squares.
3) It is not the case that squares are parallelograms.
4) It is not the case that parallelograms are squares.

546 The diagonal \( AC \) is drawn in parallelogram \( ABCD \). Which method can not be used to prove that \( \triangle ABC \cong \triangle CDA \)?
1) SSS
2) SAS
3) SSA
4) ASA
547 In the diagram of $\triangle ABC$ and $\triangle EDC$ below, $\overline{AE}$ and $\overline{BD}$ intersect at $C$, and $\angle CAB \cong \angle CED$.

Which method can be used to show that $\triangle ABC$ must be similar to $\triangle EDC$?

1) SAS
2) AA
3) SSS
4) HL

548 In the diagram below of parallelogram $STUV$, $SV = x + 3$, $VU = 2x - 1$, and $TU = 4x - 3$.

What is the length of $SV$?

1) 5
2) 2
3) 7
4) 4

549 The equation of a circle is $(x - 2)^2 + (y + 4)^2 = 4$. Which diagram is the graph of the circle?
550  The figure in the diagram below is a triangular prism.

Which statement must be true?

1) $DE \cong AB$
2) $AD \cong BC$
3) $AD \parallel CE$
4) $DE \parallel BC$

551  The diameter of a circle has endpoints at $(-2,3)$ and $(6,3)$. What is an equation of the circle?

1) $(x - 2)^2 + (y - 3)^2 = 16$
2) $(x - 2)^2 + (y - 3)^2 = 4$
3) $(x + 2)^2 + (y + 3)^2 = 16$
4) $(x + 2)^2 + (y + 3)^2 = 4$

552  In $\triangle ABC$, $AB = 7$, $BC = 8$, and $AC = 9$. Which list has the angles of $\triangle ABC$ in order from smallest to largest?

1) $\angle A, \angle B, \angle C$
2) $\angle B, \angle A, \angle C$
3) $\angle C, \angle B, \angle A$
4) $\angle C, \angle A, \angle B$

553  Which graph could be used to find the solution to the following system of equations?

\[ y = -x + 2 \]
\[ y = x^2 \]

1) 
2) 
3) 
4)
554 The diagram below shows a pennant in the shape of an isosceles triangle. The equal sides each measure 13, the altitude is \( x + 7 \), and the base is \( 2x \).

What is the length of the base?
1) 5
2) 10
3) 12
4) 24

555 In the diagram below of \( \triangle ACT \), \( D \) is the midpoint of \( AC \), \( O \) is the midpoint of \( AT \), and \( G \) is the midpoint of \( CT \).

If \( AC = 10 \), \( AT = 18 \), and \( CT = 22 \), what is the perimeter of parallelogram \( CDOG \)?
1) 21
2) 25
3) 32
4) 40

556 If a line segment has endpoints \( A(3x + 5, 3y) \) and \( B(x - 1, -y) \), what are the coordinates of the midpoint of \( AB \)?
1) \((x + 3, 2y)\)
2) \((2x + 2, y)\)
3) \((2x + 3, y)\)
4) \((4x + 4, 2y)\)

557 The diagram below shows a right pentagonal prism.

Which statement is always true?
1) \( BC \parallel ED \)
2) \( FG \parallel CD \)
3) \( FJ \parallel IH \)
4) \( GB \parallel HC \)
558 Which diagram shows the construction of an equilateral triangle?

1)

2)

3)

4)

559 Given $\triangle ABC$ with base $AFEDC$, median $BF$, altitude $BD$, and $BE$ bisects $\angle ABC$, which conclusion is valid?

![Diagram with labeled points A, B, C, F, D, E]

1) $\angle FAB \cong \angle ABF$
2) $\angle ABF \cong \angle CBD$
3) $CE \cong EA$
4) $CF \cong FA$

560 One step in a construction uses the endpoints of $AB$ to create arcs with the same radii. The arcs intersect above and below the segment. What is the relationship of $AB$ and the line connecting the points of intersection of these arcs?

1) collinear
2) congruent
3) parallel
4) perpendicular

561 In which triangle do the three altitudes intersect outside the triangle?

1) a right triangle
2) an acute triangle
3) an obtuse triangle
4) an equilateral triangle
562 In the diagram below of circle $O$, chords $AD$ and $BC$ intersect at $E$, $m\overarc{AC} = 87$, and $m\overarc{BD} = 35$.

What is the degree measure of $\angle CEA$?
1) 87
2) 61
3) 43.5
4) 26

563 In the diagram below of right triangle $ACB$, altitude $CD$ is drawn to hypotenuse $AB$.

If $AB = 36$ and $AC = 12$, what is the length of $AD$?
1) 32
2) 6
3) 3
4) 4

564 In the diagram below of circle $O$, secant $AB$ intersects circle $O$ at $D$, secant $AOC$ intersects circle $O$ at $E$, $AE = 4$, $AB = 12$, and $DB = 6$.

What is the length of $OC$?
1) 4.5
2) 7
3) 9
4) 14

565 What is the distance between the points $(-3,2)$ and $(1,0)$?
1) $2\sqrt{2}$
2) $2\sqrt{3}$
3) $5\sqrt{2}$
4) $2\sqrt{5}$

566 Point $P$ is on line $m$. What is the total number of planes that are perpendicular to line $m$ and pass through point $P$?
1) 1
2) 2
3) 0
4) infinite
567 In isosceles triangle $ABC$, $AB = BC$. Which statement will always be true?
1) $m\angle B = m\angle A$
2) $m\angle A > m\angle B$
3) $m\angle A = m\angle C$
4) $m\angle C < m\angle B$

568 What is the inverse of the statement “If two triangles are not similar, their corresponding angles are not congruent”?
1) If two triangles are similar, their corresponding angles are not congruent.
2) If corresponding angles of two triangles are not congruent, the triangles are not similar.
3) If two triangles are similar, their corresponding angles are congruent.
4) If corresponding angles of two triangles are congruent, the triangles are similar.

569 In the diagram below of regular pentagon $ABCDE$, $EB$ is drawn.

What is the measure of $\angle AEB$?
1) $36^\circ$
2) $54^\circ$
3) $72^\circ$
4) $108^\circ$

570 The lines represented by the equations $y + \frac{1}{2}x = 4$ and $3x + 6y = 12$ are
1) the same line
2) parallel
3) perpendicular
4) neither parallel nor perpendicular

571 Which equation represents the circle whose center is $(-2,3)$ and whose radius is 5?
1) $(x - 2)^2 + (y + 3)^2 = 5$
2) $(x + 2)^2 + (y - 3)^2 = 5$
3) $(x + 2)^2 + (y - 3)^2 = 25$
4) $(x - 2)^2 + (y + 3)^2 = 25$

572 What is the equation of a line that passes through the point $(-3,-11)$ and is parallel to the line whose equation is $2x - y = 4$?
1) $y = 2x + 5$
2) $y = 2x - 5$
3) $y = \frac{1}{2}x + \frac{25}{2}$
4) $y = -\frac{1}{2}x - \frac{25}{2}$

573 Triangle $ABC$ has vertices $A(1,3)$, $B(0,1)$, and $C(4,0)$. Under a translation, $A'$, the image point of $A$, is located at $(4,4)$. Under this same translation, point $C'$ is located at
1) $(7,1)$
2) $(5,3)$
3) $(3,2)$
4) $(1,-1)$
574 Which geometric principle is used to justify the construction below?

1) A line perpendicular to one of two parallel lines is perpendicular to the other.
2) Two lines are perpendicular if they intersect to form congruent adjacent angles.
3) When two lines are intersected by a transversal and alternate interior angles are congruent, the lines are parallel.
4) When two lines are intersected by a transversal and the corresponding angles are congruent, the lines are parallel.

575 What are the center and radius of a circle whose equation is \((x - A)^2 + (y - B)^2 = C)\)?
1) center = \((A, B)\); radius = \(C\)
2) center = \((-A, -B)\); radius = \(C\)
3) center = \((A, B)\); radius = \(\sqrt{C}\)
4) center = \((-A, -B)\); radius = \(\sqrt{C}\)

576 Which equation represents a line parallel to the line whose equation is \(2y - 5x = 10\)?
1) \(5y - 2x = 25\)
2) \(5y + 2x = 10\)
3) \(4y - 10x = 12\)
4) \(2y + 10x = 8\)

577 In the diagram of circle \(O\) below, chords \(AB\) and \(CD\) are parallel, and \(BD\) is a diameter of the circle.

If \(m\overline{AD} = 60\), what is \(m\angle CDB\)?
1) 20
2) 30
3) 60
4) 120

578 What is an equation for the circle shown in the graph below?
1) \(x^2 + y^2 = 2\)
2) \(x^2 + y^2 = 4\)
3) \(x^2 + y^2 = 8\)
4) \(x^2 + y^2 = 16\)
579 In the diagram of circle $O$ below, chord $CD$ is parallel to diameter $AOB$ and $mAC = 30$.

What is $mCD$?
1) 150
2) 120
3) 100
4) 60

580 What is the slope of a line perpendicular to the line whose equation is $5x + 3y = 8$?
1) $\frac{5}{3}$
2) $\frac{3}{5}$
3) $\frac{3}{5}$
4) $-\frac{5}{3}$

581 A circle is represented by the equation $x^2 + (y + 3)^2 = 13$. What are the coordinates of the center of the circle and the length of the radius?
1) $(0, 3)$ and 13
2) $(0, 3)$ and $\sqrt{13}$
3) $(0, -3)$ and 13
4) $(0, -3)$ and $\sqrt{13}$
110

584 In the diagram below of $\triangle PRT$, $Q$ is a point on $PR$, $S$ is a point on $TR$, $QS$ is drawn, and $\angle RPT \cong \angle RSQ$.

Which reason justifies the conclusion that $\triangle PRT \sim \triangle SRQ$?

1) AA  
2) ASA  
3) SAS  
4) SSS

585 In the diagram of circle $O$ below, chord $AB$ intersects chord $CD$ at $E$, $DE = 2x + 8$, $EC = 3$, $AE = 4x - 3$, and $EB = 4$.

What is the value of $x$?

1) 1  
2) 3.6  
3) 5  
4) 10.25

586 The diagram below shows the construction of the perpendicular bisector of $AB$.

Which statement is not true?

1) $AC = CB$  
2) $CB = \frac{1}{2} AB$  
3) $AC = 2AB$  
4) $AC + CB = AB$

587 In the diagram of $\triangle ABC$ and $\triangle DEF$ below, $AB \cong DE$, $\angle A \cong \angle D$, and $\angle B \cong \angle E$.

Which method can be used to prove $\triangle ABC \cong \triangle DEF$?

1) SSS  
2) SAS  
3) ASA  
4) HL
A polygon is transformed according to the rule: 
$(x,y) \rightarrow (x+2,y)$. Every point of the polygon moves two units in which direction?
1) up
2) down
3) left
4) right
589 In the diagram below of \(\triangle ACD\), \(B\) is a point on \(\overline{AC}\) such that \(\triangle ADB\) is an equilateral triangle, and \(\triangle DBC\) is an isosceles triangle with \(DB = BC\). Find \(m\angle C\).

590 On the diagram below, use a compass and straightedge to construct the bisector of \(\angle XYZ\). [Leave all construction marks.]

591 Determine and state the measure, in degrees, of an interior angle of a regular decagon.

592 Two intersecting lines are shown in the diagram below. Sketch the locus of points that are equidistant from the two lines. Sketch the locus of points that are a given distance, \(d\), from the point of intersection of the given lines. State the number of points that satisfy both conditions.

593 As shown in the diagram below, \(\overline{AS}\) is a diagonal of trapezoid \(STAR\), \(RA \parallel ST\), \(m\angle ATS = 48\), \(m\angle RSA = 47\), and \(m\angle ARS = 68\).

Determine and state the longest side of \(\triangle SAT\).
594 Using a compass and straightedge, construct the bisector of $\angle CBA$. [Leave all construction marks.]

595 In the diagram below of $\triangle ABC$, $DE$ and $DF$ are midsegments. If $DE = 9$, and $BC = 17$, determine and state the perimeter of quadrilateral $FDEC$.

596 Tim is going to paint a wooden sphere that has a diameter of 12 inches. Find the surface area of the sphere, to the nearest square inch.

597 Write an equation of the line that is perpendicular to the line whose equation is $2y = 3x + 12$ and that passes through the origin.

598 Write an equation of the circle graphed in the diagram below.

599 Determine whether the two lines represented by the equations $y = 2x + 3$ and $2y + x = 6$ are parallel, perpendicular, or neither. Justify your response.

600 A right prism has a square base with an area of 12 square meters. The volume of the prism is 84 cubic meters. Determine and state the height of the prism, in meters.

601 Triangle $RST$ is similar to $\triangle XYZ$ with $RS = 3$ inches and $XY = 2$ inches. If the area of $\triangle RST$ is 27 square inches, determine and state the area of $\triangle XYZ$, in square inches.
602 In \( \triangle ABC \), the measure of angle \( A \) is fifteen less than twice the measure of angle \( B \). The measure of angle \( C \) equals the sum of the measures of angle \( A \) and angle \( B \). Determine the measure of angle \( B \).

603 A circle has the equation \((x - 3)^2 + (y + 4)^2 = 10\). Find the coordinates of the center of the circle and the length of the circle's radius.

604 In circle \( O \), diameter \( RS \) has endpoints \( R(3a, 2b - 1) \) and \( S(a - 6, 4b + 5) \). Find the coordinates of point \( O \), in terms of \( a \) and \( b \). Express your answer in simplest form.

605 Triangle \( ABC \) has vertices \( A(6, 6) \), \( B(9, 0) \), and \( C(3, -3) \). State and label the coordinates of \( \triangle A'B'C' \), the image of \( \triangle ABC \) after a dilation of \( D_{\frac{1}{5}} \).

606 Given: \( \overline{BE} \) and \( \overline{AD} \) intersect at point \( C \)
\[
\frac{BC}{EC} = \frac{EC}{AC} \\
\frac{AC}{DC} = \frac{AB}{DE}
\]
\( AB \) and \( DE \) are drawn
Prove: \( \triangle ABC \cong \triangle DEC \)

607 The image of \( RS \) after a reflection through the origin is \( R'S' \). If the coordinates of the endpoints of \( RS \) are \( R(2, -3) \) and \( S(5, 1) \), state and label the coordinates of \( R' \) and \( S' \). [The use of the set of axes below is optional.]

608 In the diagram below, trapezoid \( ABCD \), with bases \( AB \) and \( DC \), is inscribed in circle \( O \), with diameter \( DC \). If \( m\overline{AB} = 80 \), find \( m\overline{BC} \).
609 Write a statement that is logically equivalent to the statement “If two sides of a triangle are congruent, the angles opposite those sides are congruent.” Identify the new statement as the converse, inverse, or contrapositive of the original statement.

610 The Parkside Packing Company needs a rectangular shipping box. The box must have a length of 11 inches and a width of 8 inches. Find, to the nearest tenth of an inch, the minimum height of the box such that the volume is at least 800 cubic inches.

611 In the diagram below, $\triangle ABC \sim \triangle EFG$, $m \angle C = 4x + 30$, and $m \angle G = 5x + 10$. Determine the value of $x$.

612 Two prisms with equal altitudes have equal volumes. The base of one prism is a square with a side length of 5 inches. The base of the second prism is a rectangle with a side length of 10 inches. Determine and state, in inches, the measure of the width of the rectangle.

613 The diagram below shows isosceles trapezoid $ABCD$ with $AB \parallel DC$ and $AD \cong BC$. If $m \angle BAD = 2x$ and $m \angle BCD = 3x + 5$, find $m \angle BAD$.

614 In the diagram below, secants $PQR$ and $PST$ are drawn to a circle from point $P$. If $PR = 24$, $PQ = 6$, and $PS = 8$, determine and state the length of $PT$.

615 In $\triangle RST$, $m \angle RST = 46$ and $RS \cong ST$. Find $m \angle STR$.

616 The degree measures of the angles of $\triangle ABC$ are represented by $x$, $3x$, and $5x - 54$. Find the value of $x$. 
617 The endpoints of $\overline{AB}$ are $A(3, -4)$ and $B(7, 2)$. Determine and state the length of $\overline{AB}$ in simplest radical form.

620 The coordinates of the endpoints of $\overline{CD}$ are $C(3, 8)$ and $D(6, -1)$. Find the length of $\overline{CD}$ in simplest radical form.

618 In the diagram below of $\triangle ABC$, $D$ is a point on $\overline{AB}$, $E$ is a point on $\overline{BC}$, $\overline{AC} \parallel \overline{DE}$, $CE = 25$ inches, $AD = 18$ inches, and $DB = 12$ inches. Find, to the nearest tenth of an inch, the length of $\overline{EB}$.

621 Find an equation of the line passing through the point $(5, 4)$ and parallel to the line whose equation is $2x + y = 3$.

619 Using a compass and straightedge, construct the perpendicular bisector of $\overline{AB}$. [Leave all construction marks.]

622 Using a compass and straightedge, construct the perpendicular bisector of side $\overline{AR}$ in $\triangle ART$ shown below. [Leave all construction marks.]

623 The base of a pyramid is a rectangle with a width of 6 cm and a length of 8 cm. Find, in centimeters, the height of the pyramid if the volume is 288 cm$^3$.

624 Write the negation of the statement “2 is a prime number,” and determine the truth value of the negation.
625 In the diagram below of circle $O$, diameter $AB$ is perpendicular to chord $CD$ at $E$. If $AO = 10$ and $BE = 4$, find the length of $CE$.

626 Using a compass and straightedge, on the diagram below of $RS$, construct an equilateral triangle with $RS$ as one side. [Leave all construction marks.]

627 The coordinates of the endpoints of $FG$ are $(-4,3)$ and $(2,5)$. Find the length of $FG$ in simplest radical form.

628 As shown in the diagram below, a right circular cone has a height of 12 and a radius of 5.

Determine, in terms of $\pi$, the lateral area of the right circular cone.

629 The coordinates of the vertices of $\triangle ABC$ are $A(1,2)$, $B(-4,3)$, and $C(-3,-5)$. State the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$ after a rotation of $90^\circ$ about the origin. [The use of the set of axes below is optional.]
630 A right circular cone has a base with a radius of 15 cm, a vertical height of 20 cm, and a slant height of 25 cm. Find, in terms of $\pi$, the number of square centimeters in the lateral area of the cone.

631 The coordinates of the vertices of $\triangle RST$ are $R(-2,3)$, $S(4,4)$, and $T(2,-2)$. Triangle $R'S'T'$ is the image of $\triangle RST$ after a rotation of $90^\circ$ about the origin. State the coordinates of the vertices of $\triangle R'S'T'$. [The use of the set of axes below is optional.]

632 Given the true statement, "The medians of a triangle are concurrent," write the negation of the statement and give the truth value for the negation.

633 Write an equation for circle $O$ shown on the graph below.

634 Using a compass and straightedge, construct a line perpendicular to $AB$ through point $P$. [Leave all construction marks.]
635 Two lines are represented by the equations 
\[ x + 2y = 4 \] and \[ 4y - 2x = 12. \] Determine whether 
these lines are parallel, perpendicular, or neither. 
Justify your answer.

636 Using a compass and straightedge, construct a line 
that passes through point \( P \) and is perpendicular to 
line \( m \). [Leave all construction marks.]

637 Tim has a rectangular prism with a length of 10 
centimeters, a width of 2 centimeters, and an 
unknown height. He needs to build another 
rectangular prism with a length of 5 centimeters 
and the same height as the original prism. The 
volume of the two prisms will be the same. Find 
the width, in centimeters, of the new prism.

638 The coordinates of the endpoints of \( \overline{BC} \) are \( B(5,1) \) 
and \( C(-3,-2) \). Under the transformation \( R_{90} \), the 
image of \( \overline{BC} \) is \( \overline{B'C'} \). State the coordinates of 
points \( B' \) and \( C' \).

639 Triangle \( ABC \) has vertices \( A(-2,2), B(-1,-3) \), and 
\( C(4,0) \). Find the coordinates of the vertices of 
\( \triangle A'B'C' \), the image of \( \triangle ABC \) after the 
transformation \( R_{y-axis} \). [The use of the grid is 
optional.]

640 In the diagram below, \( \overline{QM} \) is a median of triangle 
\( PQR \) and point \( C \) is the centroid of triangle \( PQR \).

If \( QC = 5x \) and \( CM = x + 12 \), determine and state 
the length of \( \overline{QM} \).
641 State whether the lines represented by the equations \( y = \frac{1}{2} x - 1 \) and \( y + 4 = -\frac{1}{2} (x - 2) \) are parallel, perpendicular, or neither. Explain your answer.

642 A regular pyramid with a square base is shown in the diagram below.

A side, \( s \), of the base of the pyramid is 12 meters, and the height, \( h \), is 42 meters. What is the volume of the pyramid in cubic meters?

643 Using a compass and straightedge, and \( AB \) below, construct an equilateral triangle with all sides congruent to \( AB \). [Leave all construction marks.]

644 On the set of axes below, graph the locus of points that are 4 units from the line \( x = 3 \) and the locus of points that are 5 units from the point (0,2). Label with an \( X \) all points that satisfy both conditions.

645 In the diagram below of \( \triangle TEM \), medians \( TB \), \( EC \), and \( MA \) intersect at \( D \), and \( TB = 9 \). Find the length of \( TD \).
646 Write an equation of a circle whose center is \((-3,2)\) and whose diameter is 10.

647 Using a compass and straightedge, construct a line perpendicular to line \(\ell\) through point \(P\). [Leave all construction marks.]

648 In the diagram below of \(\triangle ABC\), \(DE\) is a midsegment of \(\triangle ABC\), \(DE = 7\), \(AB = 10\), and \(BC = 13\). Find the perimeter of \(\triangle ABC\).

649 The cylindrical tank shown in the diagram below is to be painted. The tank is open at the top, and the bottom does not need to be painted. Only the outside needs to be painted. Each can of paint covers 600 square feet. How many cans of paint must be purchased to complete the job?

650 Write an equation of the line that is the perpendicular bisector of the line segment having endpoints \((3,-1)\) and \((3,5)\). [The use of the grid below is optional]
651 Find the slope of a line perpendicular to the line whose equation is \(2y - 6x = 4\).

652 On the diagram of \(\triangle ABC\) shown below, use a compass and straightedge to construct the perpendicular bisector of \(AC\). [Leave all construction marks.]

653 Using a compass and straightedge, construct the angle bisector of \(\angle ABC\) shown below. [Leave all construction marks.]

654 A cylinder has a height of 7 cm and a base with a diameter of 10 cm. Determine the volume, in cubic centimeters, of the cylinder in terms of \(\pi\).

655 As shown in the diagram below, quadrilateral \(DEFG\) is inscribed in a circle and \(m\angle D = 86\).

Determine and state \(m\angle GFE\). Determine and state \(m\angle F\).

656 In the diagram below of right triangle \(ACB\), altitude \(CD\) intersects \(AB\) at \(D\). If \(AD = 3\) and \(DB = 4\), find the length of \(CD\) in simplest radical form.
657 In the diagram below of \( \triangle ABC \) with side \( \overline{AC} \) extended through \( D \), \( m \angle A = 37 \) and \( m \angle BCD = 117 \). Which side of \( \triangle ABC \) is the longest side? Justify your answer.

658 In the diagram below of circle \( O \), chord \( \overline{AB} \) bisects chord \( \overline{CD} \) at \( E \). If \( AE = 8 \) and \( BE = 9 \), find the length of \( \overline{CE} \) in simplest radical form.

659 The endpoints of \( \overline{PQ} \) are \( P(-3,1) \) and \( Q(4,25) \). Find the length of \( \overline{PQ} \).

660 The sum of the interior angles of a regular polygon is \( 540^\circ \). Determine and state the number of degrees in one interior angle of the polygon.

661 Triangle \( ABC \) has coordinates \( A(-2,1) \), \( B(3,1) \), and \( C(0,-3) \). On the set of axes below, graph and label \( \triangle A'B'C' \), the image of \( \triangle ABC \) after a dilation of 2.

662 A right circular cylinder has a height of 7 inches and the base has a diameter of 6 inches. Determine the lateral area, in square inches, of the cylinder in terms of \( \pi \).

663 Rectangle \( KLMN \) has vertices \( K(0,4) \), \( L(4,2) \), \( M(1,-4) \), and \( N(-3,-2) \). Determine and state the coordinates of the point of intersection of the diagonals.
664 In the diagram below, car $A$ is parked 7 miles from car $B$. Sketch the points that are 4 miles from car $A$ and sketch the points that are 4 miles from car $B$. Label with an $X$ all points that satisfy both conditions.

665 Triangle $ABC$ has vertices at $A(3,0)$, $B(9,-5)$, and $C(7,-8)$. Find the length of $AC$ in simplest radical form.

666 In the diagram below, circles $A$ and $B$ are tangent at point $C$ and $AB$ is drawn. Sketch all common tangent lines.

667 In isosceles triangle $RST$ shown below, $RS \cong RT$, $M$ and $N$ are midpoints of $RS$ and $RT$, respectively, and $MN$ is drawn. If $MN = 3.5$ and the perimeter of $\triangle RST$ is 25, determine and state the length of $NT$.

668 In right triangle $ABC$ shown below, altitude $BD$ is drawn to hypotenuse $AC$.

If $AD = 8$ and $DC = 10$, determine and state the length of $AB$.

669 The coordinates of two vertices of square $ABCD$ are $A(2,1)$ and $B(4,4)$. Determine the slope of side $BC$.
670 The length of $\overline{AB}$ is 3 inches. On the diagram below, sketch the points that are equidistant from $A$ and $B$ and sketch the points that are 2 inches from $A$. Label with an $\times$ all points that satisfy both conditions.

671 Using a compass and straightedge, construct the bisector of $\angle MJH$. [Leave all construction marks.]

672 Write an equation of a line that is parallel to the line whose equation is $3y = x + 6$ and that passes through the point $(−3, 4)$.

673 Using a compass and straightedge, locate the midpoint of $\overline{AB}$ by construction. [Leave all construction marks.]

674 A sphere has a diameter of 18 meters. Find the volume of the sphere, in cubic meters, in terms of $\pi$. 
675 Two lines, $AB$ and $CRD$, are parallel and 10 inches apart. Sketch the locus of all points that are equidistant from $AB$ and $CRD$ and 7 inches from point $R$. Label with an $X$ each point that satisfies both conditions.

676 On the diagram below, use a compass and straightedge to construct the bisector of $\angle ABC$. [Leave all construction marks.] 

677 On the ray drawn below, using a compass and straightedge, construct an equilateral triangle with a vertex at $R$. The length of a side of the triangle must be equal to a length of the diagonal of rectangle $ABCD$. 

678 The diagram below shows $\triangle ABC$, with $\overline{AEB}$, $\overline{ADC}$, and $\angle ACB \cong \angle AED$. Prove that $\triangle ABC$ is similar to $\triangle ADE$. 

679 In the diagram below of \( \triangle ACD \), \( E \) is a point on \( AD \) and \( B \) is a point on \( AC \), such that \( EB \parallel DC \). If \( AE = 3 \), \( ED = 6 \), and \( DC = 15 \), find the length of \( EB \).

680 In the diagram below, two parallel lines intersect circle \( O \) at points \( A \), \( B \), \( C \), and \( D \), with \( \widehat{AB} = x + 20 \) and \( \widehat{DC} = 2x - 20 \). Find \( \widehat{AB} \).

681 Find, in simplest radical form, the length of the line segment with endpoints whose coordinates are \((-1, 4)\) and \((3, -2)\).

682 In right \( \triangle DEF \), \( \angle D = 90 \) and \( \angle F \) is 12 degrees less than twice \( \angle E \). Find \( \angle E \).

683 The volume of a cylinder is 12,566.4 cm\(^3\). The height of the cylinder is 8 cm. Find the radius of the cylinder to the nearest tenth of a centimeter.

684 The image of \( \triangle ABC \) under a translation is \( \triangle A'B'C' \). Under this translation, \( B(3, -2) \) maps onto \( B'(1, -1) \). Using this translation, the coordinates of image \( A' \) are \((-2, 2)\). Determine and state the coordinates of point \( A \).

685 On the set of axes below, graph the locus of points 4 units from the \( x \)-axis and equidistant from the points whose coordinates are \((-2, 0)\) and \((8, 0)\). Mark with an \( \times \) all points that satisfy both conditions.
686 In the diagram below of \( \triangle HQP \), side \( \overline{HP} \) is extended through \( P \) to \( T \), \( m\angle QPT = 6x + 20 \), \( m\angle HQP = x + 40 \), and \( m\angle PHQ = 4x - 5 \). Find \( m\angle QPT \).

(Not drawn to scale)

687 In the diagram below, \( l \parallel m \) and \( \overline{QR} \perp \overline{ST} \) at \( R \).

If \( m\angle 1 = 63 \), find \( m\angle 2 \).

688 Write an equation of the line that passes through the point \((6, -5)\) and is parallel to the line whose equation is \( 2x - 3y = 11 \).

689 The measures of the angles of a triangle are in the ratio 5:6:7. Determine the measure, in degrees, of the smallest angle of the triangle.

690 After the transformation \( r_{y=x} \), the image of \( \triangle ABC \) is \( \triangle A'B'C' \). If \( AB = 2x + 13 \) and \( A'B' = 9x - 8 \), find the value of \( x \).

691 Triangle \( XYZ \), shown in the diagram below, is reflected over the line \( x = 2 \). State the coordinates of \( \triangle X'Y'Z' \), the image of \( \triangle XYZ \).

692 Find, in degrees, the measures of both an interior angle and an exterior angle of a regular pentagon.
693 The vertices of \( \triangle ABC \) are \( A(3,2) \), \( B(6,1) \), and \( C(4,6) \). Identify and graph a transformation of \( \triangle ABC \) such that its image, \( \triangle A'B'C' \), results in \( AB \parallel A'B' \).

694 As shown in the diagram below, \( \overline{BO} \) and tangents \( \overline{BA} \) and \( \overline{BC} \) are drawn from external point \( B \) to circle \( O \). Radii \( \overline{OA} \) and \( \overline{OC} \) are drawn. If \( OA = 7 \) and \( DB = 18 \), determine and state the length of \( AB \).

695 On the set of axes below, graph the locus of points 4 units from \((0,1)\) and the locus of points 3 units from the origin. Label with an \( \times \) any points that satisfy both conditions.

696 In the diagram of \( \triangle ABC \) below, \( AB = 10 \), \( BC = 14 \), and \( AC = 16 \). Find the perimeter of the triangle formed by connecting the midpoints of the sides of \( \triangle ABC \).
697 A tree, \(T\), is 6 meters from a row of corn, \(c\), as represented in the diagram below. A farmer wants to place a scarecrow 2 meters from the row of corn and also 5 meters from the tree. Sketch both loci. Indicate, with an \(X\), all possible locations for the scarecrow.

698 Determine, in degrees, the measure of each interior angle of a regular octagon.

699 A paper container in the shape of a right circular cone has a radius of 3 inches and a height of 8 inches. Determine and state the number of cubic inches in the volume of the cone, in terms of \(\pi\).

700 Triangle \(ABC\) has vertices \(A(-1,1), B(1,3),\) and \(C(4,1)\). The image of \(\triangle ABC\) after the transformation \(r_{y=x}\) is \(\triangle A'B'C'\). State and label the coordinates of \(\triangle A'B'C'\). [The use of the set of axes below is optional.]

701 In the diagram below, point \(B\) is the incenter of \(\triangle FEC\), and \(EBR, CBD,\) and \(FB\) are drawn.

If \(m\angle FEC = 84\) and \(m\angle ECF = 28\), determine and state \(m\angle BRC\).
702 The slope of $\overline{QR}$ is $\frac{x - 1}{4}$ and the slope of $\overline{ST}$ is $\frac{8}{3}$. If $\overline{QR} \perp \overline{ST}$, determine and state the value of $x$.

703 A pentagon is drawn on the set of axes below. If the pentagon is reflected over the $y$-axis, determine if this transformation is an isometry. Justify your answer. [The use of the set of axes is optional.]

704 In the diagram below of isosceles trapezoid $DEFG$, $\overline{DE} \parallel \overline{GF}$, $DE = 4x - 2$, $EF = 3x + 2$, $FG = 5x - 3$, and $GD = 2x + 5$. Find the value of $x$.

705 The graph below shows the locus of points equidistant from the $x$-axis and $y$-axis. On the same set of axes, graph the locus of points 3 units from the line $x = 0$. Label with an $X$ all points that satisfy both conditions.

706 In the diagram below, $\triangle ABC$ is equilateral. Using a compass and straightedge, construct a new equilateral triangle congruent to $\triangle ABC$ in the space below. [Leave all construction marks.]
707 Triangle $TAP$ has coordinates $T(-1,4)$, $A(2,4)$, and $P(2,0)$. On the set of axes below, graph and label $\Delta T' A' P'$, the image of $\Delta TAP$ after the translation $(x,y) \rightarrow (x - 5, y - 1)$.

708 Using a compass and straightedge, construct the bisector of the angle shown below. [Leave all construction marks.]

709 In the diagram below, point $M$ is located on $\overrightarrow{AB}$. Sketch the locus of points that are 1 unit from $\overrightarrow{AB}$ and the locus of points 2 units from point $M$. Label with an X all points that satisfy both conditions.

710 On the line segment below, use a compass and straightedge to construct equilateral triangle $ABC$. [Leave all construction marks.]
711 In the diagram below of circle $C$, $QR$ is a diameter, and $Q(1,8)$ and $C(3.5,2)$ are points on a coordinate plane. Find and state the coordinates of point $R$.

[Diagram of a circle with points $Q(1,8)$ and $C(3.5,2)$]

712 Triangle $ABC$ has vertices $A(3,3)$, $B(7,9)$, and $C(11,3)$. Determine the point of intersection of the medians, and state its coordinates. [The use of the set of axes below is optional.]

713 Given: Two is an even integer or three is an even integer. Determine the truth value of this disjunction. Justify your answer.

714 The diameter of a sphere is 5 inches. Determine and state the surface area of the sphere, to the nearest hundredth of a square inch.
715 Triangle $ABC$ has coordinates $A(2,-2)$, $B(2,1)$, and $C(4,-2)$. Triangle $A'B'C'$ is the image of $\triangle ABC$ under $T_{5,-2}$. On the set of axes below, graph and label $\triangle ABC$ and its image, $\triangle A'B'C'$. Determine the relationship between the area of $\triangle ABC$ and the area of $\triangle A'B'C'$. Justify your response.

716 A paint can is in the shape of a right circular cylinder. The volume of the paint can is $600\pi$ cubic inches and its altitude is 12 inches. Find the radius, in inches, of the base of the paint can. Express the answer in simplest radical form. Find, to the nearest tenth of a square inch, the lateral area of the paint can.

717 In the diagram below, a right circular cone with a radius of 3 inches has a slant height of 5 inches, and a right cylinder with a radius of 4 inches has a height of 6 inches. Determine and state the number of full cones of water needed to completely fill the cylinder with water.

718 On the set of axes below, graph the locus of points that are four units from the point $(2,1)$. On the same set of axes, graph the locus of points that are two units from the line $x = 4$. State the coordinates of all points that satisfy both conditions.
719 On the set of axes below, graph and label \( \triangle DEF \) with vertices at \( D(-4,-4) \), \( E(-2,2) \), and \( F(8,-2) \). If \( G \) is the midpoint of \( EF \) and \( H \) is the midpoint of \( DF \), state the coordinates of \( G \) and \( H \) and label each point on your graph. Explain why \( GH \parallel DE \).

720 Given: \( JKLM \) is a parallelogram.
\[ JM \cong LN \]
\[ \angle LMN \cong \angle LNM \]
Prove: \( JKLM \) is a rhombus.

721 On the set of axes below, graph the locus of points 5 units from the point \( (2,-3) \) and the locus of points 2 units from the line whose equation is \( y = -1 \). State the coordinates of all points that satisfy both conditions.

722 In the diagram below, \( BFCE \), \( AB \perp BE \), \( DE \perp BE \), and \( \angle BFD \equiv \angle ECA \). Prove that \( \triangle ABC \sim \triangle DEF \).
723 In the diagram below of $\triangle ADE$, $B$ is a point on $AE$ and $C$ is a point on $AD$ such that $BC \parallel ED$, $AC = x - 3$, $BE = 20$, $AB = 16$, and $AD = 2x + 2$. Find the length of $AC$.

724 Solve the following system of equations graphically.

\[
2x^2 - 4x = y + 1 \\
x + y = 1
\]

725 In circle $O$ shown below, chords $AB$ and $CD$ and radius $OA$ are drawn, such that $AB \cong CD$, $OE \perp AB$, $OF \perp CD$, $OF = 16$, $CF = y + 10$, and $CD = 4y - 20$.

Determine the length of $DF$. Determine the length of $OA$.

726 As shown on the set of axes below, $\triangle GHS$ has vertices $G(3,1)$, $H(5,3)$, and $S(1,4)$. Graph and state the coordinates of $\triangle G''H''S''$, the image of $\triangle GHS$ after the transformation $T_{-3,1} \circ D_2$. 
727 A city is planning to build a new park. The park must be equidistant from school A at (3,3) and school B at (3,−5). The park also must be exactly 5 miles from the center of town, which is located at the origin on the coordinate graph. Each unit on the graph represents 1 mile. On the set of axes below, sketch the compound loci and label with an X all possible locations for the new park.

728 In the diagram below, tangent ML and secant MNK are drawn to circle O. The ratio \( m\angle LN : m\angle NK : m\angle KL \) is 3:4:5. Find \( m\angle LMK \).

729 In the diagram below of circle O, chords \( DF, DE, FG, \) and \( EG \) are drawn such that \( mDF : mFE : mEG : mGD = 5:2:1:7 \). Identify one pair of inscribed angles that are congruent to each other and give their measure.

730 Using a compass and straightedge, construct an equilateral triangle with \( AB \) as a side. Using this triangle, construct a 30° angle with its vertex at A. [Leave all construction marks.]

731 In \( \triangle ABC \), \( m\angle A = x^2 + 12 \), \( m\angle B = 11x + 5 \), and \( m\angle C = 13x - 17 \). Determine the longest side of \( \triangle ABC \).
732 Trapezoid $TRAP$, with median $MQ$, is shown in the diagram below. Solve algebraically for $x$ and $y$.

733 On the grid below, graph the points that are equidistant from both the $x$ and $y$ axes and the points that are 5 units from the origin. Label with an $X$ all points that satisfy both conditions.

734 The coordinates of the vertices of $\triangle ABC$ are $A(-6,5), B(-4,8),$ and $C(1,6)$. State and label the coordinates of the vertices of $\triangle A''B''C''$, the image of $\triangle ABC$ after the composition of transformations $T_{(4,-5)} \circ r_{y \text{-axis}}$. [The use of the set of axes below is optional.]

735 In $\triangle KLM$, $m\angle K = 36$ and $KM = 5$. The transformation $D_2$ is performed on $\triangle KLM$ to form $\triangle K'L'M'$. Find $m\angle K'$. Justify your answer.

Find the length of $K'M'$. Justify your answer.

736 Given: Quadrilateral $ABCD$ with $\overline{AB} \cong \overline{CD}, \overline{AD} \cong \overline{BC}$, and diagonal $\overline{BD}$ is drawn
Prove: $\angle BDC \cong \angle ABD$
737 A right circular cone has an altitude of 10 ft and the diameter of the base is 6 ft as shown in the diagram below. Determine and state the lateral area of the cone, to the nearest tenth of a square foot.

738 The graph below shows $\triangle A'B'C'$, the image of $\triangle ABC$ after it was reflected over the y-axis. Graph and label $\triangle ABC$, the pre-image of $\triangle A'B'C'$. Graph and label $\triangle A''B''C''$, the image of $\triangle A'B'C'$ after it is reflected through the origin. State a single transformation that will map $\triangle ABC$ onto $\triangle A''B''C''$.

739 A right circular cylinder with a height of 5 cm has a base with a diameter of 6 cm. Find the lateral area of the cylinder to the nearest hundredth of a square centimeter. Find the volume of the cylinder to the nearest hundredth of a cubic centimeter.

740 In parallelogram $ABCD$, with diagonal $AC$ drawn, $m\angle BCA = 4x + 2$, $m\angle DAC = 6x - 6$, $m\angle BAC = 5y - 1$, and $m\angle DCA = 7y - 15$. Determine $m\angle B$.

741 Use a compass and straightedge to divide line segment $AB$ below into four congruent parts. [Leave all construction marks.]

742 As shown in the diagram below, the diagonals of parallelogram $QRST$ intersect at $E$. If $QE = x^2 + 6x$, $SE = x + 14$, and $TE = 6x - 1$, determine $TE$ algebraically.
743 On the set of axes below, sketch the points that are 5 units from the origin and sketch the points that are 2 units from the line $y = 3$. Label with an $\mathbf{X}$ all points that satisfy both conditions.

744 If $\triangle RST \sim \triangle ABC$, $m\angle A = x^2 - 8x$, $m\angle C = 4x - 5$, and $m\angle R = 5x + 30$, find $m\angle C$. [Only an algebraic solution can receive full credit.]

745 Find an equation of the line passing through the point (6,5) and perpendicular to the line whose equation is $2y + 3x = 6$.

746 If $\overline{AB}$ is defined by the endpoints $A(4,2)$ and $B(8,6)$, write an equation of the line that is the perpendicular bisector of $\overline{AB}$.

747 In the diagram below of $\triangle GJK$, $H$ is a point on $\overline{GJ}$, $\overline{HJ} \cong \overline{JK}$, $m\angle G = 28$, and $m\angle GJK = 70$. Determine whether $\triangle GHK$ is an isosceles triangle and justify your answer.

748 The coordinates of trapezoid $ABCD$ are $A(-4,5)$, $B(1,5)$, $C(1,2)$, and $D(-6,2)$. Trapezoid $A''B''C''D''$ is the image after the composition $r_{x-axis} \circ r_{y=x}$ is performed on trapezoid $ABCD$. State the coordinates of trapezoid $A''B''C''D''$. [The use of the set of axes below is optional.]
749 Write an equation of the circle whose diameter \( AB \) has endpoints \( A(-4,2) \) and \( B(4,-4) \). [The use of the grid below is optional.]

750 Given: \( MT \) and \( HA \) intersect at \( B \), \( MA \parallel HT \), and \( MT \) bisects \( HA \).

Prove: \( MA \cong HT \)

751 Given: \( AD \) bisects \( BC \) at \( E \).

\[
\begin{align*}
AB & \perp BC \\
DC & \perp BC
\end{align*}
\]

Prove: \( AB \cong DC \)

752 Write an equation of the perpendicular bisector of the line segment whose endpoints are \((-1,1)\) and \((7,-5)\). [The use of the grid below is optional]
753 On the set of axes below, sketch the locus of points 2 units from the x-axis and sketch the locus of points 6 units from the point (0,4). Label with an X all points that satisfy both conditions.

754 In the diagram of \( \triangle BCD \) shown below, \( \overline{BA} \) is drawn from vertex \( B \) to point \( A \) on \( DC \), such that \( BC \cong BA \).

In \( \triangle DAB \), \( \angle D = x \), \( \angle DAB = 5x - 30 \), and \( \angle DBA = 3x - 60 \). In \( \triangle ABC \), \( AB = 6y - 8 \) and \( BC = 4y - 2 \). [Only algebraic solutions can receive full credit.] Find \( \angle D \). Find \( \angle BAC \). Find the length of \( BC \). Find the length of \( DC \).

755 In right triangle \( \overline{ABC} \) below, \( \overline{CD} \) is the altitude to hypotenuse \( \overline{AB} \). If \( CD = 6 \) and the ratio of \( AD \) to \( AB \) is 1:5, determine and state the length of \( BD \). [Only an algebraic solution can receive full credit.]

756 Triangle \( DEG \) has the coordinates \( D(1,1) \), \( E(5,1) \), and \( G(5,4) \). Triangle \( DEG \) is rotated 90° about the origin to form \( \triangle D'E'G' \). On the grid below, graph \( \triangle DEG \) and \( \triangle D'E'G' \). State the coordinates of the vertices \( D' \), \( E' \), and \( G' \). Justify that this transformation preserves distance.
757 On the set of axes below, graph and label circle \( A \) whose equation is \((x + 4)^2 + (y - 2)^2 = 16\) and circle \( B \) whose equation is \(x^2 + y^2 = 9\). Determine, in simplest radical form, the length of the line segment with endpoints at the centers of circles \( A \) and \( B \).

758 In the diagram below, \( \triangle ABC \sim \triangle DEF \), \( DE = 4 \), \( AB = x \), \( AC = x + 2 \), and \( DF = x + 6 \). Determine the length of \( AB \). [Only an algebraic solution can receive full credit.]

759 In the diagram below of quadrilateral \( ABCD \) with diagonal \( BD \), \( m\angle A = 93 \), \( m\angle ADB = 43 \), \( m\angle C = 3x + 5 \), \( m\angle BDC = x + 19 \), and \( m\angle DBC = 2x + 6 \). Determine if \( AB \) is parallel to \( DC \). Explain your reasoning.

760 Point \( P \) is 5 units from line \( j \). Sketch the locus of points that are 3 units from line \( j \) and also sketch the locus of points that are 8 units from \( P \). Label with an \( \times \) all points that satisfy both conditions.
761 The vertices of $\triangle RST$ are $R(-6,5), S(-7,-2)$, and $T(1,4)$. The image of $\triangle RST$ after the composition $T_{-2,3} \circ R_{y=x}$ is $\triangle R'S'T''$. State the coordinates of $\triangle R'S'T''$. [The use of the set of axes below is optional.]

762 In the diagram below, $\triangle RST$ is a $3-4-5$ right triangle. The altitude, $h$, to the hypotenuse has been drawn. Determine the length of $h$.

763 In the diagram below, circles $X$ and $Y$ have two tangents drawn to them from external point $T$. The points of tangency are $C, A, S,$ and $E$. The ratio of $TA$ to $AC$ is $1:3$. If $TS = 24$, find the length of $SE$.

764 On the set of axes below, solve the following system of equations graphically and state the coordinates of all points in the solution.

\[
(x + 3)^2 + (y - 2)^2 = 25
\]

\[
2y + 4 = -x
\]
765 Triangle $HKL$ has vertices $H(-7,2)$, $K(3,-4)$, and $L(5,4)$. The midpoint of $HL$ is $M$ and the midpoint of $LK$ is $N$. Determine and state the coordinates of points $M$ and $N$. Justify the statement: $MN$ is parallel to $HK$. [The use of the set of axes below is optional.]

767 Triangle $ABC$ has coordinates $A(-6,2)$, $B(-3,6)$, and $C(5,0)$. Find the perimeter of the triangle. Express your answer in simplest radical form. [The use of the grid below is optional.]

Given: $\triangle ABC$, $BD$ bisects $\angle ABC$, $BD \perp AC$
Prove: $AB \cong CB$
Quadrilateral $MATH$ has coordinates $M(-6,-3)$, $A(-1,-3)$, $T(-2,-1)$, and $H(-4,-1)$. The image of quadrilateral $MATH$ after the composition $r_{y-axis} \circ T_{7,5}$ is quadrilateral $M''A''T''H''$. State and label the coordinates of $M''A''T''H''$. [The use of the set of axes below is optional.]

The coordinates of the vertices of parallelogram $SWAN$ are $S(2,-2)$, $W(-2,-4)$, $A(-4,6)$, and $N(0,8)$. State and label the coordinates of parallelogram $S''W''A''N''$, the image of $SWAN$ after the transformation $T_{4,-2} \circ D_{\frac{1}{2}}$. [The use of the set of axes below is optional.]
770 In the diagram below of circle $O$, chords $RT$ and $QS$ intersect at $M$. Secant $PTR$ and tangent $PS$ are drawn to circle $O$. The length of $RM$ is two more than the length of $TM$, $QM = 2$, $SM = 12$, and $PT = 8$.

Find the length of $RT$. Find the length of $PS$.

771 Triangle $ABC$ has vertices $A(5,1), B(1,4)$ and $C(1,1)$. State and label the coordinates of the vertices of $\triangle A''B''C''$, the image of $\triangle ABC$, following the composite transformation $T_{-1} \circ D_2$.

[The use of the set of axes below is optional.]
772 Solve the following system of equations graphically. State the coordinates of all points in the solution.

\[ \begin{align*}
  y + 4x &= x^2 + 5 \\
  x + y &= 5
\end{align*} \]

773 Quadrilateral \( HYPE \) has vertices \( H(2,3) \), \( Y(1,7) \), \( P(-2,7) \), and \( E(-2,4) \). State and label the coordinates of the vertices of \( H''Y''P''E'' \) after the composition of transformations \( r_{x-axis} \circ T_{5,-3} \). [The use of the set of axes below is optional.]
The coordinates of the vertices of \( \triangle ABC \) \( A(1,3), B(-2,2) \) and \( C(0,-2) \). On the grid below, graph and label \( \triangle A''B''C'' \), the result of the composite transformation \( D_2 \circ T_{3,-2} \). State the coordinates of \( A'', B'', \) and \( C'' \).

The coordinates of the vertices of parallelogram \( ABCD \) are \( A(-2,2), B(3,5), C(4,2), \) and \( D(-1,-1) \). State the coordinates of the vertices of parallelogram \( A''B''C''D'' \) that result from the transformation \( r_{y\text{-axis}} \circ T_{3,-2} \). [The use of the set of axes below is optional.]

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774 The coordinates of the vertices of \( \triangle ABC \) \( A(1,3), B(-2,2) \) and \( C(0,-2) \). On the grid below, graph and label \( \triangle A''B''C'' \), the result of the composite transformation \( D_2 \circ T_{3,-2} \). State the coordinates of \( A'', B'', \) and \( C'' \).

775 The coordinates of the vertices of parallelogram \( ABCD \) are \( A(-2,2), B(3,5), C(4,2), \) and \( D(-1,-1) \). State the coordinates of the vertices of parallelogram \( A''B''C''D'' \) that result from the transformation \( r_{y\text{-axis}} \circ T_{3,-2} \). [The use of the set of axes below is optional.]

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149
776 On the set of coordinate axes below, graph the locus of points that are equidistant from the lines $y = 6$ and $y = 2$ and also graph the locus of points that are 3 units from the $y$-axis. State the coordinates of all points that satisfy both conditions.

777 On the set of axes below, graph two horizontal lines whose $y$-intercepts are $(0, -2)$ and $(0, 6)$, respectively. Graph the locus of points equidistant from these horizontal lines. Graph the locus of points 3 units from the $y$-axis. State the coordinates of the points that satisfy both loci.
78. Chords \( AB \) and \( CD \) intersect at \( E \) in circle \( O \), as shown in the diagram below. Secant \( FDA \) and tangent \( FB \) are drawn to circle \( O \) from external point \( F \) and chord \( AC \) is drawn. The \( m\overarc{DA} = 56 \), \( m\overarc{DB} = 112 \), and the ratio of \( m\overarc{AC} : m\overarc{CB} = 3:1 \).

Determine \( m\angle CEB \). Determine \( m\angle F \). Determine \( m\angle DAC \).

79. Given: Quadrilateral \( ABCD \), diagonal \( AFEC \), \( AE \cong FC \), \( BF \perp AC \), \( DE \perp AC \), \( \angle 1 \cong \angle 2 \)
Prove: \( ABCD \) is a parallelogram.

80. The diagram below shows rectangle \( ABCD \) with points \( E \) and \( F \) on side \( AB \). Segments \( CE \) and \( DF \) intersect at \( G \), and \( \angle ADG \cong \angle BCG \). Prove: \( \overline{AE} \cong \overline{BF} \)

81. On the set of axes below, solve the system of equations graphically and state the coordinates of all points in the solution.

\[
y = (x - 2)^2 - 3
\]
\[
2y + 16 = 4x
\]
82 On the set of axes below, graph the locus of points 5 units from the point \((3, -2)\). On the same set of axes, graph the locus of points equidistant from the points \((0, -6)\) and \((2, -4)\). State the coordinates of all points that satisfy both conditions.

84 Given: Quadrilateral \(ABCD\) has vertices \(A(-5, 6)\), \(B(6, 6)\), \(C(8, -3)\), and \(D(-3, -3)\).
Prove: Quadrilateral \(ABCD\) is a parallelogram but is neither a rhombus nor a rectangle. [The use of the grid below is optional.]

85 In the diagram below, \(PA\) and \(PB\) are tangent to circle \(O\), \(OA\) and \(OB\) are radii, and \(OP\) intersects the circle at \(C\). Prove: \(\angle AOP \cong \angle BOP\)
86 In the diagram of circle $O$ below, diameter $\overline{RS}$, chord $\overline{AS}$, tangent $\overline{TS}$, and secant $\overline{TAR}$ are drawn.

Complete the following proof to show $(RS)^2 = RA \cdot RT$

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<td>1. circle $O$, diameter $\overline{RS}$, chord $\overline{AS}$, tangent $\overline{TS}$, and secant $\overline{TAR}$</td>
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<td>2. $\overline{RS} \perp \overline{TS}$</td>
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<td>3. $\angle RST$ is a right angle</td>
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<tr>
<td>4. $\angle RAS$ is a right angle</td>
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<td>5. $\angle RST \cong \angle RAS$</td>
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<td>6. $\angle R \cong \angle R$</td>
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<tr>
<td>7. $\triangle RST \cong \triangle RAS$</td>
<td></td>
</tr>
<tr>
<td>8. $\frac{\overline{RS}}{\overline{RA}} = \frac{\overline{RT}}{\overline{RS}}$</td>
<td></td>
</tr>
<tr>
<td>9. $(RS)^2 = RA \cdot RT$</td>
<td></td>
</tr>
</tbody>
</table>

87 Given: Parallelogram $DEFG$, $K$ and $H$ are points on $\overline{DE}$ such that $\angle DGK \cong \angle EFH$ and $\overline{GK}$ and $\overline{FH}$ are drawn.

Prove: $\overline{DK} \cong \overline{EH}$

88 Given: $\triangle ABC$ with vertices $A(-6,-2)$, $B(2,8)$, and $C(6,-2)$. $\overline{AB}$ has midpoint $D$, $\overline{BC}$ has midpoint $E$, and $\overline{AC}$ has midpoint $F$.

Prove: $ADEF$ is a parallelogram

$ADEF$ is not a rhombus

[The use of the grid is optional.]
89 The vertices of quadrilateral $JKLM$ have coordinates $J(-3,1), K(1, -5), L(7, -2),$ and $M(3, 4)$. Prove that $JKLM$ is a parallelogram. Prove that $JKLM$ is not a rhombus. [The use of the set of axes below is optional.]

90 In the diagram below, right triangle $RSU$ is inscribed in circle $O$, and $UT$ is the altitude drawn to hypotenuse $RS$. The length of $RT$ is 16 more than the length of $TS$ and $TU = 15$. Find the length of $TS$. Find, in simplest radical form, the length of $RU$.

91 In the diagram below, quadrilateral $ABCD$ is inscribed in circle $O$, $AB \parallel DC$, and diagonals $AC$ and $BD$ are drawn. Prove that $\triangle ACD \cong \triangle BDC$.

92 In the diagram of $\triangle MAH$ below, $MH \cong AH$ and medians $AB$ and $MT$ are drawn. Prove: $\angle MBA \cong \angle ATM$. 

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154
93 In the diagram below, quadrilateral $STAR$ is a rhombus with diagonals $SA$ and $TR$ intersecting at $E$. $ST = 3x + 30$, $SR = 8x - 5$, $SE = 3z$, $TE = 5z + 5$, $AE = 4z - 8$, $m\angle RTA = 5y - 2$, and $m\angle TAS = 9y + 8$. Find $SR$, $RT$, and $m\angle TAS$.

94 On the set of axes below, solve the following system of equations graphically for all values of $x$ and $y$.

$$y = (x - 2)^2 + 4$$
$$4x + 2y = 14$$

95 Quadrilateral $ABCD$ with vertices $A(-7,4)$, $B(-3,6), C(3,0)$, and $D(1,-8)$ is graphed on the set of axes below. Quadrilateral $MNPQ$ is formed by joining $M, N, P, Q$, the midpoints of $AB$, $BC$, $CD$, and $AD$, respectively. Prove that quadrilateral $MNPQ$ is a parallelogram. Prove that quadrilateral $MNPQ$ is not a rhombus.

96 The diagram below shows square $ABCD$ where $E$ and $F$ are points on $BC$ such that $BE \cong FC$, and segments $AF$ and $DE$ are drawn. Prove that $AF \cong DE$. 
97 Quadrilateral $MATH$ has coordinates $M(1,1)$, $A(-2,5)$, $T(3,5)$, and $H(6,1)$. Prove that quadrilateral $MATH$ is a rhombus and prove that it is not a square. [The use of the grid is optional.]

98 In the diagram below of quadrilateral $ABCD$, $AD \cong BC$ and $\angle DAE \cong \angle BCE$. Line segments $AC$, $DB$, and $FG$ intersect at $E$. Prove: $\triangle AEF \cong \triangle CEG$
### Geometry Multiple Choice Regents Exam Questions

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**Diagram:**

![Diagram of a circle with tangents](image)
10 ANS: 1

PTS: 2 REF: 011516ge STA: G.G.21 TOP: Centroid, Orthocenter, Incenter and Circumcenter

11 ANS: 2

\[ V = \frac{4}{3} \pi r^3 = \frac{4}{3} \pi \left( \frac{15}{2} \right)^3 \approx 1767.1 \]

PTS: 2 REF: 061207ge STA: G.G.16 TOP: Volume and Surface Area

12 ANS: 3

\(-5 + 3 = -2 \quad 2 + -4 = -2\)

PTS: 2 REF: 011107ge STA: G.G.54 TOP: Translations


14 ANS: 3

\[ \frac{5}{7} = \frac{10}{x} \]

\[ 5x = 70 \]

\[ x = 14 \]

PTS: 2 REF: 081103ge STA: G.G.46 TOP: Side Splitter Theorem


16 ANS: 1

\[ 1 = \frac{-4 + x}{2}, \quad 5 = \frac{3 + y}{2}. \]

\[ -4 + x = 2 \quad 3 + y = 10 \]

\[ x = 6 \quad y = 7 \]

PTS: 2 REF: 081115ge STA: G.G.66 TOP: Midpoint

17 ANS: 1 PTS: 2 REF: 081524ge STA: G.G.34 TOP: Angle Side Relationship
18 ANS: 1
The length of the midsegment of a trapezoid is the average of the lengths of its bases. \( \frac{x + 3 + 5x - 9}{2} = 2x + 2 \).
\[ 6x - 6 = 4x + 4 \]
\[ 2x = 10 \]
\[ x = 5 \]

PTS: 2 REF: 081221ge STA: G.G.40 TOP: Trapezoids

19 ANS: 1
\[ 3x + 5 + 4x - 15 + 2x + 10 = 180. \]
\[ m\angle D = 3(20) + 5 = 65. \]
\[ m\angle E = 4(20) - 15 = 65. \]
\[ 9x = 180 \]
\[ x = 20 \]

PTS: 2 REF: 061119ge STA: G.G.30 TOP: Interior and Exterior Angles of Triangles

20 ANS: 1
\[ \frac{40 - 24}{2} = 8. \]
\[ \sqrt{10^2 - 8^2} = 6. \]

PTS: 2 REF: 061204ge STA: G.G.40 TOP: Trapezoids

21 ANS: 2
\[ 3x + x + 20 + x + 20 = 180 \]
\[ 5x = 40 \]
\[ x = 28 \]

PTS: 2 REF: 081222ge STA: G.G.31 TOP: Isosceles Triangle Theorem

22 ANS: 3 PTS: 2 REF: 061220ge STA: G.G.74 TOP: Graphing Circles


24 ANS: 2 PTS: 2 REF: 061121ge STA: G.G.22 TOP: Locus


26 ANS: 3 PTS: 2 REF: 061228ge STA: G.G.39 TOP: Special Parallelograms

27 ANS: 4
\[ \sqrt{6^2 - 2^2} = \sqrt{32} = \sqrt{16\sqrt{2}} = 4\sqrt{2} \]

PTS: 2 REF: 081124ge STA: G.G.49 TOP: Chords

29  ANS: 4
4(x + 4) = 8^2
4x + 16 = 64
4x = 48
x = 12

PTS: 2  REF: 061117ge  STA: G.G.53  TOP: Segments Intercepted by Circle
KEY: tangent and secant

30  ANS: 4
x \cdot 4x = 6^2. PQ = 4x + x = 5x = 5(3) = 15
4x^2 = 36
x = 3

PTS: 2  REF: 011227ge  STA: G.G.47  TOP: Similarity
KEY: altitude

31  ANS: 3

PTS: 2  REF: 081118ge  STA: G.G.70  TOP: Quadratic-Linear Systems

32  ANS: 4
PTS: 2  REF: 081206ge  STA: G.G.30
TOP: Interior and Exterior Angles of Triangles

33  ANS: 3
PTS: 2  REF: 061224ge  STA: G.G.45
TOP: Similarity  KEY: basic

34  ANS: 4
d = \sqrt{(-5 - 3)^2 + (4 - (-6))^2} = \sqrt{64 + 100} = \sqrt{164} = \sqrt{4 \cdot 41} = 2\sqrt{41}

PTS: 2  REF: 011121ge  STA: G.G.67  TOP: Distance
KEY: general

35  ANS: 2
m = \frac{-A}{B} = \frac{-20}{-2} = 10. m_\perp = \frac{1}{10}

PTS: 2  REF: 061219ge  STA: G.G.62  TOP: Parallel and Perpendicular Lines

36  ANS: 3
PTS: 2  REF: 081123ge  STA: G.G.12
TOP: Volume

37  ANS: 4
PTS: 2  REF: 011216ge  STA: G.G.29
TOP: Triangle Congruency

38  ANS: 2
PTS: 2  REF: 081527ge  STA: G.G.33
TOP: Triangle Inequality Theorem
39 ANS: 4 PTS: 2 REF: 061124ge STA: G.G.31
TOP: Isosceles Triangle Theorem

40 ANS: 3
\[ y = mx + b \]
\[ -1 = 2(2) + b \]
\[ -5 = b \]

PTS: 2 REF: 011224ge STA: G.G.65 TOP: Parallel and Perpendicular Lines

41 ANS: 3 PTS: 2 REF: 011104ge STA: G.G.38
TOP: Parallelograms

42 ANS: 3 PTS: 2 REF: 061522ge STA: G.G.1
TOP: Planes

43 ANS: 3
The slope of \( 2y = x + 2 \) is \( \frac{1}{2} \), which is the opposite reciprocal of \(-2\). \( 3 = -2(4) + b \)
\[ 11 = b \]

PTS: 2 REF: 081228ge STA: G.G.64 TOP: Parallel and Perpendicular Lines

44 ANS: 2 PTS: 2 REF: 061126ge STA: G.G.59
TOP: Properties of Transformations

45 ANS: 3
\[ 4x + 14 + 8x + 10 = 180 \]
\[ 12x = 156 \]
\[ x = 13 \]

PTS: 2 REF: 081213ge STA: G.G.35 TOP: Parallel Lines and Transversals

46 ANS: 1

47 ANS: 2 PTS: 2 REF: 081214ge STA: G.G.50
TOP: Tangents KEY: point of tangency

48 ANS: 1
The diagonals of a parallelogram intersect at their midpoints. \( M_{dc} \left( \frac{1+3}{2}, \frac{5+(-1)}{2} \right) = (2,2) \)

PTS: 2 REF: 061209ge STA: G.G.69 TOP: Quadrilaterals in the Coordinate Plane

49 ANS: 3 PTS: 2 REF: 081204ge STA: G.G.59
TOP: Properties of Transformations
20 + 8 + 10 + 6 = 44.

PTS: 2  REF: 061211ge  STA: G.G.42  TOP: Midsegments
51 ANS: 3  PTS: 2  REF: 011209ge  STA: G.G.44  TOP: Similarity Proofs
52 ANS: 4

PTS: 2  REF: 081114ge  STA: G.G.28  TOP: Triangle Congruency
53 ANS: 1  PTS: 2  REF: 061104ge  STA: G.G.43  TOP: Centroid
54 ANS: 3

PTS: 2  REF: 011112ge  STA: G.G.49  TOP: Chords
55 ANS: 2  PTS: 2  REF: 081102ge  STA: G.G.29  TOP: Triangle Congruency
57 ANS: 3  PTS: 2  REF: 081128ge  STA: G.G.39  TOP: Special Parallelograms
58 ANS: 4  PTS: 2  REF: 061213ge  STA: G.G.5  TOP: Planes
59 ANS: 1
\[ m = \left( \frac{8+0}{2}, \frac{2+6}{2} \right) = (4,4) \]
\[ m = \frac{6-2}{0-8} = \frac{4}{-8} = -\frac{1}{2} \]
\[ m_{\perp} = 2 \quad \text{and} \quad y = mx + b \]
\[ 4 = 2(4) + b \]
\[ -4 = b \]

PTS: 2 \quad REF: 081126ge \quad STA: G.G.68 \quad TOP: Perpendicular Bisector

60 ANS: 3
\[ x + 2x + 15 = 5x + 15 \quad 2(5) + 15 = 25 \]
\[ 3x + 15 = 5x + 5 \]
\[ 10 = 2x \]
\[ 5 = x \]

PTS: 2 \quad REF: 011127ge \quad STA: G.G.32 \quad TOP: Exterior Angle Theorem

61 ANS: 4 \quad PTS: 2 \quad REF: 011118ge \quad STA: G.G.25 \quad TOP: Compound Statements

62 ANS: 4 \quad PTS: 2 \quad REF: 081110ge \quad STA: G.G.71 \quad TOP: Equations of Circles

63 ANS: 2 \quad PTS: 2 \quad REF: 081515ge \quad STA: G.G.55 \quad TOP: Properties of Transformations

64 ANS: 1 \quad PTS: 2 \quad REF: 011112ge \quad STA: G.G.39 \quad TOP: Special Parallelograms

65 ANS: 4
The slope of \( 3x + 5y = 4 \) is \[ m = \frac{-A}{B} = \frac{-3}{5} \]
\[ m_{\perp} = \frac{5}{3} \]

PTS: 2 \quad REF: 061127ge \quad STA: G.G.62 \quad TOP: Parallel and Perpendicular Lines

66 ANS: 2
\[ 7x = 5x + 30 \]
\[ 2x = 30 \]
\[ x = 15 \]

PTS: 2 \quad REF: 061106ge \quad STA: G.G.35 \quad TOP: Parallel Lines and Transversals

67 ANS: 2 \quad PTS: 2 \quad REF: 061516ge \quad STA: G.G.52 \quad TOP: Chords and Secants

68 ANS: 2
\[ \frac{50+x}{2} = 34 \]
\[ 50 + x = 68 \]
\[ x = 18 \]

PTS: 2 \quad REF: 011214ge \quad STA: G.G.51 \quad TOP: Arcs Determined by Angles

KEY: inside circle
74 ANS: 1
\[ 7x + 4 = 2(2x + 5) \]
\[ PM = 2(2) + 5 = 9 \]
\[ 7x + 4 = 4x + 10 \]
\[ 3x = 6 \]
\[ x = 2 \]

PTS: 2 REF: 011226ge STA: G.G.43 TOP: Centroid

75 ANS: 1

PTS: 2 REF: 081508ge STA: G.G.10 TOP: Solids

76 ANS: 1

PTS: 2 REF: 011526ge STA: G.G.10 TOP: Solids

77 ANS: 3

PTS: 2 REF: 011110ge STA: G.G.21 KEY: Centroid, Orthocenter, Incenter and Circumcenter

78 ANS: 3

\[ 180(n - 2) = n \left( 180 - \frac{180(n - 2)}{n} \right) \]
\[ 180n - 360 = 180n - 180n + 360 \]
\[ 180n = 720 \]
\[ n = 4 \]

PTS: 2 REF: 081223ge STA: G.G.36 TOP: Interior and Exterior Angles of Polygons

79 ANS: 4

\[ AB \] is a vertical line, so its perpendicular bisector is a horizontal line through the midpoint of \( AB \), which is (0,3).

PTS: 2 REF: 011225ge STA: G.G.68 TOP: Perpendicular Bisector
80 ANS: 3

Diagonals of rectangles and trapezoids do not bisect opposite angles. \( m\angle DAB = 90 \) if \( ABCD \) is a square.

PTS: 2 REF: 061511ge STA: G.G.39 TOP: Special Parallelograms

81 ANS: 2 PTS: 2 REF: 061101ge STA: G.G.18 TOP: Constructions

82 ANS: 2

\[
V = \frac{4}{3} \pi r^3 = \frac{4}{3} \pi \left( \frac{6}{2} \right)^3 \approx 36\pi
\]

PTS: 2 REF: 081215ge STA: G.G.16 TOP: Volume and Surface Area

83 ANS: 4

The centroid divides each median into segments whose lengths are in the ratio 2:1.

PTS: 2 REF: 081220ge STA: G.G.43 TOP: Centroid

84 ANS: 2 PTS: 2 REF: 011109ge STA: G.G.9 TOP: Planes

85 ANS: 2

\[
M_x = \frac{7 + (-3)}{2} = 2, \quad M_y = \frac{-1 + 3}{2} = 1.
\]

PTS: 2 REF: 011106ge STA: G.G.66 TOP: Midpoint

86 ANS: 3 PTS: 2 REF: 061210ge STA: G.G.71 TOP: Equations of Circles

87 ANS: 4

\[ x + 6y = 12 \]
\[ 3(x - 2) = -y - 4 \]
\[ 6y = -x + 12 \]
\[ -3(x - 2) = y + 4 \]
\[ y = \frac{1}{6}x + 2 \]
\[ m = -3 \]
\[ m = \frac{1}{6} \]

PTS: 2 REF: 011119ge STA: G.G.63 TOP: Parallel and Perpendicular Lines

88 ANS: 1 PTS: 2 REF: 011122ge STA: G.G.28 TOP: Triangle Congruency

89 ANS: 3 PTS: 2 REF: 081512ge STA: G.G.19 TOP: Constructions

90 ANS: 2 PTS: 2 REF: 081108ge STA: G.G.54 TOP: Reflections KEY: basic


92 ANS: 3 PTS: 2 REF: 081507ge STA: G.G.46 TOP: Side Splitter Theorem
93 ANS: 4

\[ m_\perp = -\frac{1}{3}, \quad y = mx + b \]

\[ 6 = -\frac{1}{3}(-9) + b \]

\[ 6 = 3 + b \]

\[ 3 = b \]

PTS: 2  REF: 061215ge  STA: G.G.64  TOP: Parallel and Perpendicular Lines

94 ANS: 1

\( AB = CD \)

\( AB + BC = CD + BC \)

\( AC = BD \)

PTS: 2  REF: 081207ge  STA: G.G.27  TOP: Triangle Proofs

95 ANS: 4  PTS: 2  REF: 081106ge  STA: G.G.17

TOP: Constructions

96 ANS: 1  PTS: 2  REF: 011128ge  STA: G.G.2

TOP: Planes

97 ANS: 1  PTS: 2  REF: 061113ge  STA: G.G.63

TOP: Parallel and Perpendicular Lines

98 ANS: 1

\[
\begin{align*}
A & \quad \text{C} \\
B & \quad \text{D} \\
\end{align*}
\]

PTS: 2  REF: 081210ge  STA: G.G.28  TOP: Triangle Congruency

99 ANS: 4  PTS: 2  REF: 011108ge  STA: G.G.27

TOP: Angle Proofs

100 ANS: 4

\( y = mx + b \)

\[ 3 = \frac{3}{2}(-2) + b \]

\[ 3 = -3 + b \]

\[ 6 = b \]

PTS: 2  REF: 011114ge  STA: G.G.65  TOP: Parallel and Perpendicular Lines

101 ANS: 1  PTS: 2  REF: 081113ge  STA: G.G.54

TOP: Reflections  KEY: basic
102 ANS: 4 PTS: 2 REF: 081216ge STA: G.G.45
TOP: Similarity KEY: basic
103 ANS: 1 PTS: 2 REF: 081517ge STA: G.G.41
TOP: Special Quadrilaterals
104 ANS: 3
\[ d = \sqrt{(1 - 9)^2 + (-4 - 2)^2} = \sqrt{64 + 36} = \sqrt{100} = 10 \]
PTS: 2 REF: 081107ge STA: G.G.67 TOP: Distance KEY: general
105 ANS: 3
As originally administered, this question read, “Which fact is not sufficient to show that planes \( R \) and \( S \) are perpendicular?” The State Education Department stated that since a correct solution was not provided for Question 11, all students shall be awarded credit for this question.

PTS: 2 REF: 081211ge STA: G.G.5 TOP: Planes
106 ANS: 2 PTS: 2 REF: 011125ge STA: G.G.74
TOP: Graphing Circles
107 ANS: 4
\[ 6^2 = x(x + 5) \]
\[ 36 = x^2 + 5x \]
\[ 0 = x^2 + 5x - 36 \]
\[ 0 = (x + 9)(x - 4) \]
\[ x = 4 \]
PTS: 2 REF: 011123ge STA: G.G.47 TOP: Similarity KEY: leg
108 ANS: 3 PTS: 2 REF: 011105ge STA: G.G.10
TOP: Solids
109 ANS: 1 PTS: 2 REF: 061108ge STA: G.G.9
TOP: Planes
110 ANS: 1
Parallel lines intercept congruent arcs.

PTS: 2 REF: 061105ge STA: G.G.52 TOP: Chords and Secants
111 ANS: 1
\[ d = \sqrt{(4 - 1)^2 + (7 - 11)^2} = \sqrt{9 + 16} = \sqrt{25} = 5 \]
PTS: 2 REF: 011205ge STA: G.G.67 TOP: Distance KEY: general
112 ANS: 1 PTS: 2 REF: 011207ge STA: G.G.20
TOP: Constructions
113 ANS: 4
\[ \sqrt{25^2 - 7^2} = 24 \]

PTS: 2  REF: 081105ge  STA: G.G.50  TOP: Tangents
KEY: point of tangency

114 ANS: 3  PTS: 2  REF: 061122ge  STA: G.G.56
TOP: Identifying Transformations

115 ANS: 4
\[-5 = \frac{-3 + x}{2}, \quad \frac{2}{6} + \frac{y}{2} \]
\[-10 = -3 + x \quad 4 = 6 + y \]
\[-7 = x \quad -2 = y \]

PTS: 2  REF: 081203ge  STA: G.G.66  TOP: Midpoint

116 ANS: 4
Parallel lines intercept congruent arcs.

PTS: 2  REF: 081201ge  STA: G.G.52  TOP: Chords and Secants

117 ANS: 1
\[10 - 4 < s < 10 + 4\]
\[6 < s < 14\]

PTS: 2  REF: 011519ge  STA: G.G.33  TOP: Triangle Inequality Theorem

118 ANS: 4  PTS: 2  REF: 011212ge  STA: G.G.71
TOP: Equations of Circles

119 ANS: 4
\[x^2 - 6x + 2x - 3 = 9x + 27\]
\[x^2 - 4x - 3 = 9x + 27\]
\[x^2 - 13x - 30 = 0\]
\[(x - 15)(x + 2) = 0\]
\[x = 15, -2\]

PTS: 2  REF: 061225ge  STA: G.G.32  TOP: Exterior Angle Theorem

120 ANS: 4  PTS: 2  REF: 081101ge  STA: G.G.25
TOP: Compound Statements  KEY: conjunction

121 ANS: 1  PTS: 2  REF: 081116ge  STA: G.G.7
TOP: Planes

122 ANS: 4  PTS: 2  REF: 081501ge  STA: G.G.29
TOP: Triangle Congruency
123 ANS: 4
\[ k: m = \frac{2}{3} \quad m: m = -\frac{A}{B} = -\frac{2}{3} \quad n: m = \frac{3}{2} \]

PTS: 2 \quad REF: 061518ge \quad STA: G.G.63 \quad TOP: Parallel and Perpendicular Lines

124 ANS: 2 \quad PTS: 2 \quad REF: 061201ge \quad STA: G.G.59
TOP: Properties of Transformations

125 ANS: 2
\[ 6x + 42 = 18x - 12 \]
\[ 54 = 12x \]
\[ x = \frac{54}{12} = 4.5 \]

PTS: 2 \quad REF: 011201ge \quad STA: G.G.35 \quad TOP: Parallel Lines and Transversals

126 ANS: 3
\[ d = \sqrt{(-1 - 4)^2 + (0 - (-3))^2} = \sqrt{25 + 9} = \sqrt{34} \]

PTS: 2 \quad REF: 061217ge \quad STA: G.G.67 \quad TOP: Distance
KEY: general

127 ANS: 3
\[ \sqrt{5^2 + 12^2} = 13 \]

PTS: 2 \quad REF: 061116ge \quad STA: G.G.39 \quad TOP: Special Parallelograms

128 ANS: 4 \quad PTS: 2 \quad REF: 061118ge \quad STA: G.G.1
TOP: Planes

129 ANS: 4 \quad PTS: 2 \quad REF: 011124ge \quad STA: G.G.51
TOP: Arcs Determined by Angles \quad KEY: inscribed

130 ANS: 2
\[ 5 - 3 = 2, 5 + 3 = 8 \]

PTS: 2 \quad REF: 011228ge \quad STA: G.G.33 \quad TOP: Triangle Inequality Theorem

131 ANS: 3 \quad PTS: 2 \quad REF: 081104ge \quad STA: G.G.55
TOP: Properties of Transformations

132 ANS: 2 \quad PTS: 2 \quad REF: 081205ge \quad STA: G.G.17
TOP: Constructions

133 ANS: 2
\[ AC = BD \]
\[ AC - BC = BD - BC \]
\[ AB = CD \]

PTS: 2 \quad REF: 061206ge \quad STA: G.G.27 \quad TOP: Line Proofs

134 ANS: 1 \quad PTS: 2 \quad REF: 011218ge \quad STA: G.G.3
TOP: Planes
135 ANS: 2 PTS: 2 REF: 011510ge STA: G.G.34
TOP: Angle Side Relationship

136 ANS: 2 PTS: 2 REF: 081226ge STA: G.G.69
TOP: Triangles in the Coordinate Plane

137 ANS: 2
\[ V = \pi r^2 h = \pi \cdot 6^2 \cdot 15 = 540\pi \]
PTS: 2 REF: 011117ge STA: G.G.14 TOP: Volume and Lateral Area

138 ANS: 2 PTS: 2 REF: 061115ge STA: G.G.69
TOP: Triangles in the Coordinate Plane

139 ANS: 1
\[ x^2 = 7(16 - 7) \]
\[ x^2 = 63 \]
\[ x = \sqrt{9} \sqrt{7} \]
\[ x = 3\sqrt{7} \]
PTS: 2 REF: 061128ge STA: G.G.47 TOP: Similarity
KEY: altitude

140 ANS: 2
\[ \frac{4x + 10}{2} = 2x + 5 \]
PTS: 2 REF: 011103ge STA: G.G.42 TOP: Midsegments

141 ANS: 3 PTS: 2 REF: 061508ge STA: G.G.32
TOP: Exterior Angle Theorem

142 ANS: 1 PTS: 2 REF: 081121ge STA: G.G.39
TOP: Special Parallelograms

143 ANS: 3 PTS: 2 REF: 011217ge STA: G.G.64
TOP: Parallel and Perpendicular Lines

144 ANS: 2 PTS: 2 REF: 011203ge STA: G.G.73
TOP: Equations of Circles

145 ANS: 3
![Diagram of a parallelogram with opposite sides and diagonals labeled.]

Opposite sides of a parallelogram are congruent and the diagonals of a parallelogram bisect each other.

PTS: 2 REF: 061222ge STA: G.G.28 TOP: Triangle Congruency

146 ANS: 2 PTS: 2 REF: 081120ge STA: G.G.8
TOP: Planes
147 ANS: 3
\[
\frac{7x}{4} = \frac{7}{x} \cdot 7(2) = 14
\]
7x^2 = 28

\[
x = 2
\]

PTS: 2 REF: 061120ge STA: G.G.45 TOP: Similarity
KEY: basic

148 ANS: 3 PTS: 2 REF: 061501ge STA: G.G.61
TOP: Analytical Representations of Transformations

149 ANS: 2 PTS: 2 REF: 061227ge STA: G.G.56
TOP: Identifying Transformations

150 ANS: 1 PTS: 2 REF: 011221ge STA: G.G.10
TOP: Solids

151 ANS: 1 PTS: 2 REF: 061125ge STA: G.G.39
TOP: Special Parallelograms

152 ANS: 3

The slope of 9x - 3y = 27 is
\[
m = \frac{-A}{B} = \frac{-9}{-3} = 3
\]
which is the opposite reciprocal of \(-\frac{1}{3}\).


153 ANS: 3

\[
\frac{8}{2} = \frac{12}{x}
\]
8x = 24

\[
x = 3
\]

PTS: 2 REF: 061216ge STA: G.G.46 TOP: Side Splitter Theorem

154 ANS: 3 PTS: 2 REF: 011503ge STA: G.G.55
TOP: Properties of Transformations

155 ANS: 3 PTS: 2 REF: 011524ge STA: G.G.58
TOP: Dilations

156 ANS: 4

\[
m = \frac{-A}{B} = \frac{-4}{6} = \frac{2}{3}
\]

PTS: 2 REF: 011520ge STA: G.G.63 TOP: Parallel and Perpendicular Lines

157 ANS: 3 PTS: 2 REF: 061218ge STA: G.G.36
TOP: Interior and Exterior Angles of Polygons
\[ \sqrt{17^2 - 15^2} = 8. \ 17 - 8 = 9 \]

\[
\begin{align*}
\text{ANS: } & 2 \\
\text{PTS: } & 2 \\
\text{REF: } & 061221ge \\
\text{STA: } & G.G.49 \\
\text{TOP: } & \text{Chords}
\end{align*}
\]

\[
\begin{align*}
\frac{5}{2+3+5} \times 180 = 90
\end{align*}
\]

\[
\begin{align*}
\text{ANS: } & 4 \\
\text{PTS: } & 2 \\
\text{REF: } & 081119ge \\
\text{STA: } & G.G.30 \\
\text{TOP: } & \text{Interior and Exterior Angles of Triangles}
\end{align*}
\]

The slope of a line in standard form is \( \frac{-A}{B} \), so the slope of this line is \( \frac{-4}{3} \). A parallel line would also have a slope of \( \frac{-4}{3} \). Since the answers are in standard form, use the point-slope formula.

\[
\begin{align*}
2 - \frac{-4}{3} (x + 5) \\
3y - 6 = -4x - 20 \\
4x + 3y = -14
\end{align*}
\]

\[
\begin{align*}
\text{ANS: } & 2 \\
\text{PTS: } & 2 \\
\text{REF: } & 061123ge \\
\text{STA: } & G.G.65 \\
\text{TOP: } & \text{Parallel and Perpendicular Lines}
\end{align*}
\]

\[
\begin{align*}
(n - 2)180 = (6 - 2)180 = 720. \ \frac{720}{6} = 120.
\end{align*}
\]

\[
\begin{align*}
\text{ANS: } & 2 \\
\text{PTS: } & 2 \\
\text{REF: } & 081125ge \\
\text{STA: } & G.G.37 \\
\text{TOP: } & \text{Interior and Exterior Angles of Polygons}
\end{align*}
\]

\[
\begin{align*}
\text{ANS: } & 2 \\
\text{PTS: } & 2 \\
\text{REF: } & 011522ge \\
\text{STA: } & G.G.38 \\
\text{TOP: } & \text{Parallelograms}
\end{align*}
\]

\[
\begin{align*}
\text{ANS: } & 1 \\
\text{PTS: } & 2 \\
\text{REF: } & 061223ge \\
\text{STA: } & G.G.73 \\
\text{TOP: } & \text{Equations of Circles}
\end{align*}
\]

\[
\begin{align*}
d = \sqrt{(-1 - 7)^2 + (9 - 4)^2} = \sqrt{64 + 25} = \sqrt{89}
\end{align*}
\]

\[
\begin{align*}
\text{ANS: } & 2 \\
\text{PTS: } & 2 \\
\text{REF: } & 061109ge \\
\text{STA: } & G.G.67 \\
\text{TOP: } & \text{Distance}
\end{align*}
\]

\[
\text{KEY: general}
\]
169 ANS: 2  PTS: 2  REF: 081212ge  STA: G.G.72
TOP: Equations of Circles

170 ANS: 4
\[ m = -\frac{A}{B} = -\frac{3}{2} \]  \[ y = mx + b \]
\[ -1 = \left( -\frac{3}{2} \right)(2) + b \]
\[ -1 = -3 + b \]
\[ 2 = b \]

PTS: 2  REF: 061226ge  STA: G.G.65  TOP: Parallel and Perpendicular Lines

171 ANS: 3  PTS: 2  REF: 061111ge  STA: G.G.38
TOP: Parallelograms

172 ANS: 3  PTS: 2  REF: 081227ge  STA: G.G.42
TOP: Midsegments

173 ANS: 3
\[(u - 2)180 = (5 - 2)180 = 540\]

PTS: 2  REF: 011223ge  STA: G.G.36  TOP: Interior and Exterior Angles of Polygons

174 ANS: 3  PTS: 2  REF: 081208ge  STA: G.G.27
TOP: Quadrilateral Proofs

175 ANS: 3
\[(3, -2) \rightarrow (2, 3) \rightarrow (8, 12)\]

KEY: basic

176 ANS: 3
\[7x = 5x + 30\]
\[2x = 30\]
\[x = 15\]

PTS: 2  REF: 081109ge  STA: G.G.35  TOP: Parallel Lines and Transversals

177 ANS: 3  PTS: 2  REF: 081209ge  STA: G.G.71
TOP: Equations of Circles

178 ANS: 1  PTS: 2  REF: 061110ge  STA: G.G.72
TOP: Equations of Circles

179 ANS: 2
\[ m = -\frac{A}{B} = -\frac{4}{2} = -2 \]  \[ y = mx + b \]
\[ 2 = -2(2) + b \]
\[ 6 = b \]

PTS: 2  REF: 081112ge  STA: G.G.65  TOP: Parallel and Perpendicular Lines
180 \text{ ANS: } 3 \\
\begin{align*}
x^2 + 7^2 &= (x + 1)^2 \\
x + 1 &= 25 \\
6 &= x
\end{align*}

181 \text{ ANS: } 3 \text{ PTS: } 2 \text{ REF: } 081116ge \text{ STA: } G.G.48 \text{ TOP: Pythagorean Theorem}

182 \text{ ANS: } 1 \text{ PTS: } 2 \text{ REF: } 011111ge \text{ STA: } G.G.55 \text{ TOP: Properties of Transformations}

185 \text{ ANS: } 3 \text{ PTS: } 2 \text{ REF: } 061102ge \text{ STA: } G.G.29 \text{ TOP: Triangle Congruency}

186 \text{ ANS: } 3 \text{ PTS: } 2 \text{ REF: } 061112ge \text{ STA: } G.G.16 \text{ TOP: Volume and Surface Area}

180 \text{ ANS: } 3 \\
\begin{align*}
x^2 + 7^2 &= (x + 1)^2 \\
x + 1 &= 25 \\
6 &= x
\end{align*}

182 \text{ ANS: } 1 \text{ PTS: } 2 \text{ REF: } 011111ge \text{ STA: } G.G.55 \text{ TOP: Properties of Transformations}

185 \text{ ANS: } 3 \text{ PTS: } 2 \text{ REF: } 061102ge \text{ STA: } G.G.29 \text{ TOP: Triangle Congruency}

186 \text{ ANS: } 3 \text{ PTS: } 2 \text{ REF: } 061112ge \text{ STA: } G.G.16 \text{ TOP: Volume and Surface Area}

\begin{align*}
8^2 + 24^2 &\neq 25^2 \\
\text{PTS: } 2 \text{ REF: } 011111ge \text{ STA: } G.G.48 \text{ TOP: Pythagorean Theorem}
\end{align*}

187 \text{ ANS: } 4 \text{ PTS: } 2 \text{ REF: } 061503ge \text{ STA: } G.G.10 \text{ TOP: Solids}

188 \text{ ANS: } 2 \\
The diagonals of a rhombus are perpendicular. \( 180 - (90 + 12) = 78 \)

189 \text{ ANS: } 3 \text{ PTS: } 2 \text{ REF: } 081111ge \text{ STA: } G.G.32 \text{ TOP: Exterior Angle Theorem}

190 \text{ ANS: } 4 \\
\sqrt{25^2 - \left(\frac{26 - 12}{2}\right)^2} = 24

191 \text{ ANS: } 4 \text{ PTS: } 2 \text{ REF: } 061103ge \text{ STA: } G.G.60 \text{ TOP: Identifying Transformations}

192 \text{ ANS: } 2 \text{ PTS: } 2 \text{ REF: } 061512ge \text{ STA: } G.G.19 \text{ TOP: Construction}

193 \text{ ANS: } 2 \\
V = \frac{4}{3} \pi r^3 = \frac{4}{3} \pi \cdot 3^3 = 36\pi

\begin{align*}
\text{PTS: } 2 \text{ REF: } 061112ge \text{ STA: } G.G.16 \text{ TOP: Pythagorean Theorem}
\end{align*}
The slope of $x + 2y = 3$ is $m = \frac{-A}{B} = \frac{-1}{2}$. $m_\perp = 2$.

\[
\frac{180 - 70}{2} = 55
\]

\[
\text{PTS: 2} \quad \text{REF: 081122ge} \quad \text{STA: G.G.62} \quad \text{TOP: Parallel and Perpendicular Lines}
\]

\[
\text{PTS: 2} \quad \text{REF: 061205ge} \quad \text{STA: G.G.52} \quad \text{TOP: Chords and Secants}
\]

\[
\text{PTS: 2} \quad \text{REF: 011514ge} \quad \text{STA: G.G.72} \quad \text{TOP: Equations of Circles}
\]

\[
\text{PTS: 2} \quad \text{REF: 011504ge} \quad \text{STA: G.G.30} \quad \text{TOP: Interior and Exterior Angles of Triangles}
\]
Geometry Multiple Choice Regents Exam Questions
Answer Section

200 ANS: 2
\[ 2^2 + 3^2 \neq 4^2 \]

PTS: 2    REF: 011316ge    STA: G.G.48    TOP: Pythagorean Theorem

201 ANS: 4    PTS: 2    REF: 011426ge    STA: G.G.73
TOP: Equations of Circles

202 ANS: 3    PTS: 2    REF: 011304ge    STA: G.G.61
TOP: Analytical Representations of Transformations

203 ANS: 3
Both pairs of opposite sides are parallel, so not a trapezoid. None of the angles are right angles, so not a rectangle or square. All sides are congruent, so a rhombus.

PTS: 2    REF: 081411ge    STA: G.G.69    TOP: Quadrilaterals in the Coordinate Plane

204 ANS: 4    PTS: 2    REF: 061410ge    STA: G.G.29
TOP: Triangle Congruency

205 ANS: 1    PTS: 2    REF: 061325ge    STA: G.G.74
TOP: Graphing Circles

206 ANS: 3
\[ 25 \times 9 \times 12 = 15^2h \]
\[ 2700 = 15^2h \]
\[ 12 = h \]

PTS: 2    REF: 061323ge    STA: G.G.11    TOP: Volume

207 ANS: 1    PTS: 2    REF: 081514ge    STA: G.G.2
TOP: Planes

208 ANS: 1    PTS: 2    REF: 081421ge    STA: G.G.25
TOP: Compound Statements

209 ANS: 3
\[ \frac{12}{8} = \frac{21}{x} \quad 21 + 14 = 35 \]
\[ 12x = 168 \]
\[ x = 14 \]

PTS: 2    REF: 061426ge    STA: G.G.46    TOP: Side Splitter Theorem

210 ANS: 3    PTS: 2    REF: 081320ge    STA: G.G.42
TOP: Midsegments
211 ANS: 3
\[ 3x - 15 = 2(6) \]
\[ 3x = 27 \]
\[ x = 9 \]

PTS: 2  
REF: 061311ge  
STA: G.G.42  
TOP: Midsegments

212 ANS: 3
Parallel lines intercept congruent arcs.

PTS: 2  
REF: 061409ge  
STA: G.G.52  
TOP: Chords and Secants

213 ANS: 4
\((x, y) \rightarrow (-x, -y)\)

PTS: 2  
REF: 061304ge  
STA: G.G.54  
TOP: Rotations

214 ANS: 3
PTS: 2  
REF: 011425ge  
STA: G.G.39  
TOP: Special Parallelograms

215 ANS: 1
\[ \frac{180 - 52}{2} = 64. \quad 180 - (90 + 64) = 26 \]

PTS: 2  
REF: 011314ge  
STA: G.G.30  
TOP: Interior and Exterior Angles of Triangles

216 ANS: 3
\[ \sqrt{20^2 + 7^2} \approx 21 \]

PTS: 2  
REF: 081525ge  
STA: G.G.50  
TOP: Tangents

217 ANS: 3
\[ m = \frac{-A}{B} = \frac{-3}{-2} = \frac{3}{2} \]

PTS: 2  
REF: 011324ge  
STA: G.G.63  
TOP: Parallel and Perpendicular Lines

218 ANS: 2
\[ x^2 - 2 = x \]
\[ x^2 - x - 2 = 0 \]
\[ (x - 2)(x + 1) = 0 \]
\[ x = 2, -1 \]

PTS: 2  
REF: 011409ge  
STA: G.G.70  
TOP: Quadratic-Linear Systems
219 ANS: 3 \\
\[x^2 = 4 \cdot 7\] \\
\[x = \sqrt{4} \cdot \sqrt{7}\] \\
\[x = 2\sqrt{7}\]

PTS: 2 REF: 081528ge STA: G.G.47 TOP: Similarity 
KEY: leg

220 ANS: 3 PTS: 2 REF: 011322ge STA: G.G.49 
TOP: Chords

221 ANS: 2 
Parallel chords intercept congruent arcs. \(\frac{360 - (104 + 168)}{2} = 44\)

PTS: 2 REF: 011302ge STA: G.G.52 TOP: Chords and Secants

222 ANS: 2 
\[5x + 3 = 7x - 15 \quad 5(9) + 3 = 48\] 
\[18 = 2x\] 
\[9 = x\]

PTS: 2 REF: 011515ge STA: G.G.40 TOP: Trapezoids 
TOP: Constructions

223 ANS: 3 PTS: 2 REF: 011309ge STA: G.G.20
TOP: Constructions 

224 ANS: 2 PTS: 2 REF: 011303ge STA: G.G.24 
TOP: Statements

225 ANS: 2 
\[180(n - 2) = 720\]
\[n - 2 = 4\]
\[n = 6\]

PTS: 2 REF: 061521ge STA: G.G.37 TOP: Interior and Exterior Angles of Polygons

226 ANS: 4 PTS: 2 REF: 011318ge STA: G.G.73 
TOP: Equations of Circles 

227 ANS: 1 PTS: 2 REF: 061527ge STA: G.G.43 
TOP: Centroid

228 ANS: 4 
\[m = \frac{2}{3} \cdot 2 = \frac{3}{2} (4) + b\]
\[m_\perp = \frac{3}{2} \cdot 2 = -6 + b\]
\[8 = b\]

PTS: 2 REF: 011319ge STA: G.G.64 TOP: Parallel and Perpendicular Lines

229 ANS: 4 PTS: 2 REF: 061423ge STA: G.G.25 
TOP: Compound Statements KEY: conditional
230 ANS: 2
\[ x^2 + 5x = 4x + 110 \]
\[ \measuredangle Q = 4(10) = 40 \]
\[ x^2 + x - 110 = 0 \]
\[ (x + 11)(x - 10) = 0 \]
\[ 10 = x \]

PTS: 2 REF: 061425ge STA: G.G.32 TOP: Exterior Angle Theorem

231 ANS: 4
\[ (n - 2)180 - n \left( \frac{(n - 2)180}{n} \right) = 180n - 360 - 180n + 180n - 360 = 180n - 720. \]
\[ 180(5) - 720 = 180 \]

PTS: 2 REF: 081322ge STA: G.G.37 TOP: Interior and Exterior Angles of Polygons

232 ANS: 1
\[ 8 \times 12 = 16x \]
\[ 6 = x \]

PTS: 2 REF: 081328ge STA: G.G.53 TOP: Segments Intercepted by Circle

KEY: two chords

233 ANS: 3
\[ 2y = 3x - 4. \quad 1 = \frac{3}{2} (6) + b \]
\[ y = \frac{3}{2} x - 2 \quad 1 = 9 + b \]
\[ -8 = b \]

PTS: 2 REF: 061316ge STA: G.G.65 TOP: Parallel and Perpendicular Lines

234 ANS: 4 PTS: 2 REF: 081417ge STA: G.G.24

TOP: Statements

235 ANS: 2
Perimeter of \( \triangle DEF \) is \( 5 + 8 + 11 = 24 \).
\[ \frac{5}{24} = \frac{x}{60} \]
\[ 24x = 300 \]
\[ x = 12.5 \]

PTS: 2 REF: 011307ge STA: G.G.45 TOP: Similarity

KEY: perimeter and area

236 ANS: 1
\[ k: \frac{-A}{B} = \frac{-1}{2} \]
\[ p: \frac{-A}{B} = \frac{-6}{3} = -2 \]
\[ m: \frac{-A}{B} = \frac{(-1)}{2} = \frac{1}{2} \]

PTS: 2 REF: 081426ge STA: G.G.63 TOP: Parallel and Perpendicular Lines

238 ANS: 2 PTS: 2 REF: 081415ge STA: G.G.67 TOP: Distance KEY: general

239 ANS: 1

\[ r^2 = 48 \]

\[ r = \sqrt{48} = \sqrt{16 \cdot 3} = 4\sqrt{3} \]

PTS: 2 REF: 081412ge STA: G.G.73 TOP: Equations of Circles

240 ANS: 3

\[ m = \frac{A}{B} = \frac{-4}{-2} = 2 \]

\[ y = mx + b \]

\[ 1 = 2(-2) + b \]

\[ 1 = -4 + b \]

\[ 5 = b \]

PTS: 2 REF: 081509ge STA: G.G.65 TOP: Parallel and Perpendicular Lines

241 ANS: 4

\[ 2x - 8 = x + 2. \ AE = 10 + 2 = 12. \ AC = 2(AE) = 2(12) = 24 \]

\[ x = 10 \]

PTS: 2 REF: 011327ge STA: G.G.39 TOP: Special Parallelograms

242 ANS: 4 PTS: 2 REF: 081308ge STA: G.G.49 TOP: Chords


244 ANS: 4

Distance is preserved after a rotation.


245 ANS: 1 PTS: 2 REF: 011512ge STA: G.G.3 TOP: Planes

246 ANS: 1

\[ m = \frac{6}{3} = 2 \]

\[ m_{\perp} = -\frac{1}{2} \]

\[ 4 = -\frac{1}{2} (2) + b \]

\[ 4 = -1 + b \]

\[ 5 = b \]

PTS: 2 REF: 061507ge STA: G.G.64 TOP: Parallel and Perpendicular Lines

Isosceles or not, \( \triangle RSV \) and \( \triangle RST \) have a common base, and since \( 
oline{RS} \) and \( 
oline{VT} \) are bases, congruent altitudes.

\[
\text{Parallel secants intercept congruent arcs. } \frac{360 - (106 + 24)}{2} = \frac{230}{2} = 115
\]

\[
180 - 2(58) = 64
\]

\[
3x + 17 + 5x - 21 = 180 \quad m\angle 1 = 3(23) + 17 = 86
\]

\[
8x - 4 = 180
\]

\[
8x = 184
\]

\[
x = 23
\]

\[
12(8) = x(6)
\]

\[
96 = 6x
\]

\[
16 = x
\]
258 ANS: 3

\[
\begin{array}{c}
\text{PTS: 2 Ref: 081402ge STA: G.G.38 TOP: Parallelograms} \\
\end{array}
\]

259 ANS: 1

\[
(2, -7) \rightarrow (2 - 3, -7 + 5) = (-1, -2)
\]

\[
\begin{array}{c}
\text{PTS: 2 Ref: 061504ge STA: G.G.61 TOP: Analytical Representations of Transformations} \\
\end{array}
\]

260 ANS: 4 PTS: 2 Ref: 011428ge STA: G.G.50 TOP: Tangents KEY: common tangency

261 ANS: 1 PTS: 2 Ref: 061523ge STA: G.G.34 TOP: Angle Side Relationship

262 ANS: 1

\[
d = \sqrt{(5 - 1)^2 + (3 - 6)^2} = \sqrt{16 + 9} = \sqrt{25} = 5
\]

\[
\begin{array}{c}
\text{PTS: 2 Ref: 011507ge STA: G.G.67 TOP: Distance KEY: general} \\
\end{array}
\]

263 ANS: 3

\[
d = \sqrt{(-2 - 4)^2 + (3 - 5)^2} = \sqrt{36 + 4} = \sqrt{40} = 2\sqrt{10}
\]

\[
\begin{array}{c}
\text{PTS: 2 Ref: 061411ge STA: G.G.67 TOP: Distance KEY: general} \\
\end{array}
\]

264 ANS: 3

\[
180 - 38 = 142
\]

\[
\begin{array}{c}
\text{PTS: 2 Ref: 011419ge STA: G.G.50 TOP: Tangents KEY: two tangents} \\
\end{array}
\]

265 ANS: 2 PTS: 2 Ref: 081316ge STA: G.G.23 TOP: Locus

266 ANS: 2

\[
180 - 2(66) = 48
\]

\[
\begin{array}{c}
\text{PTS: 2 Ref: 061513ge STA: G.G.50 TOP: Tangents KEY: two tangents} \\
\end{array}
\]

267 ANS: 2

\[
M_x = \frac{8 + (-3)}{2} = 2.5, \quad M_y = \frac{-4 + 2}{2} = -1
\]

\[
\begin{array}{c}
\text{PTS: 2 Ref: 061312ge STA: G.G.66 TOP: Midpoint} \\
\end{array}
\]

268 ANS: 3 PTS: 2 Ref: 081502ge STA: G.G.73 TOP: Equations of Circles
269 ANS: 1 PTS: 2 REF: 081513ge STA: G.G.26
TOP: Contrapositive

\[ \sqrt{9^2 + 12^2} = 15 \]

PTS: 2 REF: 011505ge STA: G.G.39 TOP: Special Parallelograms

271 ANS: 3 PTS: 2 REF: 011427ge STA: G.G.56
TOP: Identifying Transformations

272 ANS: 3 PTS: 2 REF: 081405ge STA: G.G.56
TOP: Identifying Transformations

273 ANS: 1
Parallel chords intercept congruent arcs. \( m\overarc{AC} = m\overarc{BD} \).
\( \frac{180 - 110}{2} = 35. \)

PTS: 2 REF: 081302ge STA: G.G.52 TOP: Chords and Secants

274 ANS: 4
\( 3 + 6 > 8 \)

PTS: 2 REF: 061416ge STA: G.G.33 TOP: Triangle Inequality Theorem

275 ANS: 4 PTS: 2 REF: 011528ge STA: G.G.44
TOP: Similarity Proofs

276 ANS: 2
\[ \sqrt{(-2 - 4)^2 + (-3 - (-1))^2} = \sqrt{40} = \sqrt{4 \times 10} = 2\sqrt{10} \]

PTS: 2 REF: 011313ge STA: G.G.69 TOP: Quadrilaterals in the Coordinate Plane

277 ANS: 4
\[ \frac{2}{3} (x - 4) = y - 5 \]
\[ 2x - 8 = 3y - 15 \]
\[ 7 = 3y - 2x \]

PTS: 2 REF: 061528ge STA: G.G.65 TOP: Parallel and Perpendicular Lines

278 ANS: 3
\[ 120\pi = \pi(12)(l) \]
\[ 10 = l \]

PTS: 2 REF: 081314ge STA: G.G.15 TOP: Volume and Lateral Area

279 ANS: 3 PTS: 2 REF: 061526ge STA: G.G.26
TOP: Inverse

280 ANS: 2 PTS: 2 REF: 011511ge STA: G.G.71
TOP: Equations of Circles
281 ANS: 3
\[ 6 = \frac{4 + x}{2}, \quad 8 = \frac{2 + y}{2}. \]
\[ 4 + x = 12 \quad 2 + y = 16 \]
\[ x = 8 \quad y = 14 \]

PTS: 2 \hspace{1cm} REF: 011305ge \hspace{1cm} STA: G.G.66 \hspace{1cm} TOP: Midpoint

282 ANS: 4
\[ 2x + 36 + 7x - 9 = 180 \quad m\angle 1 = 2(17) + 36 = 70 \]
\[ 9x + 27 = 180 \]
\[ 9x = 153 \]
\[ x = 17 \]

PTS: 2 \hspace{1cm} REF: 081427ge \hspace{1cm} STA: G.G.35 \hspace{1cm} TOP: Parallel Lines and Transversals

283 ANS: 3

\[ \frac{4}{2 + 3 + 4} \times 180 = 80 \]

PTS: 2 \hspace{1cm} REF: 061404ge \hspace{1cm} STA: G.G.30 \hspace{1cm} TOP: Interior and Exterior Angles of Triangles

284 ANS: 2
\[ \frac{(n - 2)180}{n} = 120 \]
\[ 180n - 360 = 120n \]
\[ 60n = 360 \]
\[ n = 6 \]

PTS: 2 \hspace{1cm} REF: 011326ge \hspace{1cm} STA: G.G.37 \hspace{1cm} TOP: Interior and Exterior Angles of Polygons

285 ANS: 4 \hspace{1cm} PTS: 2 \hspace{1cm} REF: 011421ge \hspace{1cm} STA: G.G.54
TOP: Rotations

286 ANS: 4
\[ M_x = \frac{2 + 8}{2} = 5. \quad M_y = \frac{-5 + 3}{2} = -1. \]

PTS: 2 \hspace{1cm} REF: 011502ge \hspace{1cm} STA: G.G.66 \hspace{1cm} TOP: Midpoint
KEY: general

287 ANS: 3 \hspace{1cm} PTS: 2 \hspace{1cm} REF: 061401ge \hspace{1cm} STA: G.G.9
TOP: Planes

288 ANS: 3 \hspace{1cm} PTS: 2 \hspace{1cm} REF: 081419ge \hspace{1cm} STA: G.G.39
TOP: Special Parallelograms

289 ANS: 1 \hspace{1cm} PTS: 2 \hspace{1cm} REF: 081303ge \hspace{1cm} STA: G.G.24
TOP: Negations
290 ANS: 2
m∠ABC = 55, so m∠ACR = 60 + 55 = 115

PTS: 2 REF: 011414ge STA: G.G.32 TOP: Exterior Angle Theorem

291 ANS: 3
144π = 4πr²
36 = r²
6 = r

PTS: 2 REF: 061415ge STA: G.G.16 TOP: Volume and Surface Area

292 ANS: 2 PTS: 2 REF: 081504ge STA: G.G.61
TOP: Analytical Representations of Transformations

293 ANS: 1
\[
\left( \frac{2 + 2}{2}, \frac{0 + (-8)}{2} \right) = (2, -4) \quad \sqrt{(2 - 2)^2 + (-8 - 0)^2} = 8 = d
\]
\[4 = r\]
\[16 = r^2\]

PTS: 2 REF: 061428ge STA: G.G.71 TOP: Equations of Circles

294 ANS: 2 PTS: 2 REF: 061324ge STA: G.G.44
TOP: Similarity Proofs

295 ANS: 1 PTS: 2 REF: 081522ge STA: G.G.22
TOP: Locus

296 ANS: 4
\[180 - \frac{180 - 80}{2} = 130\]

PTS: 2 REF: 011508ge STA: G.G.31 TOP: Isosceles Triangle Theorem

297 ANS: 1 PTS: 2 REF: 011404ge STA: G.G.9
TOP: Planes

298 ANS: 3
\[M_x = \frac{1 + 10}{2} = \frac{11}{2} = 5.5 \quad M_y = \frac{3 + 7}{2} = \frac{10}{2} = 5.\]

PTS: 2 REF: 081407ge STA: G.G.66 TOP: Midpoint
KEY: graph

299 ANS: 2 PTS: 2 REF: 061305ge STA: G.G.18
TOP: Constructions
300 ANS: 4

\[ 2x + 3 = -x^2 - x + 1 \quad y = 2(-2) + 3 = -1 \]

\[ x^2 + 3x + 2 = 0 \]

\[ (x + 2)(x + 1) = 0 \]

\[ x = -2, -1 \]

PTS: 2  REF: 081516ge  STA: G.G.70  TOP: Quadratic-Linear Systems

301 ANS: 1  PTS: 2  REF: 061307ge  STA: G.G.55

TOP: Properties of Transformations

302 ANS: 4

\[
\begin{align*}
\triangle ABC & \quad \triangle DEF \\
A & \quad D \\
B & \quad E \\
C & \quad F
\end{align*}
\]

PTS: 2  REF: 061520ge  STA: G.G.42  TOP: Midsegments

303 ANS: 3  PTS: 2  REF: 061320ge  STA: G.G.35

TOP: Parallel Lines and Transversals

304 ANS: 3

\[ 2(4x + 20) + 2(3x - 15) = 360. \quad \angle D = 3(25) - 15 = 60 \]

\[ 8x + 40 + 6x - 30 = 360 \]

\[ 14x + 10 = 360 \]

\[ 14x = 350 \]

\[ x = 25 \]

PTS: 2  REF: 011321ge  STA: G.G.40  TOP: Trapezoids

305 ANS: 1  PTS: 2  REF: 061514ge  STA: G.G.3

TOP: Planes

306 ANS: 4  PTS: 2  REF: 011306ge  STA: G.G.9

TOP: Planes

307 ANS: 4

(2) rotation is also a correct response

PTS: 2  REF: 011527ge  STA: G.G.56  TOP: Identifying Transformations

308 ANS: 2

\[ x + x + x + 15 = 180 \]

\[ 3x + 15 = 180 \]

\[ 3x = 165 \]

\[ x = 15 \]

PTS: 2  REF: 061407ge  STA: G.G.31  TOP: Isosceles Triangle Theorem
309 ANS: 2
\[ 2 = \frac{10 + x}{2}, \quad 8 = \frac{12 + y}{2} \]
\[ 4 = 10 + x, \quad 16 = 12 + y \]
\[ -6 = x, \quad 4 = y \]

PTS: 2  REF: 061505ge  STA: G.G.66  TOP: Midpoint

310 ANS: 3
\[ V = \frac{2}{3} \pi \left( \frac{12}{2} \right)^3 \approx 905 \]

PTS: 2  REF: 061502ge  STA: G.G.16  TOP: Volume and Surface Area

311 ANS: 1  PTS: 2  REF: 081323ge  STA: G.G.9  TOP: Planes

312 ANS: 2
\[ 5x - 22 = 3x + 10 \]
\[ 2x = 32 \]
\[ x = 16 \]

PTS: 2  REF: 061403ge  STA: G.G.35  TOP: Parallel Lines and Transversals

313 ANS: 3  PTS: 2  REF: 061421ge  STA: G.G.55  TOP: Properties of Transformations

314 ANS: 2
\[ x + 2x = x^2 \]
\[ (0,0), (3,3) \]
\[ 0 = x^2 - 3x \]
\[ 0 = x(x - 3) \]
\[ x = 0, 3 \]

PTS: 2  REF: 061406ge  STA: G.G.70  TOP: Quadratic-Linear Systems

315 ANS: 3
\[ 2.4 + 2(2.4) = 7.2 \]

PTS: 2  REF: 081526ge  STA: G.G.43  TOP: Centroid

316 ANS: 1
Parallel lines intercept congruent arcs.

PTS: 2  REF: 081413ge  STA: G.G.52  TOP: Chords and Secants


319 \[
\frac{70 - 20}{2} = 25
\]

**KEY: outside circle**

**TOP: Arcs Determined by Angles**

320 \[
9x - 10 = 5x + 30 \quad 5(10) + 30 = 80
\]
\[
4x = 40
\]
\[
x = 10
\]

**TOP: Chords and Secants**

321 \[
11 - 7 = 4, \quad 11 + 7 = 18
\]

**TOP: Triangle Inequality Theorem**

322 The slope of \(2x + 4y = 12\) is \(m = -\frac{A}{B} = -\frac{2}{4} = -\frac{1}{2}\).

**TOP: Parallel and Perpendicular Lines**

323 \(\frac{2x + 40}{2} = 20\) \(GH = 2(20) + 20 = 60\)

**TOP: Isosceles Triangle Theorem**

324 \(x + 40 = 2x + 20\)

**TOP: Locus**
\[
\frac{4}{6} = \frac{x + 2}{4x - 7}
\]

\[16x - 28 = 6x + 12\]

\[10x = 40\]

\[x = 4\]

PTS: 2  
REF: 011521ge  
STA: G.G.46  
TOP: Side Splitter Theorem

\[AB = 8 - 4 = 4. \quad BC = \sqrt{(-2 - (-5))^2 + (8 - 6)^2} = \sqrt{13}. \quad AC = \sqrt{(-2 - (-5))^2 + (4 - 6)^2} = \sqrt{13}\]

PTS: 2  
REF: 011328ge  
STA: G.G.69  
TOP: Triangles in the Coordinate Plane

\[AB = 8 - 4 = 4. \quad BC = \sqrt{(-2 - (-5))^2 + (8 - 6)^2} = \sqrt{13}. \quad AC = \sqrt{(-2 - (-5))^2 + (4 - 6)^2} = \sqrt{13}\]

PTS: 2  
REF: 011506ge  
STA: G.G.24  
TOP: Negations

\[AB = 8 - 4 = 4. \quad BC = \sqrt{(-2 - (-5))^2 + (8 - 6)^2} = \sqrt{13}. \quad AC = \sqrt{(-2 - (-5))^2 + (4 - 6)^2} = \sqrt{13}\]

PTS: 2  
REF: 001415ge  
STA: G.G.72  
TOP: Equations of Circles

\[x = 12\]

\[x = 12\]

PTS: 2  
REF: 061506ge  
STA: G.G.47  
TOP: Similarity

\[15 \frac{5}{18} = \frac{5}{6}\]

PTS: 2  
REF: 081317ge  
STA: G.G.45  
TOP: Similarity

\[\text{KEY: perimeter and area}\]
340 ANS: 3
\[3x + 1 + 4x - 17 + 5x - 20 = 180\] 
\[3(18) + 1 = 55\]
\[12x - 36 = 180\] 
\[4(18) - 17 = 55\] 
\[12x = 216\] 
\[5(18) - 20 = 70\] 
\[x = 18\]

PTS: 2         REF: 061308ge         STA: G.G.30         TOP: Interior and Exterior Angles of Triangles

341 ANS: 2

\[
\begin{aligned}
\angle A & \quad \angle B \\
\angle C & \quad \angle D
\end{aligned}
\]

PTS: 2         REF: 081422ge         STA: G.G.34         TOP: Angle Side Relationship

342 ANS: 1
\[M_x = \frac{-5 + 3}{2} = -\frac{2}{2} = -1. \quad M_y = \frac{1 + 5}{2} = \frac{6}{2} = 3.\]

PTS: 2         REF: 061402ge         STA: G.G.66         TOP: Midpoint

343 ANS: 2
\[m = \frac{1}{3} \quad 12 = -3(-9) + b\]
\[m_{\perp} = -3 \quad 12 = 27 + b\]
\[-15 = b\]

PTS: 2         REF: 081404ge         STA: G.G.64         TOP: Parallel and Perpendicular Lines

344 ANS: 3
\[L = 2\pi rh = 2\pi \cdot \frac{6}{2} \cdot 15 = 90\pi\]

PTS: 2         REF: 061405ge         STA: G.G.14         TOP: Volume and Lateral Area

345 ANS: 3         PTS: 2         REF: 011523ge         STA: G.G.51         TOP: Arcs Determined by Angles         KEY: inscribed

346 ANS: 1
\[m\angle A + m\angle B = 50\]
\[30.1 + m\angle B = 50\]
\[m\angle B = 19.9\]

PTS: 2         REF: 081424ge         STA: G.G.32         TOP: Exterior Angle Theorem

347 ANS: 2         PTS: 2         REF: 011517ge         STA: G.G.26         TOP: Contrapositive
348 ANS: 3
midpoint: \( \left( \frac{6+8}{2}, \frac{8+4}{2} \right) = (7,6) \). slope: \( \frac{8-4}{6-8} = \frac{4}{-2} = -2 \); \( m_\perp = \frac{1}{2} \). \( 6 = \frac{1}{2} (7) + b \)
\[ \frac{12}{2} = \frac{7}{2} + b \]
\[ \frac{5}{12} = b \]

PTS: 2  REF: 081327ge  STA: G.G.68  TOP: Perpendicular Bisector

349 ANS: 4
\( 8^2 + 15^2 = 17^2 \)

PTS: 2  REF: 081418ge  STA: G.G.48  TOP: Pythagorean Theorem


351 ANS: 2
\[ m = \frac{y_1 - y_2}{x_1 - x_2} = \frac{-5}{1} = -5 \]
\[ y = mx + b \]
\[ 3 = -5(5) + b \]
\[ 28 = b \]

PTS: 2  REF: 011410ge  STA: G.G.65  TOP: Parallel and Perpendicular Lines

352 ANS: 3  PTS: 2  REF: 061424ge  STA: G.G.43  TOP: Centroid

353 ANS: 2
\[ 180 - \frac{(n-2)180}{n} = 45 \]
\[ 180n - 180n + 360 = 45n \]
\[ 360 = 45n \]
\[ n = 8 \]

PTS: 2  REF: 061413ge  STA: G.G.37  TOP: Interior and Exterior Angles of Polygons

354 ANS: 4  PTS: 2  REF: 011315ge  STA: G.G.1  TOP: Planes

355 ANS: 4  PTS: 2  REF: 061303ge  STA: G.G.22  TOP: Locus


357 ANS: 1  PTS: 2  REF: 061314ge  STA: G.G.26  TOP: Converse and Biconditional
358 ANS: 1
\[2x + x = 12. \quad \overline{BD} = 2(4) = 8\]
\[3x = 12\]
\[x = 4\]

PTS: 2  REF: 011408ge  STA: G.G.43  TOP: Centroid

359 ANS: 3  PTS: 2  REF: 011402ge  STA: G.G.17
TOP: Constructions

360 ANS: 2
\[m = \frac{-A}{B} = \frac{-2}{3} \quad m_{\perp} = \frac{3}{2}\]


361 ANS: 1  PTS: 2  REF: 011320ge  STA: G.G.26
TOP: Conditional Statements

362 ANS: 2
\[m = \frac{-A}{B} = \frac{-3}{-7} = \frac{3}{7} \quad m_{\perp} = \frac{-7}{3}\]


363 ANS: 3
\[r^2 = 50\]
\[r = \sqrt{50} = \sqrt{25 \cdot 2} = 5\sqrt{2}\]

PTS: 2  REF: 061515ge  STA: G.G.73  TOP: Equations of Circles

364 ANS: 3  PTS: 2  REF: 081309ge  STA: G.G.29
TOP: Triangle Congruency

365 ANS: 1  PTS: 2  REF: 011416ge  STA: G.G.34
TOP: Angle Side Relationship

366 ANS: 4  PTS: 2  REF: 011407ge  STA: G.G.23
TOP: Locus

367 ANS: 3
The regular polygon with the smallest interior angle is an equilateral triangle, with 60°. 180° − 60° = 120°

PTS: 2  REF: 011417ge  STA: G.G.37  TOP: Interior and Exterior Angles of Polygons

368 ANS: 1  PTS: 2  REF: 081324ge  STA: G.G.74
TOP: Graphing Circles

369 ANS: 2  PTS: 2  REF: 061427ge  STA: G.G.27
TOP: Line Proofs

370 ANS: 4  PTS: 2  REF: 081403ge  STA: G.G.49
TOP: Chords
371 ANS: 2
\[ s^2 + s^2 = (3\sqrt{2})^2 \]
\[ 2s^2 = 18 \]
\[ s^2 = 9 \]
\[ s = 3 \]

PTS: 2 REF: 011420ge STA: G.G.39 TOP: Special Parallelograms

372 ANS: 3
\[ 180 - \frac{(n-2)180}{n} = 40 \]
\[ 180n - 180(n-2) + 360 = 40n \]
\[ 360 = 40n \]
\[ n = 9 \]

PTS: 2 REF: 061519ge STA: G.G.37 TOP: Interior and Exterior Angles of Polygons

373 ANS: 1 PTS: 2 REF: 011412ge STA: G.G.28 TOP: Triangle Congruency

374 ANS: 2
\[ 45 \cdot \frac{8}{20} = 18 \]

PTS: 2 REF: 081511ge STA: G.G.45 TOP: Similarity
KEY: perimeter and area

375 ANS: 1 PTS: 2 REF: 061310ge STA: G.G.2 TOP: Planes


377 ANS: 2

PTS: 2 REF: 061414ge STA: G.G.39 TOP: Special Parallelograms


379 ANS: 3 PTS: 2 REF: 011311ge STA: G.G.42 TOP: Midsegments
\[ L + L - 30 = 180 \]
\[ 2L = 210 \]
\[ L = 105 \]

380 ANS: 2

PTS: 2 REF: 081519ge STA: G.G.38 TOP: Parallelograms

TOP: Equations of Circles

381 ANS: 4

PTS: 2 REF: 081305ge STA: G.G.71

TOP: Angle Side Relationship

382 ANS: 2

PTS: 2 REF: 061321ge STA: G.G.34

TOP: Similarity KEY: perimeter and area

383 ANS: 1

(1) is true because of vertical angles. (3) and (4) are true because CPCTC.

PTS: 2 REF: 061302ge STA: G.G.29 TOP: Triangle Congruency

384 ANS: 2

6x = x + 40 + 3x + 10. \( m\angle CAB = 25 + 40 = 65 \)

6x = 4x + 50

2x = 50

x = 25

PTS: 2 REF: 081310ge STA: G.G.32 TOP: Exterior Angle Theorem

385 ANS: 4

If two prisms have equal heights and volume, the area of their bases is equal.

PTS: 2 REF: 081321ge STA: G.G.11 TOP: Volume

386 ANS: 1

TOP: Negations

387 ANS: 3

\[ x^2 + 5^2 = 25 \]

\[ x = 0 \]

PTS: 2 REF: 011312ge STA: G.G.70 TOP: Quadratic-Linear Systems

388 ANS: 4

\( (n - 2)180 = (8 - 2)180 = 1080. \frac{1080}{8} = 135. \)

PTS: 2 REF: 081521ge STA: G.G.37 TOP: Interior and Exterior Angles of Polygons

389 ANS: 2

TOP: Equations of Circles

390 ANS: 4

TOP: Converse and Biconditional

391 ANS: 4
\[ \sqrt{8^2 + 15^2} = 17 \]

PTS: 2    REF: 061326ge    STA: G.G.39    TOP: Special Parallelograms

ANS: 1
\[ m = \frac{-A}{B} = \frac{1}{2} \]
\[ -1 = \frac{1}{2} (4) + b \]
\[ -3 = b \]

PTS: 2    REF: 061420ge    STA: G.G.65    TOP: Parallel and Perpendicular Lines

TOP: Solids

TOP: Equations of Circles

\[ V = \frac{4}{3} \pi r^3 \]

\[ 44.6022 = \frac{4}{3} \pi r^3 \]
\[ 10.648 \approx r^3 \]
\[ 2.2 \approx r \]

PTS: 2    REF: 061315ge    STA: G.G.13

TOP: Properties of Transformations

\[ x^2 + 5 = x + 5 \quad y = (0) + 5 = 5 \]
\[ x^2 - x = 0 \quad y = (1) + 5 = 6 \]
\[ x(x - 1) = 0 \]
\[ x = 0, 1 \]

PTS: 2    REF: 081406ge    STA: G.G.70    TOP: Quadratic-Linear Systems

\[ 6 + x = 4, \quad \frac{-4 + y}{2} = 2 \]
\[ x = 2, \quad y = 8 \]

PTS: 2    REF: 011401ge    STA: G.G.66    TOP: Midpoint
\[
m_{AB} = \frac{6 - 3}{7 - 5} = \frac{3}{2}, \quad m_{CD} = \frac{4 - 0}{6 - 9} = \frac{4}{-3}
\]

400 ANS: 4

PTS: 2

REF: 061318ge

STA: G.G.63

TOP: Parallel and Perpendicular Lines

\[
720 = 5B
\]

144 = B

401 ANS: 3

PTS: 2

REF: 081523ge

STA: G.G.11

TOP: Volume

\[
\frac{3}{6} = \frac{5}{x}
\]

3x = 30

x = 10

PTS: 2

REF: 081423ge

STA: G.G.46

TOP: Side Splitter Theorem

\[
7x - 36 + 5x + 12 = 180
\]

12x - 24 = 180

12x = 204

x = 17

PTS: 2

REF: 011422ge

STA: G.G.35

TOP: Parallel Lines and Transversals

\[
\sqrt{17^2 - 15^2} = \sqrt{289 - 225} = \sqrt{64} = 8
\]

404 ANS: 2

PTS: 2

REF: 011424ge

STA: G.G.49

TOP: Chords

\[
x^2 = 2(2 + 10)
\]

\[
x^2 = 24
\]

\[
x = \sqrt{24} = \sqrt{4} \sqrt{6} = 2\sqrt{6}
\]

405 ANS: 3

PTS: 2

REF: 081326ge

STA: G.G.47

TOP: Similarity

\[
x^2 = 3 \times 12
\]

\[
x = 6
\]

406 ANS: 1

PTS: 2

REF: 011308ge

STA: G.G.47

TOP: Similarity

KEY: leg

KEY: altitude
407 ANS: 1 PTS: 2 REF: 061510ge STA: G.G.72
TOP: Equations of Circles

408 ANS: 2
\[ \sqrt{15^2 - 12^2} = 9 \]
PTS: 2 REF: 081325ge STA: G.G.50 TOP: Tangents
KEY: point of tangency

409 ANS: 4 PTS: 2 REF: 081401ge STA: G.G.10
TOP: Solids

410 ANS: 4 PTS: 2 REF: 081313ge STA: G.G.19
TOP: Constructions

411 ANS: 3
The centroid divides each median into segments whose lengths are in the ratio 2 : 1.
PTS: 2 REF: 081307ge STA: G.G.43 TOP: Centroid

412 ANS: 2 PTS: 2 REF: 081311ge STA: G.G.10
TOP: Solids

413 ANS: 1
\[ 256 = \frac{1}{3} B \cdot 12 \]
\[ 64 = B \]
\[ 8 = s \]
PTS: 2 REF: 081428ge STA: G.G.35 TOP: Volume

414 ANS: 4 PTS: 2 REF: 011323ge STA: G.G.72
TOP: Equations of Circles

415 ANS: 2 PTS: 2 REF: 081520ge STA: G.G.72
TOP: Equations of Circles

416 ANS: 1
\[ 180 - 123 = 57 \]
PTS: 2 REF: 061419ge STA: G.G.40 TOP: Trapezoids

417 ANS: 3
\[ x^2 = 3 \times 12. \quad \sqrt{6^2 + 3^2} = \sqrt{45} = \sqrt{9} \sqrt{5} = 3\sqrt{5} \]
\[ x = 6 \]
PTS: 2 REF: 061327ge STA: G.G.47 TOP: Similarity
KEY: leg

418 ANS: 1 PTS: 2 REF: 011405ge STA: G.G.59
TOP: Properties of Transformations
\[ \begin{align*}
3y + 6 &= 2x \\
2y - 3x &= 6 \\
3y &= 2x - 6 \\
2y &= 3x + 6 \\
y &= \frac{2}{3}x - 2 \\
y &= \frac{3}{2}x + 3 \\
m &= \frac{2}{3} \\
m &= \frac{3}{2}
\end{align*} \]
**Geometry Multiple Choice Regents Exam Questions**

**Answer Section**

420 ANS: 4  
PTS: 2  
REF: 080915ge  
STA: G.G.56  
TOP: Identifying Transformations

421 ANS: 1  
Parallel lines intercept congruent arcs.  
PTS: 2  
REF: 061001ge  
STA: G.G.52  
TOP: Chords and Secants

422 ANS: 2  
PTS: 2  
REF: 061007ge  
STA: G.G.35  
TOP: Parallel Lines and Transversals

423 ANS: 2  
PTS: 2  
REF: 011006ge  
STA: G.G.56  
TOP: Identifying Transformations

424 ANS: 1  
The closer a chord is to the center of a circle, the longer the chord.  
PTS: 2  
REF: 011005ge  
STA: G.G.49  
TOP: Chords

425 ANS: 2  
\( M_x = \frac{-2 + 6}{2} = 2 \)  \( M_y = \frac{-4 + 2}{2} = -1 \)  
PTS: 2  
REF: 080910ge  
STA: G.G.66  
TOP: Midpoint  
KEY: general

426 ANS: 4  
\( SA = 4\pi r^2 \)  \( V = \frac{4}{3} \pi r^3 = \frac{4}{3} \pi \cdot 6^3 = 288\pi \)  
\( 144\pi = 4\pi r^2 \)  
\( 36 = r^2 \)  
\( 6 = r \)  
PTS: 2  
REF: 081020ge  
STA: G.G.16  
TOP: Surface Area

427 ANS: 4  
\( y + x = 4 \)  \( x^2 - 6x + 10 = -x + 4 \)  \( y + x = 4 \)  \( y + 2 = 4 \)  
\( y = -x + 4 \)  \( x^2 - 5x + 6 = 0 \)  \( y + 3 = 4 \)  \( y = 2 \)  
\( (x - 3)(x - 2) = 0 \)  \( y = 1 \)  
\( x = 3 \) or 2  
PTS: 2  
REF: 080912ge  
STA: G.G.70  
TOP: Quadratic-Linear Systems
The slope of \( y = -3x + 2 \) is \(-3\). The perpendicular slope is \( \frac{1}{3} \). 

\[-1 = \frac{1}{3} (3) + b\]

\[-1 = 1 + b\]

\[b = -2\]

ANS: 4

PTS: 2

REF: 011018ge

STA: G.G.64

TOP: Parallel and Perpendicular Lines

\[4(x + 4) = 8^2\]

\[4x + 16 = 64\]

\[x = 12\]

ANS: 4

PTS: 2

REF: 081001ge

STA: G.G.29

TOP: Triangle Congruency

\[4(x + 3)^2 - 4 = 2x + 5\]

\[x^2 + 6x + 9 - 4 = 2x + 5\]

\[x^2 + 4x = 0\]

\[x(x + 4) = 0\]

\[x = 0, -4\]

ANS: 3

PTS: 2

REF: 081004ge

STA: G.G.70

TOP: Quadratic-Linear Systems
\[ 3x + 15 + 2x - 1 = 6x + 2 \]
\[ 5x + 14 = 6x + 2 \]
\[ x = 12 \]

**436**
ANS: 2
PTS: 2
REF: 080921ge
STA: G.G.72
TOP: Equations of Circles

**437**
ANS: 1
PTS: 2
REF: 060920ge
STA: G.G.74
TOP: Graphing Circles

\[ a^2 + (5\sqrt{2})^2 = (2\sqrt{15})^2 \]
\[ a^2 + (25 \times 2) = 4 \times 15 \]
\[ a^2 + 50 = 60 \]
\[ a^2 = 10 \]
\[ a = \sqrt{10} \]

**438**
ANS: 1
PTS: 2
REF: 011016ge
STA: G.G.48
TOP: Pythagorean Theorem

**439**
ANS: 3
PTS: 2
REF: 081021ge
STA: G.G.57
TOP: Properties of Transformations

\[ 2y = -6x + 8 \quad \text{Perpendicular lines have slope the opposite and reciprocal of each other.} \]
\[ y = -3x + 4 \]
\[ m = -3 \]
\[ m_\perp = \frac{1}{3} \]

**440**
ANS: 3
PTS: 2
REF: 081024ge
STA: G.G.62
TOP: Parallel and Perpendicular Lines
4x = 6 \cdot 10
\begin{align*}
x &= 15
\end{align*}

441 ANS: 1

PTS: 2 REF: 081017ge STA: G.G.53 TOP: Segments Intercepted by Circle
KEY: two chords

442 ANS: 2 PTS: 2 REF: 081015ge STA: G.G.56
TOP: Identifying Transformations

443 ANS: 2 PTS: 2 REF: fall0806ge STA: G.G.9
TOP: Planes

444 ANS: 3 PTS: 2 REF: 060908ge STA: G.G.60
TOP: Identifying Transformations

445 ANS: 1
\begin{align*}
-2\left(-\frac{1}{2} -y &= 6x + 10 \right) \\
y &= -12x - 20
\end{align*}

PTS: 2 REF: 061027ge STA: G.G.63 TOP: Parallel and Perpendicular Lines

446 ANS: 1
Translations and reflections do not affect distance.


447 ANS: 2 PTS: 2 REF: 080927ge STA: G.G.4
TOP: Planes

448 ANS: 4
(4) is not true if \( \angle PQR \) is obtuse.

PTS: 2 REF: 060924ge STA: G.G.32 TOP: Exterior Angle Theorem

449 ANS: 3 PTS: 2 REF: fall0816ge STA: G.G.1
TOP: Planes

450 ANS: 1
\begin{align*}
x + 2x + 2 + 3x + 4 &= 180 \\
6x + 6 &= 180 \\
x &= 29
\end{align*}

PTS: 2 REF: 011002ge STA: G.G.30 TOP: Interior and Exterior Angles of Triangles
The slope of $2x + 3y = 12$ is $\frac{-A}{B} = \frac{-2}{3}$. The slope of a perpendicular line is $\frac{3}{2}$. Rewritten in slope intercept form, (2) becomes $y = \frac{3}{2}x + 3$.

\[ M_x = \frac{-6 + 1}{2} = -\frac{5}{2}, \quad M_y = \frac{1 + 8}{2} = \frac{9}{2}. \]

If $\angle A$ is at minimum (50°) and $\angle B$ is at minimum (90°), $\angle C$ is at maximum of 40° (180° - (50° + 90°)). If $\angle A$ is at maximum (60°) and $\angle B$ is at maximum (100°), $\angle C$ is at minimum of 20° (180° - (60° + 100°)).

\[ V = \pi r^2 h = \pi \cdot 6^2 \cdot 27 = 972\pi \]

The centroid divides each median into segments whose lengths are in the ratio 2 : 1. \[ GC = 2FG \]

\[ GC + FG = 24 \]
\[ 2FG + FG = 24 \]
\[ 3FG = 24 \]
\[ FG = 8 \]
The length of the midsegment of a trapezoid is the average of the lengths of its bases. \( \frac{x + 30}{2} = 44 \). 
\[ x + 30 = 88 \]
\[ x = 58 \]

\[ 3y + 1 = 6x + 4 \]
\[ 2y + 1 = x - 9 \]
\[ 3y = 6x + 3 \]
\[ 2y = x - 10 \]
\[ y = 2x + 1 \]
\[ y = \frac{1}{2}x - 5 \]

The diagonals of an isosceles trapezoid are congruent. \( 5x + 3 = 11x - 5 \).
\[ 6x = 18 \]
\[ x = 3 \]

The slope of \( y = -\frac{2}{3}x - 5 \) is \( -\frac{2}{3} \). Perpendicular lines have slope that are opposite reciprocals.

Since \( AC \cong BC \), \( m\angle A = m\angle B \) under the Isosceles Triangle Theorem.
474 ANS: 3

After the translation, the coordinates are $A'(-1,5)$ and $B'(3,4)$. After the dilation, the coordinates are $A''(-2,10)$ and $B''(6,8)$.

476 ANS: 1

The centroid divides each median into segments whose lengths are in the ratio 2 : 1.

478 ANS: 3

$$m = \frac{-A}{B} = -\frac{3}{4}$$

479 ANS: 4

Corresponding angles of similar triangles are congruent.

480 ANS: 2

$$\frac{3}{7} = \frac{6}{x}$$

$$3x = 42$$

$$x = 14$$

481 ANS: 3

482 ANS: 2

483 ANS: 4
\[ d = \sqrt{(-6 - 2)^2 + (4 - (-5))^2} = \sqrt{64 + 81} = \sqrt{145} \]

ANS: 4

PTS: 2  REF: 081013ge  STA: G.G.67  TOP: Distance
KEY: general

485  ANS: 2

The slope of \( y = \frac{1}{2}x + 5 \) is \( \frac{1}{2} \). The slope of a perpendicular line is \(-2\). \( y = mx + b \)  

\[ 5 = (-2)(-2) + b \]
\[ b = 1 \]

PTS: 2  REF: 060907ge  STA: G.G.64  TOP: Parallel and Perpendicular Lines

486  ANS: 3

\[ \frac{36 + 20}{2} = 28 \]

PTS: 2  REF: 061019ge  STA: G.G.51  TOP: Arcs Determined by Angles
KEY: inside circle

487  ANS: 4

\[ 180 - (50 + 30) = 100 \]

PTS: 2  REF: 081006ge  STA: G.G.45  TOP: Similarity
KEY: basic

488  ANS: 2  PTS: 2

REF: 061322ge  STA: G.G.51
TOP: Arcs Determined by Angles
KEY: inscribed

489  ANS: 2  PTS: 2

REF: 011011ge  STA: G.G.22
TOP: Locus

490  ANS: 3

The slope of \( y = x + 2 \) is 1. The slope of \( y - x = -1 \) is \( \frac{A}{B} = \frac{-(-1)}{1} = 1 \).

PTS: 2  REF: 080909ge  STA: G.G.63  TOP: Parallel and Perpendicular Lines

491  ANS: 4

\[ \text{sum of interior } \angle s = \text{sum of exterior } \angle s \]

\[ (n - 2)180 = n \left( 180 - \frac{(n - 2)180}{n} \right) \]

\[ 180n - 360 = 180n - 180n + 360 \]
\[ 180n = 720 \]
\[ n = 4 \]

PTS: 2  REF: 081016ge  STA: G.G.36  TOP: Interior and Exterior Angles of Polygons
In an equilateral triangle, each interior angle is 60° and each exterior angle is 120° (180° - 120°). The sum of the three interior angles is 180° and the sum of the three exterior angles is 360°.

\[ d = \sqrt{(-4 - 2)^2 + (5 - (-5))^2} = \sqrt{36 + 100} = \sqrt{136} = \sqrt{4 \cdot 34} = 2\sqrt{34} . \]

Adjacent sides of a rectangle are perpendicular and have opposite and reciprocal slopes.

\[ y = x^2 - 4x = (4)^2 - 4(4) = 0. \ (4,0) \text{ is the only intersection.} \]

\[ L = 2\pi rh = 2\pi \cdot 5 \cdot 11 \approx 345.6 \]

Because the triangles are similar, \( \frac{m\angle A}{m\angle D} = 1 \)
The sum of the interior angles of a pentagon is $(5 - 2)180 = 540$. 

\[
\Delta ABC \sim \Delta DBE. \quad \frac{AB}{DB} = \frac{AC}{DE}
\]

\[
\frac{9}{2} = \frac{x}{3}
\]

\[
x = 13.5
\]

The slope of a line in standard form is $-\frac{A}{B}$, so the slope of this line is $-\frac{4}{2} = -2$. A parallel line would also have a slope of $-2$. Since the answers are in slope intercept form, find the $y$-intercept: 

\[
y = mx + b
\]

\[
3 = -2(7) + b
\]

\[
17 = b
\]
509 ANS: 1

510 ANS: 4
PTS: 2
REF: 080905ge STA: G.G.29 TOP: Triangle Congruency

511 ANS: 1
PTS: 2
REF: 081008ge STA: G.G.3 TOP: Planes

512 ANS: 3
PTS: 2
REF: 081002ge STA: G.G.9 TOP: Planes

513 ANS: 1
PTS: 2
REF: 060903ge STA: G.G.56 TOP: Identifying Transformations

514 ANS: 2
\[
\frac{140 - RS}{2} = 40
\]
\[
140 - RS = 80
\]
\[
RS = 60
\]

515 ANS: 2
7 + 18 > 6 + 12

516 ANS: 1
PTS: 2
REF: 081025ge STA: G.G.51 TOP: Arcs Determined by Angles

517 ANS: 4
PTS: 2
REF: fall0819ge STA: G.G.33 TOP: Triangle Inequality Theorem

518 ANS: 3
PTS: 2
REF: 081026ge STA: G.G.26 TOP: Contrapositive
519 ANS: 2

520 ANS: 3

521 ANS: 2

Longest side of a triangle is opposite the largest angle. Shortest side is opposite the smallest angle.

522 ANS: 1

523 ANS: 2

524 ANS: 1

525 ANS: 4

\[(n - 2)180 = (8 - 2)180 = 1080. \quad \frac{1080}{8} = 135.\]

526 ANS: 3

527 ANS: 2

\[M_x = \frac{2 + (-4)}{2} = -1. \quad M_y = \frac{-3 + 6}{2} = \frac{3}{2}.\]
$BG$ is also an angle bisector since it intersects the concurrence of $\overline{CD}$ and $\overline{AE}$

PTS: 2    REF: 061025ge    STA: G.G.21
KEY: Centroid, Orthocenter, Incenter and Circumcenter

529 ANS: 4    PTS: 2    REF: fall0802ge    STA: G.G.24
TOP: Negations

530 ANS: 3
Because $OC$ is a radius, its length is 5. Since $CE = 2\ OE = 3$. $\triangle EDO$ is a 3-4-5 triangle. If $ED = 4$, $BD = 8$.

PTS: 2    REF: fall0811ge    STA: G.G.49    TOP: Chords

531 ANS: 1
\[
\frac{3x^2 + 18x + 24}{3(x + 2)}
\]
\[
\frac{3(x^2 + 6x + 8)}{3(x + 2)}
\]
\[
\frac{3(x + 4)(x + 2)}{3(x + 2)}
\]
\[x + 4\]

PTS: 2    REF: fall0815ge    STA: G.G.12    TOP: Volume

532 ANS: 1
$\angle DCB$ and $\angle ADC$ are supplementary adjacent angles of a parallelogram. $180 - 120 = 60$. $\angle 2 = 60 - 45 = 15$.

PTS: 2    REF: 080907ge    STA: G.G.38    TOP: Parallelograms

533 ANS: 2
A dilation affects distance, not angle measure.

PTS: 2    REF: 080906ge    STA: G.G.60    TOP: Identifying Transformations

534 ANS: 2
$6 + 17 > 22$

PTS: 2    REF: 080916ge    STA: G.G.33    TOP: Triangle Inequality Theorem

535 ANS: 4    PTS: 2    REF: 060912ge    STA: G.G.23
TOP: Locus

536 ANS: 4    PTS: 2    REF: 011019ge    STA: G.G.44
TOP: Similarity Proofs
537 ANS: 1
\[ V = \pi r^2 h \]
\[ 1000 = \pi r^2 \cdot 8 \]
\[ r^2 = \frac{1000}{8\pi} \]
\[ r \approx 6.3 \]

PTS: 2 REF: 080926ge STA: G.G.14 TOP: Volume and Lateral Area

538 ANS: 4
The marked 60° angle and the angle above it are on the same straight line and supplementary. This unmarked supplementary angle is 120°. Because the unmarked 120° angle and the marked 120° angle are alternate exterior angles and congruent, \( d \parallel e \).

PTS: 2 REF: 080901ge STA: G.G.35 TOP: Parallel Lines and Transversals

539 ANS: 2

\[ AB = 10 \text{ since } \triangle ABC \text{ is a 6-8-10 triangle. } \]
\[ 6^2 = 10x \]
\[ 3.6 = x \]

PTS: 2 REF: 061026ge STA: G.G.51 TOP: Arcs Determined by Angles

540 ANS: 1

\[ V = \frac{1}{3} \pi r^2 h = \frac{1}{3} \pi \cdot 4^2 \cdot 12 \approx 201 \]

PTS: 2 REF: 060915ge STA: G.G.47 TOP: Similarity

541 ANS: 1

\[ V = \frac{1}{3} \pi r^2 h = \frac{1}{3} \pi \cdot 4^2 \cdot 12 \approx 201 \]

PTS: 2 REF: 060921ge STA: G.G.15 TOP: Volume

542 ANS: 4 PTS: 2 REF: 080925ge STA: G.G.21 TOP: Centroid, Orthocenter, Incenter and Circumcenter
543 ANS: 4  
\[x^2 = (4 + 5) \times 4\]
\[x^2 = 36\]
\[x = 6\]

PTS: 2  REF: 011008ge  STA: G.G.53  TOP: Segments Intercepted by Circle  
KEY: tangent and secant

544 ANS: 2  
\[x^2 = 3(x + 18)\]
\[x^2 - 3x - 54 = 0\]
\[(x - 9)(x + 6) = 0\]
\[x = 9\]

PTS: 2  REF: fall0817ge  STA: G.G.53  TOP: Segments Intercepted by Circle  
KEY: tangent and secant

545 ANS: 3  PTS: 2  REF: 080924ge  STA: G.G.24  TOP: Negations

546 ANS: 3  PTS: 2  REF: 080913ge  STA: G.G.28  TOP: Triangle Congruency

547 ANS: 2

\[\angle ACB \text{ and } \angle ECD \text{ are congruent vertical angles and } \angle CAB \cong \angle CED.\]

PTS: 2  REF: 060917ge  STA: G.G.44  TOP: Similarity Proofs

548 ANS: 1  
Opposite sides of a parallelogram are congruent. \(4x - 3 = x + 3\). \(SV = (2) + 3 = 5\).
\[3x = 6\]
\[x = 2\]

PTS: 2  REF: 011013ge  STA: G.G.38  TOP: Parallelograms

549 ANS: 2  PTS: 2  REF: 011020ge  STA: G.G.74  TOP: Graphing Circles

550 ANS: 3  
The lateral edges of a prism are parallel.

PTS: 2  REF: fall0808ge  STA: G.G.10  TOP: Solids

551 ANS: 1  
\[M_x = \frac{-2 + 6}{2} = 2.\]
\[M_y = \frac{3 + 3}{2} = 3.\]
The center is \((2, 3)\). \[d = \sqrt{(-2 - 6)^2 + (3 - 3)^2} = \sqrt{64 + 0} = 8.\] If the diameter is 8, the radius is 4 and \(r^2 = 16\).

PTS: 2  REF: fall0820ge  STA: G.G.71  TOP: Equations of Circles
552 ANS: 4
Longest side of a triangle is opposite the largest angle. Shortest side is opposite the smallest angle.

PTS: 2 REF: 081011ge STA: G.G.34 TOP: Angle Side Relationship

553 ANS: 3

PTS: 2 REF: fall0805ge STA: G.G.70 TOP: Quadratic-Linear Systems

554 ANS: 2
\[ x^2 + (x + 7)^2 = 13^2 \]
\[ x^2 + x^2 + 7x + 7x + 49 = 169 \]
\[ 2x^2 + 14x - 120 = 0 \]
\[ x^2 + 7x - 60 = 0 \]
\[ (x + 12)(x - 5) = 0 \]
\[ x = 5 \]
\[ 2x = 10 \]

PTS: 2 REF: 061024ge STA: G.G.48 TOP: Pythagorean Theorem

555 ANS: 3

PTS: 2 REF: 080920ge STA: G.G.42 TOP: Midsegments

556 ANS: 2
\[ M_x = \frac{3x + 5 + x - 1}{2} = \frac{4x + 4}{2} = 2x + 2. \quad M_y = \frac{3y + (-y)}{2} = \frac{2y}{2} = y. \]

PTS: 2 REF: 081019ge STA: G.G.66 TOP: Midpoint KEY: general


558 ANS: 1 PTS: 2 REF: 061012ge STA: G.G.20 TOP: Constructions
Median $BF$ bisects $AC$ so that $CF \cong FA$.

\[ \frac{87 + 35}{2} = \frac{122}{2} = 61 \]

\[ x = 4 \]

\[ (d + 4)4 = 12(6) \]
\[ 4d + 16 = 72 \]
\[ d = 14 \]
\[ r = 7 \]

\[ d = \sqrt{(-3 - 1)^2 + (2 - 0)^2} = \sqrt{16 + 4} = \sqrt{20} = \sqrt{4 \cdot 5} = 2\sqrt{5} \]

\[ \angle A = \frac{(n - 2)180}{n} = \frac{(5 - 2)180}{5} = 108 \quad \angle AEB = \frac{180 - 108}{2} = 36 \]
The slope of a line in standard form is \(-\frac{A}{B}\), so the slope of this line is \(\frac{-2}{-1} = 2\). A parallel line would also have a slope of 2. Since the answers are in slope intercept form, find the \(y\)-intercept:

\[
y = mx + b
\]

\[
-11 = 2(-3) + b
\]

\[
-5 = b
\]

\[
(x, y) \rightarrow (x + 3, y + 1)
\]

The radius is 4.

\[
r^2 = 16.
\]
Parallel chords intercept congruent arcs. \( m\widehat{AC} = m\widehat{BD} = 30 \). \( 180 - 30 - 30 = 120 \).

The slope of a line in standard form is \( \frac{A}{B} \) so the slope of this line is \( \frac{5}{3} \). Perpendicular lines have slope that are the opposite and reciprocal of each other.

\( \Delta PRT \) and \( \Delta SRQ \) share \( \angle R \) and it is given that \( \angle RPT \cong \angle RSQ \).

\[ 4(4x - 3) = 3(2x + 8) \]
\[ 16x - 12 = 6x + 24 \]
\[ 10x = 36 \]
\[ x = 3.6 \]
Geometry 2 Point Regents Exam Questions
Answer Section

589 ANS:

PTS: 2 REF: 011129ge STA: G.G.31 TOP: Isosceles Triangle Theorem

590 ANS:

PTS: 2 REF: 011233ge STA: G.G.17 TOP: Constructions

591 ANS:
\[
\frac{(n-2)180}{n} = \frac{(10-2)180}{10} = 144
\]

PTS: 2 REF: 011531ge STA: G.G.37 TOP: Interior and Exterior Angles of Polygons

592 ANS:

PTS: 2 REF: 081334ge STA: G.G.22 TOP: Locus

593 ANS:

PTS: 2 REF: 061430ge STA: G.G.34 TOP: Angle Side Relationship
594 ANS:

PTS: 2 \hspace{1cm} REF: 061232ge \hspace{1cm} STA: G.G.17 \hspace{1cm} TOP: Constructions

595 ANS:

\[
8.5 + 9 + 8.5 + 9 = 35
\]

PTS: 2 \hspace{1cm} REF: 081430ge \hspace{1cm} STA: G.G.42 \hspace{1cm} TOP: Midsegments

596 ANS:

\[
452. \ SA = 4\pi r^2 = 4\pi \cdot 6^2 = 144\pi \approx 452
\]

PTS: 2 \hspace{1cm} REF: 061029ge \hspace{1cm} STA: G.G.16 \hspace{1cm} TOP: Volume and Surface Area

597 ANS:

\[
m = \frac{3}{2}; \ m_\perp = -\frac{2}{3}; \ y = \frac{2}{3}x
\]

PTS: 2 \hspace{1cm} REF: 081533ge \hspace{1cm} STA: G.G.64 \hspace{1cm} TOP: Parallel and Perpendicular Lines

598 ANS:

\[
(x - 5)^2 + (y + 4)^2 = 36
\]

PTS: 2 \hspace{1cm} REF: 081132ge \hspace{1cm} STA: G.G.72 \hspace{1cm} TOP: Equations of Circles

599 ANS:

The slope of \( y = 2x + 3 \) is 2. The slope of \( 2y + x = 6 \) is \(-\frac{A}{B} = -\frac{1}{2}\). Since the slopes are opposite reciprocals, the lines are perpendicular.

PTS: 2 \hspace{1cm} REF: 011231ge \hspace{1cm} STA: G.G.63 \hspace{1cm} TOP: Parallel and Perpendicular Lines

600 ANS:

\[
Bh = V
\]

\[
12h = 84
\]

\[
h = 7
\]

PTS: 2 \hspace{1cm} REF: 011432ge \hspace{1cm} STA: G.G.12 \hspace{1cm} TOP: Volume
601 ANS:

\[ \left( \frac{3}{2} \right)^2 = \frac{27}{A} \]

\[ \frac{9}{4} = \frac{27}{A} \]

\[ 9A = 108 \]

\[ A = 12 \]

PTS: 2  REF: 061434ge  STA: G.G.45  TOP: Similarity

KEY: perimeter and area

602 ANS:

\[ A = 2B - 15 \]

\[ 2B - 15 + B + 2B - 15 + B = 180 \]

\[ C = A + B \]

\[ 6B - 30 = 180 \]

\[ C = 2B - 15 + B \]

\[ 6B = 210 \]

\[ B = 35 \]

PTS: 2  REF: 081332ge  STA: G.G.30  TOP: Interior and Exterior Angles of Triangles

603 ANS:

center: (3, -4); radius: \( \sqrt{10} \)

PTS: 2  REF: 081333ge  STA: G.G.73  TOP: Equations of Circles

604 ANS:

\[ (2a - 3, 3b + 2). \left( \frac{3a + a - 6}{2}, \frac{2b - 1 + 4b + 5}{2} \right) = \left( \frac{4a - 6}{2}, \frac{6b + 4}{2} \right) = (2a - 3, 3b + 2) \]

PTS: 2  REF: 061134ge  STA: G.G.66  TOP: Midpoint

605 ANS:

\[ A'(2, 2), B'(3, 0), C(1, -1) \]

PTS: 2  REF: 081329ge  STA: G.G.58  TOP: Dilations

606 ANS:

\[ \overline{BE} \text{ and } \overline{AD} \text{ intersect at point } C, \overline{BC} \cong \overline{EC}, \overline{AC} \cong \overline{DC}, \overline{AB} \text{ and } \overline{DE} \text{ are drawn (Given). } \angle BCA \cong \angle ECD \text{ (Vertical Angles). } \triangle ABC \cong \triangle DEC \text{ (SAS).} \]

PTS: 2  REF: 011529ge  STA: G.G.27  TOP: Triangle Proofs
ANS:

\[ \frac{180 - 80}{2} = 50 \]

PTS: 2  
REF: 081129ge  
STA: G.G.52  
TOP: Chords and Secants

ANS:

Contrapositive-If two angles of a triangle are not congruent, the sides opposite those angles are not congruent.

PTS: 2  
REF: fall0834ge  
STA: G.G.26  
TOP: Conditional Statements

ANS:

\[
9.1. \quad (11)(8)h = 800 \\
\quad h \approx 9.1
\]

PTS: 2  
REF: 0611131ge  
STA: G.G.12  
TOP: Volume

ANS:

\[
20. \quad 5x + 10 = 4x + 30 \\
\quad x = 20
\]

PTS: 2  
REF: 060934ge  
STA: G.G.45  
TOP: Similarity

ANS:

\[
5 \cdot 5 = 10w \\
\quad 25 = 10w \\
\quad 2.5 = w
\]

PTS: 2  
REF: 061432ge  
STA: G.G.11  
TOP: Volume
613 ANS:
70. \(3x + 5 + 3x + 5 + 2x + 2x = 180\)
\[10x + 10 = 360\]
\[10x = 350\]
\[x = 35\]
\[2x = 70\]

PTS: 2 REF: 081029ge STA: G.G.40 TOP: Trapezoids

614 ANS:
24 \cdot 6 = w \cdot 8
144 = 8w
18 = w

PTS: 2 REF: 011533ge STA: G.G.53 TOP: Segments Intercepted by Circle

KEY: two secants

615 ANS:
67. \(\frac{180 - 46}{2} = 67\)

PTS: 2 REF: 011029ge STA: G.G.31 TOP: Isosceles Triangle Theorem

616 ANS:
26. \(x + 3x + 5x - 54 = 180\)
\[9x = 234\]
\[x = 26\]

PTS: 2 REF: 080933ge STA: G.G.30 TOP: Interior and Exterior Angles of Triangles

617 ANS:
\[\sqrt{(3 - 7)^2 + (-4 - 2)^2} = \sqrt{16 + 36} = \sqrt{52} = \sqrt{4 \cdot 13} = 2\sqrt{13}.\]

PTS: 2 REF: 011431ge STA: G.G.67 TOP: Distance

618 ANS:
16.7. \(\frac{x}{25} = \frac{12}{18}\)
\[18x = 300\]
\[x \approx 16.7\]

PTS: 2 REF: 061133ge STA: G.G.46 TOP: Side Splitter Theorem
619 ANS:

\[
\sqrt{(6 - 3)^2 + (-1 - 8)^2} = \sqrt{9 + 81} = \sqrt{90} = \sqrt{9\times10} = 3\sqrt{10}.
\]

PTS: 2    REF: 011430ge    STA: G.G.18    TOP: Constructions

620 ANS:

\[
(6 - 3)^2 + (-1 - 8)^2 = \sqrt{9 + 81} = \sqrt{90} = 3\sqrt{10}.
\]

PTS: 2    REF: 061533ge    STA: G.G.67    TOP: Distance

621 ANS:

\(y = -2x + 14\). The slope of \(2x + y = 3\) is \(\frac{-A}{B} = \frac{-2}{1} = -2\). \(y = mx + b\) .

\[
4 = (-2)(5) + b
\]

\[
b = 14
\]

PTS: 2    REF: 060931ge    STA: G.G.65    TOP: Parallel and Perpendicular Lines

622 ANS:

\[
\text{Diagram}
\]

PTS: 2    REF: 011530ge    STA: G.G.18    TOP: Constructions
18. $V = \frac{1}{3}Bh = \frac{1}{3}lwh$

$288 = \frac{1}{3} \cdot 8 \cdot 6 \cdot h$

$288 = 16h$

$18 = h$

PTS: 2  
REF: 061034ge  
STA: G.G.13  
TOP: Volume

2 is not a prime number, false.

PTS: 2  
REF: 081229ge  
STA: G.G.24  
TOP: Negations

$EO = 6$. $CE = \sqrt{10^2 - 6^2} = 8$

PTS: 2  
REF: 011234ge  
STA: G.G.49  
TOP: Chords

PTS: 2  
REF: 061130ge  
STA: G.G.20  
TOP: Constructions

$\sqrt{(-4 - 2)^2 + (3 - 5)^2} = \sqrt{36 + 4} = \sqrt{40} = \sqrt{4 \cdot 10} = 2\sqrt{10}$.

PTS: 2  
REF: 081232ge  
STA: G.G.67  
TOP: Distance

$l = \sqrt{12^2 + 5^2} = \sqrt{169} = 13$. $L = \pi rl = \pi(5)(13) = 65\pi$

PTS: 2  
REF: 061531ge  
STA: G.G.15  
TOP: Volume and Lateral Area
630 ANS:
\[ L = \pi rl = \pi (15)(25) = 375\pi \]

631 ANS:
\[ R'(−3, −2), S'(−4, 4), \text{ and } T'(2, 2). \]

632 ANS:
The medians of a triangle are not concurrent. False.

633 ANS:
\[ (x + 1)^2 + (y − 2)^2 = 36 \]

634 ANS:

635 ANS:
The slope of \( x + 2y = 4 \) is \( m = \frac{-A}{B} = \frac{-1}{2} \). The slope of \( 4y − 2x = 12 \) is \( m = \frac{-A}{B} = \frac{2}{4} = \frac{1}{2} \). Since the slopes are neither equal nor opposite reciprocals, the lines are neither parallel nor perpendicular.
636 ANS:

\[ l_1w_1h_1 = l_2w_2h_2 \]
\[ 10 \times 2 \times h = 5 \times w_2 \times h \]
\[ 20 = 5w_2 \]
\[ w_2 = 4 \]

PTS: 2 REF: 060930ge STA: G.G.19 TOP: Constructions

637 ANS:

4. \[ l_1w_1h_1 = l_2w_2h_2 \]
\[ 10 \times 2 \times h = 5 \times w_2 \times h \]
\[ 20 = 5w_2 \]
\[ w_2 = 4 \]

PTS: 2 REF: 011030ge STA: G.G.11 TOP: Volume

638 ANS:

\[(x, y) \rightarrow (-y, x)\]
\[B(5, 1) \rightarrow B'(−1, 5)\]
\[C(−3, -2) \rightarrow C'(2, -3)\]

PTS: 2 REF: 061429ge STA: G.G.54 TOP: Rotations

639 ANS:

PTS: 2 REF: 011130ge STA: G.G.54 TOP: Reflections

KEY: grids
ANS:  
5x = 2(x + 12)  \( QM = 5(8) + (8) + 12 = 60 \)  
5x = 2x + 24  
3x = 24  
x = 8

PTS: 2  REF: 081433ge  STA: G.G.43  TOP: Centroid

641 ANS:  
Neither. The slope of \( y = \frac{1}{2}x - 1 \) is \( \frac{1}{2} \). The slope of \( y + 4 = -\frac{1}{2}(x - 2) \) is \( -\frac{1}{2} \). The slopes are neither the same nor opposite reciprocals.

PTS: 2  REF: 011433ge  STA: G.G.63  TOP: Parallel and Perpendicular Lines

642 ANS:  
2016. \( V = \frac{1}{3}Bh = \frac{1}{3}s^2h = \frac{1}{3}12^2 \cdot 42 = 2016 \)

PTS: 2  REF: 080930ge  STA: G.G.13  TOP: Volume

643 ANS:  

PTS: 2  REF: 011032ge  STA: G.G.20  TOP: Constructions

644 ANS:  

PTS: 2  REF: 061234ge  STA: G.G.23  TOP: Locus

645 ANS:  
6. The centroid divides each median into segments whose lengths are in the ratio 2 : 1. \( \overline{TD} = 6 \) and \( \overline{DB} = 3 \)

PTS: 2  REF: 011034ge  STA: G.G.43  TOP: Centroid
ANS:

If \( r = 5 \), then \( r^2 = 25 \). \( (x + 3)^2 + (y - 2)^2 = 25 \)

PTS: 2    REF: 011332ge    STA: G.G.71    TOP: Equations of Circles

ANS:

PTS: 2    REF: 011333ge    STA: G.G.19    TOP: Constructions

ANS:

37. Since \( DE \) is a midsegment, \( AC = 14 \). \( 10 + 13 + 14 = 37 \)

PTS: 2    REF: 061030ge    STA: G.G.42    TOP: Midsegments

ANS:

\[ L = 2\pi rh = 2\pi \cdot 12 \cdot 22 \approx 1659. \quad \frac{1659}{600} \approx 2.8. \quad 3 \text{ cans are needed.} \]

PTS: 2    REF: 061233ge    STA: G.G.14    TOP: Volume and Lateral Area

ANS:

\[ M = \left( \frac{3 + 3}{2}, \frac{-1 + 5}{2} \right) = (3,2). \quad y = 2. \]

PTS: 2    REF: 011334ge    STA: G.G.68    TOP: Perpendicular Bisector

ANS:

\[ m = \frac{-A}{B} = \frac{6}{2} = 3. \quad m_\perp = \frac{1}{3}. \]

652 ANS:

\[ V = \pi r^2 h = \pi (5)^2 \cdot 7 = 175\pi \]

653 ANS:

\[ 86^\circ \cdot 2 = 172^\circ 180^\circ - 86^\circ = 94^\circ \]

654 ANS:

\[ 2\sqrt{3} \cdot x^2 = 3 \cdot 4 \]

\[ x = \sqrt{12} = 2\sqrt{3} \]

655 ANS:

\[ \angle BCA = 63 \text{ and } \angle ABC = 80. \text{ } AC \text{ is the longest side as it is opposite the largest angle.} \]

656 ANS:

\[ \overline{AC} \]

657 ANS:

\[ \overline{AC} \]
658 ANS:
\[ x^2 = 9 \cdot 8 \]
\[ x = \sqrt{72} \]
\[ x = \sqrt{36} \cdot \sqrt{2} \]
\[ x = 6 \sqrt{2} \]

PTS: 2  REF: 011132ge  STA: G.G.53  TOP: Segments Intercepted by Circle

KEY: two chords

659 ANS:
25. \[ d = \sqrt{(-3 - 4)^2 + (1 - 25)^2} = \sqrt{49 + 576} = \sqrt{625} = 25. \]

PTS: 2  REF: fall0831ge  STA: G.G.67  TOP: Distance

KEY: general

660 ANS:
\[ (n - 2)180 = 540 \]
\[ \frac{540}{5} = 108 \]
\[ n - 2 = 3 \]
\[ n = 5 \]

PTS: 2  REF: 081434ge  STA: G.G.37  TOP: Interior and Exterior Angles of Polygons

661 ANS:

PCS: 2  REF: 081429ge  STA: G.G.58  TOP: Dilations

662 ANS:
\[ L = 2\pi rh = 2\pi \cdot 3 \cdot 7 = 42\pi \]

PTS: 2  REF: 061329ge  STA: G.G.14  TOP: Volume and Lateral Area

663 ANS:
\[ \left\{ \frac{0+1}{2}, \frac{4-4}{2} \right\} = \left\{ \frac{1}{2}, 0 \right\} \]

PTS: 2  REF: 081534ge  STA: G.G.69  TOP: Quadrilaterals in the Coordinate Plane
ANS:

\[ \sqrt{(7 - 3)^2 + (-8 - 0)^2} = \sqrt{16 + 64} = \sqrt{80} = 4\sqrt{5} \]

PTS: 2    REF: 081033ge    STA: G.G.22    TOP: Locus

665

ANS:

\[ (7 - 3)^2 + (-8 - 0)^2 = 16 + 64 = 80 \]

PTS: 2    REF: 061331ge    STA: G.G.69    TOP: Triangles in the Coordinate Plane

666

ANS:

\[ 2x + 7 = 25 \quad NT = 4.5 \]
\[ 2x = 18 \]
\[ x = 9 \]

PTS: 2    REF: 011330ge    STA: G.G.50    TOP: Tangents

KEY: common tangency

667

ANS:

\[ x^2 = 8(10 + 8) \]
\[ x^2 = 144 \]
\[ x = 12 \]

PTS: 2    REF: 081531ge    STA: G.G.42    TOP: Midsegments

KEY: leg

668

ANS:

\[ \frac{m_{AB}}{4 - 2} = \frac{3}{2}, \quad m_{BC} = \frac{-2}{3} \]

PTS: 4    REF: 061334ge    STA: G.G.69    TOP: Quadrilaterals in the Coordinate Plane
670 ANS:

PTS: 2
REF: 060932ge
STA: G.G.22
TOP: Locus

671 ANS:

\[ m = \frac{1}{3} \quad 4 = \frac{1}{3}(-3) + b \quad y = \frac{1}{3}x + 5 \]

\[ 4 = -1 + b \]

\[ 5 = b \]

PTS: 2
REF: 081330ge
STA: G.G.17
TOP: Constructions

672 ANS:

PTS: 2
REF: 011532ge
STA: G.G.65
TOP: Parallel and Perpendicular Lines

673 ANS:

PTS: 2
REF: 061532ge
STA: G.G.18
TOP: Constructions
\[ V = \frac{4}{3} \pi \cdot 9^3 = 972\pi \]

PTS: 2    REF: 081131ge    STA: G.G.16    TOP: Volume and Surface Area

\[ \angle ACB \cong \angle AED \text{ is given.} \triangle A \cong \triangle A \text{ because of the reflexive property. Therefore } \triangle ABC \sim \triangle ADE \text{ because of AA.} \]

PTS: 2    REF: 081133ge    STA: G.G.44    TOP: Similarity Proofs
ANS:
5. \[
\frac{3}{x} = \frac{6 + 3}{15}
\]
9x = 45
x = 5

PTS: 2  REF: 011033ge  STA: G.G.46  TOP: Side Splitter Theorem

ANS:
2x - 20 = x + 20. \(\overline{AB} = x + 20 = 40 + 20 = 60\)
\[x = 40\]

PTS: 2  REF: 011229ge  STA: G.G.52  TOP: Chords and Secants

ANS:
\[
\sqrt{(-1 - 3)^2 + (4 - (-2))^2} = \sqrt{16 + 36} = \sqrt{52} = 4\sqrt{13}
\]

PTS: 2  REF: 081331ge  STA: G.G.67  TOP: Distance

ANS:
34. 2x - 12 + x + 90 = 180
3x + 78 = 90
3x = 102
x = 34

PTS: 2  REF: 061031ge  STA: G.G.30  TOP: Interior and Exterior Angles of Triangles

ANS:
22.4. \[
V = \pi r^2 h
\]
12566.4 = \pi r^2 \cdot 8
\[
r^2 = \frac{12566.4}{8\pi}
\]
\[r \approx 22.4\]

PTS: 2  REF: fall0833ge  STA: G.G.14  TOP: Volume and Lateral Area

ANS:
\[
T_{-2,1} (0,1)
\]

PTS: 2  REF: 081431ge  STA: G.G.54  TOP: Translations
685 ANS:

PTS: 2  REF: 061333ge  STA: G.G.23  TOP: Locus

686 ANS:
110.  
6x + 20 = x + 40 + 4x − 5
6x + 20 = 5x + 35
x = 15
6((15) + 20 = 110

PTS: 2  REF: 081031ge  STA: G.G.32  TOP: Exterior Angle Theorem

687 ANS:
180 − (90 + 63) = 27

PTS: 2  REF: 061230ge  STA: G.G.35  TOP: Parallel Lines and Transversals

688 ANS:
y = \frac{2}{3}x − 9.  The slope of 2x − 3y = 11 is \frac{A}{B} = \frac{-2}{-3} = \frac{2}{3} −5 = \left(\frac{2}{3}\right)(6) + b

−5 = 4 + b
b = −9

PTS: 2  REF: 080931ge  STA: G.G.65  TOP: Parallel and Perpendicular Lines

689 ANS:
\frac{5}{5 + 6 + 7} \cdot 180 = 50

PTS: 2  REF: 061529ge  STA: G.G.30  TOP: Interior and Exterior Angles of Triangles

690 ANS:
Distance is preserved after the reflection.  2x + 13 = 9x − 8
21 = 7x
3 = x

691 ANS:

\[ (a, b) \]

\[ (c, d) \]

PTS: 2  REF: 061032ge  STA: G.G.54  TOP: Reflections
KEY: grids

692 ANS:

\[(5 - 2)180 = 540. \quad \frac{540}{5} = 108 \text{ interior. } 180 - 108 = 72 \text{ exterior} \]

PTS: 2  REF: 011131ge  STA: G.G.37  TOP: Interior and Exterior Angles of Polygons

693 ANS:

\[ x^2 + 7^2 = 25^2 \]

\[ x^2 + 49 = 625 \]

\[ x^2 = 576 \]

\[ x = 24 \]

PTS: 2  REF: fall0830ge  STA: G.G.55  TOP: Properties of Transformations
KEY: point of tangency

694 ANS:

\[ x^2 + 7^2 = 25^2 \]

\[ x^2 + 49 = 625 \]

\[ x^2 = 576 \]

\[ x = 24 \]

PTS: 2  REF: 061433ge  STA: G.G.50  TOP: Tangents
KEY: point of tangency
20. The sides of the triangle formed by connecting the midpoints are half the sides of the original triangle.

\[5 + 7 + 8 = 20.\]

\[(n - 2)180 = (8 - 2)180 = 1080. \quad \frac{1080}{8} = 135.\]
700 ANS:

PTS: 2 REF: 061530ge STA: G.G.54 TOP: Reflections
KEY: grids

701 ANS:

180 - \left( \frac{84}{2} + 28 \right) = 180 - 70 = 110

PTS: 2 REF: 061534ge STA: G.G.21 TOP: Centroid, Orthocenter, Incenter and Circumcenter

702 ANS:

\frac{x - 1}{4} = \frac{-3}{8}

8x - 8 = -12

8x = -4

x = -\frac{1}{2}

PTS: 2 REF: 011534ge STA: G.G.62 TOP: Parallel and Perpendicular Lines

703 ANS:

Yes. A reflection is an isometry.


704 ANS:

3. The non-parallel sides of an isosceles trapezoid are congruent. 2x + 5 = 3x + 2

x = 3

PTS: 2 REF: 080929ge STA: G.G.40 TOP: Trapezoids
PTS: 2  REF: 081234ge  STA: G.G.23  TOP: Locus

706 ANS:

PTS: 2  REF: 081532ge  STA: G.G.20  TOP: Constructions

707 ANS:

\[ T'(-6,3), A'(-3,3), P'(-3,-1) \]

\[ (6, -4). \quad C_x = \frac{Q_x + R_x}{2}, \quad C_y = \frac{Q_y + R_y}{2}. \]

\[
3.5 = \frac{1 + R_x}{2} \quad 2 = \frac{8 + R_y}{2} \\
7 = 1 + R_x \quad 4 = 8 + R_y \\
6 = R_x \quad -4 = R_y
\]
(7,5) \( m_{AB} = \left( \frac{3+7}{2}, \frac{3+9}{2} \right) = (5,6) \quad m_{BC} = \left( \frac{7+11}{2}, \frac{9+3}{2} \right) = (9,6) \)

713 ANS:
True. The first statement is true and the second statement is false. In a disjunction, if either statement is true, the disjunction is true.

714 ANS:
\( SA = 4\pi r^2 = 4\pi \cdot 2.5^2 = 25\pi \approx 78.54 \)
Geometry 4 Point Regents Exam Questions
Answer Section

715 ANS:

$A'(7,-4), B'(7,-1), C'(9,-4)$. The areas are equal because translations preserve distance.


716 ANS:

\[ V = \pi r^2 h \quad L = 2\pi rh = 2\pi \cdot 5\sqrt{2} \cdot 12 \approx 533.1 \]

\[ 600\pi = \pi r^2 \cdot 12 \]

\[ 50 = r^2 \]

\[ \sqrt{25\cdot2} = r \]

\[ 5\sqrt{2} = r \]

PTS: 4 REF: 011236ge STA: G.G.14 TOP: Volume and Lateral Area

717 ANS:

\[ h = \sqrt{5^2 - 3^2} = 4 \quad V = \frac{1}{3} \pi \cdot 3^2 \cdot 4 = 12\pi \quad V = \pi \cdot 4^2 \cdot 6 = 96\pi \quad \frac{96\pi}{12\pi} = 8 \]


718 ANS:

PTS: 4 REF: 011135ge STA: G.G.23 TOP: Locus
719 ANS:

![Diagram showing midsegments](image1)

PTS: 4 REF: fall0835ge STA: G.G.42 TOP: Midsegments

720 ANS:

\[JK \cong LM\] because opposite sides of a parallelogram are congruent. \[LM \cong LN\] because of the Isosceles Triangle Theorem. \[LM \cong JM\] because of the transitive property. \(JKLM\) is a rhombus because all sides are congruent.

PTS: 4 REF: 011036ge STA: G.G.27 TOP: Quadrilateral Proofs

721 ANS:

![Graph with coordinates](image2)

PTS: 4 REF: 081535ge STA: G.G.23 TOP: Locus

722 ANS:

\(\angle B\) and \(\angle E\) are right angles because of the definition of perpendicular lines. \(\angle B \cong \angle E\) because all right angles are congruent. \(\angle BFD\) and \(\angle DFE\) are supplementary and \(\angle ECA\) and \(\angle ACB\) are supplementary because of the definition of supplementary angles. \(\angle DFE \cong \angle ACB\) because angles supplementary to congruent angles are congruent. \(\triangle ABC \sim \triangle DEF\) because of AA.

PTS: 4 REF: 011136ge STA: G.G.44 TOP: Similarity Proofs

723 ANS:

\[
\begin{align*}
32. \quad \frac{16}{20} &= \frac{x - 3}{x + 5} \quad \Rightarrow \quad AC &= x - 3 = 35 - 3 = 32 \\
16x + 80 &= 20x - 60 \\
140 &= 4x \\
35 &= x
\end{align*}
\]

PTS: 4 REF: 011137ge STA: G.G.46 TOP: Side Splitter Theorem
724 ANS:

\[ 2(y + 10) = 4y - 20. \quad DF = y + 10 = 20 + 10 = 30. \quad OA = OD = \sqrt{16^2 + 30^2} = 34 \]

725 ANS:

\[ 2y + 20 = 4y - 20 \]
\[ 40 = 2y \]
\[ 20 = y \]

726 ANS:

\[ G''(3,3), H''(7,7), S''(-1,9) \]
727 ANS:

PTS: 4 REF: fall0837ge STA: G.G.23 TOP: Locus

728 ANS:

30. \(3x + 4x + 5x = 360\). \(m\angle LN : m\angle NK : m\angle KL = 90 : 120 : 150\). \(\frac{150 - 90}{2} = 30\)

\[x = 20\]

PTS: 4 REF: 061136ge STA: G.G.51 TOP: Arcs Determined by Angles
KEY: outside circle

729 ANS:

\(\angle D, \angle G\) and \(24^\circ\) or \(\angle E, \angle F\) and \(84^\circ\). \(m\overparen{FE} = \frac{2}{15} \times 360 = 48\). Since the chords forming \(\angle D\) and \(\angle G\) are intercepted by \(\overparen{FE}\), their measure is \(24^\circ\). \(m\overparen{GD} = \frac{7}{15} \times 360 = 168\). Since the chords forming \(\angle E\) and \(\angle F\) are intercepted by \(\overparen{GD}\), their measure is \(84^\circ\).

PTS: 4 REF: fall0836ge STA: G.G.51 TOP: Arcs Determined by Angles
KEY: inscribed

730 ANS:

PTS: 4 REF: 061437ge STA: G.G.17 TOP: Constructions
731 ANS:
\[ x^2 + 12 + 11x + 5 + 13x - 17 = 180. \quad m\angle A = 6^2 + 12 = 48 \quad \angle B \text{ is the largest angle, so } \overline{AC} \text{ in the longest side.} \]
\[ x^2 + 24x - 180 = 0 \quad m\angle B = 11(6) + 5 = 71 \]
\[ (x + 30)(x - 6) = 0 \quad m\angle C = 13(6) - 7 = 61 \]
\[ x = 6 \]

PTS: 4  REF: 011337ge STA: G.G.34 TOP: Angle Side Relationship

732 ANS:
\[ 12x - 4 + 7x + 13 = 180. \quad 16y + 1 = \frac{12y + 1 + 18y + 6}{2} \]
\[ 19x + 9 = 180 \quad 32y + 2 = 30y + 7 \]
\[ 19x = 171 \quad 2y = 5 \]
\[ x = 9 \quad y = \frac{5}{2} \]

PTS: 4  REF: 081337ge STA: G.G.40 TOP: Trapezoids

733 ANS:

PTS: 4  REF: 011037ge STA: G.G.23 TOP: Locus

734 ANS:

PTS: 3  REF: 011436ge STA: G.G.58 TOP: Compositions of Transformations

KEY: grids
36, because a dilation does not affect angle measure. 10, because a dilation does affect distance.

\[ \overline{BD} \cong \overline{DB} \text{ (Reflexive Property); } \triangle ABD \cong \triangle CDB \text{ (SSS); } \angle BDC \cong \angle ABD \text{ (CPCTC).} \]

\[ l = \sqrt{10^2 + 3^2} = \sqrt{109} \quad L = \pi rl = \pi(3)(\sqrt{109}) \approx 98.4 \]

\[ 6x - 6 = 4x + 2 \quad m\angle BCA = 4(4) + 2 = 18 \quad 7y - 15 = 5y - 1 \quad m\angle BAC = 5(7) - 1 = 34 \quad m\angle B = 180 - (18 + 34) = 128 \]

\[ 2x = 8 \quad 2y = 14 \quad x = 4 \quad y = 7 \]
741 ANS:

PTS: 4  REF: 081437ge  STA: G.G.18  TOP: Constructions

742 ANS:

11. \[ x^2 + 6x = x + 14. \]
\[ 6(2) - 1 = 11 \]
\[ x^2 + 5x - 14 = 0 \]
\[ (x + 7)(x - 2) = 0 \]
\[ x = 2 \]

PTS: 2  REF: 081235ge  STA: G.G.38  TOP: Parallelograms

743 ANS:

PTS: 4  REF: 080936ge  STA: G.G.23  TOP: Locus

744 ANS:

\[ x^2 - 8x = 5x + 30. \]
\[ m\angle C = 4(15) - 5 = 55 \]
\[ x^2 - 13x - 30 = 0 \]
\[ (x - 15)(x + 2) = 0 \]
\[ x = 15 \]

PTS: 4  REF: 061337ge  STA: G.G.45  TOP: Similarity

KEY: basic
745 ANS: 

\[ y = \frac{2}{3}x + 1 \]
\[ 2y + 3x = 6 \]
\[ y = mx + b \]

\[ 2y = -3x + 6 \]
\[ 5 = \frac{2}{3}(6) + b \]

\[ y = \frac{-3}{2}x + 3 \]
\[ 5 = 4 + b \]

\[ m = \frac{-3}{2} \]
\[ 1 = b \]

\[ m_\perp = \frac{2}{3} \]
\[ y = \frac{2}{3}x + 1 \]

PTS: 4 REF: 061036ge STA: G.G.64 TOP: Parallel and Perpendicular Lines

746 ANS: 

\[ M = \left( \frac{4+8}{2}, \frac{2+6}{2} \right) = (6,4) \]
\[ m = \frac{6-2}{8-4} = \frac{4}{4} = 1 \]
\[ m_\perp = -1 \]
\[ y - 1 = -(x - 6) \]

PTS: 4 REF: 081536ge STA: G.G.68 TOP: Perpendicular Bisector

747 ANS: 

No, \( \angle KGH \) is not congruent to \( \angle GKH \).

PTS: 2 REF: 081135ge STA: G.G.31 TOP: Isosceles Triangle Theorem

748 ANS: 

\[ A'(5,-4), B'(5,1), C'(2,1), D'(2,-6); A''(5,4), B''(5,-1), C''(2,-1), D''(2,6) \]

PTS: 4 REF: 061236ge STA: G.G.58 TOP: Compositions of Transformations

KEY: grids
749 ANS:
Midpoint: $\left(\frac{-4+4}{2}, \frac{2+(-4)}{2}\right) = (0,-1)$. Distance: $d = \sqrt{(-4-4)^2 + (2-(-4))^2} = \sqrt{100} = 10$
\[r = 5\]
\[r^2 = 25\]
\[x^2 + (y + 1)^2 = 25\]


750 ANS:
MT and HA intersect at B, MA $\parallel$ HT, and MT bisects HA (Given). $\angle MBA \cong \angle TBH$ (Vertical Angles).
$\angle A \cong \angle H$ (Alternate Interior Angles). BH $\cong$ BA (The bisection of a line segment creates two congruent segments). $\triangle MAB \cong \triangle THB$ (ASA). MA $\cong$ HT (CPCTC).

PTS: 4  REF: 081435ge  STA: G.G.27  TOP: Triangle Proofs

751 ANS:
$\angle B$ and $\angle C$ are right angles because perpendicular lines form right angles. $\angle B \cong \angle C$ because all right angles are congruent. $\triangle AEB \cong \triangle DEC$ because vertical angles are congruent. $\triangle ABE \cong \triangle DCE$ because of ASA. AB $\cong$ DC because CPCTC.


752 ANS:
$y = \frac{4}{3}x - 6$. $M_x = \frac{-1+7}{2} = 3$  The perpendicular bisector goes through $(3,-2)$ and has a slope of $\frac{4}{3}$.

\[M_y = \frac{1+(-5)}{2} = -2\]

\[m = \frac{1-(-5)}{-1-7} = -\frac{3}{4}\]

\[y - y_M = m(x - x_M)\]

\[y - 1 = \frac{4}{3}(x - 2)\]

PTS: 4  REF: 080935ge  STA: G.G.68  TOP: Perpendicular Bisector
753 ANS:

754 ANS:
\[
x + 3x - 60 + 5x - 30 = 180 \\
5(30) - 30 = 120 \\
6y - 8 = 4y - 2 \\
\overline{DC} = 10 + 10 = 20 \\
9x - 90 = 180 \\
m\angle BAC = 180 - 120 = 60 \\
2y = 6 \\
y = 3 \\
x = 30 = m\angle D \\
4(3) - 2 = 10 = \overline{BC}
\]

755 ANS:
\[
4x \cdot x = 6^2 \\
4x^2 = 36 \\
x^2 = 9 \\
x = 3 \\
\overline{BD} = 4(3) = 12
\]
756 ANS:

\[ D'(-1, 1), E'(-1, 5), G'(-4, 5) \]


757 ANS:

PTS: 4  REF: 081537ge  STA: G.G.74  TOP: Graphing Circles

758 ANS:

\[
\begin{align*}
2 & \quad \frac{x + 2}{x} = \frac{x + 6}{4} \\
& \quad x^2 + 6x = 4x + 8 \\
& \quad x^2 + 2x - 8 = 0 \\
& \quad (x + 4)(x - 2) = 0 \\
& \quad x = 2
\end{align*}
\]

PTS: 4  REF: 081137ge  STA: G.G.45  TOP: Similarity

KEY: basic

759 ANS:

Yes, \( m\angle ABD = m\angle BDC = 44 \) \( 180 - (93 + 43) = 44 \) \( x + 19 + 2x + 6 + 3x + 5 = 180 \). Because alternate interior angles \( \angle ABD \) and \( \angle CDB \) are congruent, \( AB \) is parallel to \( DC \).

PTS: 4  REF: 081035ge  STA: G.G.35  TOP: Parallel Lines and Transversals
760 ANS:

PTS: 4  REF: 061537ge  STA: G.G.22  TOP: Locus

761 ANS:

PTS: 4  REF: 081236ge  STA: G.G.58  TOP: Compositions of Transformations

KEY: grids

762 ANS:

2.4.  $5a = 4^2  \quad 5b = 3^3  \quad h^2 = ab$

$a = 3.2  \quad b = 1.8  \quad h^2 = 3.2 \cdot 1.8$

$h = \sqrt{5.76} = 2.4$

PTS: 4  REF: 081037ge  STA: G.G.47  TOP: Similarity

KEY: leg

763 ANS:

18. If the ratio of $TA$ to $AC$ is 1:3, the ratio of $TE$ to $ES$ is also 1:3. $x + 3x = 24$. $3(6) = 18$.

$x = 6$

PTS: 4  REF: 060935ge  STA: G.G.50  TOP: Tangents

KEY: common tangency
764 ANS:

\[
M \left( \frac{-7 + 5}{2}, \frac{2 + 4}{2} \right) = M(-1,3). \quad N \left( \frac{3 + 5}{2}, \frac{-4 + 4}{2} \right) = N(4,0). \quad \overline{MN} \text{ is a midsegment.}
\]

765 ANS:

\[
M \left( \frac{-7 + 5}{2}, \frac{2 + 4}{2} \right) = M(-1,3). \quad N \left( \frac{3 + 5}{2}, \frac{-4 + 4}{2} \right) = N(4,0). \quad \overline{MN} \text{ is a midsegment.}
\]

766 ANS:

\[
\Delta ABC, \overline{BD} \text{ bisects } \angle ABC, \overline{BD} \perp \overline{AC} \text{ (Given).} \quad \angle CBD \cong \angle ABD \text{ (Definition of angle bisector).} \quad \overline{BD} \cong \overline{BD} \text{ (Reflexive property).} \quad \angle CDB \text{ and } \angle ADB \text{ are right angles (Definition of perpendicular).} \quad \angle CDB \cong \angle ADB \text{ (All right angles are congruent).} \quad \Delta CDB \cong \Delta ADB \text{ (SAS).} \quad \overline{AB} \cong \overline{CB} \text{ (CPCTC).}
\]

767 ANS:

\[
15 + 5\sqrt{5}.
\]
14

768 ANS:

\[ M''(1,-2), A''(6,-2), T''(5,-4), H''(3,-4) \]

PTS: 4  REF: 081336ge  STA: G.G.58  TOP: Compositions of Transformations

KEY: grids

769 ANS:

\[ S''(5,-3), W''(3,-4), A''(2,1), \text{ and } N''(4,2) \]

PTS: 4  REF: 061335ge  STA: G.G.58  TOP: Compositions of Transformations

KEY: grids

770 ANS:

\[ x(x + 2) = 12 \cdot 2 \Rightarrow x^2 + 2x - 24 = 0 \]

\[ (x + 6)(x - 4) = 0 \]

\[ x = 4, y = 12 \]

PTS: 4  REF: 061237ge  STA: G.G.53  TOP: Segments Intercepted by Circle

KEY: tangent and secant
771 ANS:

\[ A''(11,1), B''(3,7), C''(3,1) \]

PTS: 4 REF: 011336ge STA: G.G.58 TOP: Compositions of Transformations

772 ANS:

PTS: 4 REF: 061535ge STA: G.G.70 TOP: Quadratic-Linear Systems

773 ANS:

\[ H'(7,0), Y'(6,4), P'(3,4), E'(3,1) \]

\[ H''(7,0), Y''(6,−4), P''(3,−4), E''(3,−1) \]

PTS: 4 REF: 011535ge STA: G.G.58 TOP: Compositions of Transformations

KEY: grids
774 ANS:

\[ A''(8,2), B''(2,0), C''(6,-8) \]

PTS: 4  REF: 081036ge  STA: G.G.58  TOP: Compositions of Transformations

775 ANS:

PTS: 4  REF: 060937ge  STA: G.G.54  TOP: Compositions of Transformations

KEY: grids

776 ANS:

PTS: 4  REF: 061135ge  STA: G.G.23  TOP: Locus
777 ANS:

PTS: 4 REF: 011536ge STA: G.G.23 TOP: Locus
Geometry 6 Point Regents Exam Questions: Due to ExamView limitations, the following problems can not be numbered correctly. Precede each number with a 7

Answer Section

78 ANS:

\[ 52, 40, 80. \quad 360 - (56 + 112) = 192. \quad \frac{192 - 112}{2} = 40. \quad \frac{112 + 48}{2} = 80 \]

\[ \frac{1}{4} \times 192 = 48 \]

\[ \frac{56 + 48}{2} = 52 \]

PTS: 6 REF: 081238ge STA: G.G.51 TOP: Arcs Determined by Angles

KEY: mixed

79 ANS:

\[ \overline{FE} \cong \overline{FE} \text{ (Reflexive Property)}; \quad \overline{AE} - \overline{FE} \cong \overline{FC} - \overline{EF} \text{ (Line Segment Subtraction Theorem)}; \quad \overline{AF} \cong \overline{CE} \text{ (Substitution)}; \quad \angle BFA \cong \angle DEC \text{ (All right angles are congruent)}; \quad \triangle BFA \cong \triangle DEC \text{ (AAS)}; \]

\[ \overline{AB} \cong \overline{CD} \text{ and } \overline{BF} \cong \overline{DE} \text{ (CPCTC)}; \quad \angle BFC \cong \angle DEA \text{ (All right angles are congruent)}; \quad \triangle BFC \cong \triangle DEA \text{ (SAS)}; \]

\[ \overline{AD} \cong \overline{CB} \text{ (CPCTC)}; \quad ABCD \text{ is a parallelogram (opposite sides of quadrilateral } ABCD \text{ are congruent)} \]


ANS:

Rectangle \(ABCD\) with points \(E\) and \(F\) on side \(AB\), segments \(CE\) and \(DF\) intersect at \(G\), and \(\angle ADG \cong \angle BCE\) are given. \(AD \cong BC\) because opposite sides of a rectangle are congruent. \(\angle A\) and \(\angle B\) are right angles and congruent because all angles of a rectangle are right and congruent. \(\triangle ADF \cong \triangle BCE\) by ASA. \(\overline{AF} \cong \overline{BE}\) per CPCTC. \(EF \cong FE\) under the Reflexive Property. \(\overline{AF} - \overline{EF} \cong \overline{BE} - \overline{FE}\) using the Subtraction Property of Segments. \(\overline{AE} \cong \overline{BF}\) because of the Definition of Segments.


80 ANS:

\[ \overline{AB} \cong \overline{DB} \quad \text{because } \overline{AB} \cong \overline{DB}; \quad \overline{AD} \cong \overline{BC} \quad \text{because opposite sides of a rectangle are congruent}; \quad \angle A \text{ and } \angle B \text{ are right angles and congruent because all angles of a rectangle are right and congruent. } \triangle ADF \cong \triangle BCE \text{ by ASA}. \quad \overline{AF} \cong \overline{BE} \text{ per CPCTC}. \]

\(EF \cong FE\) under the Reflexive Property. \(\overline{AF} - \overline{EF} \cong \overline{BE} - \overline{FE}\) using the Subtraction Property of Segments. \(\overline{AE} \cong \overline{BF}\) because of the Definition of Segments.

PTS: 6 REF: 001238ge STA: G.G.70 TOP: Quadratic-Linear Systems
\[ (x - 3)^2 + (y + 2)^2 = 25 \]

\[ m = \frac{-6 - 4}{0 - 2} = \frac{-2}{-2} = 1 \]

\[ M\left(\frac{0 + 2}{2}, \frac{-6 - 4}{2}\right) = M(1, -5) \]

\[ m_2 = -1 \]

\[ -5 = (-1)(1) + b \]

\[ -4 = b \]

\[ y = -x - 4 \]

PTS: 6  REF: 081438ge  STA: G.G.23  TOP: Locus

\[ AC \cong EC \text{ and } DC \cong BC \] because of the definition of midpoint. \[ \angle ACB \cong \angle ECD \] because of vertical angles. \[ \triangle ABC \cong \triangle EDC \] because of SAS. \[ \angle CDE \cong \angle CBA \] because of CPCTC. \( BD \) is a transversal intersecting \( AB \) and \( ED \). Therefore \( AB \parallel DE \) because \( \angle CDE \) and \( \angle CBA \) are congruent alternate interior angles.


\[ AB \parallel CD \text{ and } AD \parallel CB \] because their slopes are equal. \( ABCD \) is a parallelogram because opposite side are parallel. \( AB \neq BC \). \( ABCD \) is not a rhombus because all sides are not equal. \( AB \perp BC \) because their slopes are not opposite reciprocals. \( ABCD \) is not a rectangle because \( \angle ABC \) is not a right angle.

PTS: 4  REF: 081038ge  STA: G.G.69  TOP: Quadrilaterals in the Coordinate Plane
85 ANS:
\[ \overline{OA} \cong \overline{OB} \] because all radii are equal.  
\[ \overline{OP} \cong \overline{OP} \] because of the reflexive property.  
\[ \overline{OA} \perp \overline{PA} \] and \[ \overline{OB} \perp \overline{PB} \] because tangents to a circle are perpendicular to a radius at a point on a circle.  
\[ \angle PAO \cong \angle PBO \] because all right angles are congruent.  
\[ \triangle AOP \cong \triangle BOP \] because of HL.  
\[ \angle AOP \cong \angle BOP \] because of CPCTC.

PTS: 6  REF: 061138ge  STA: G.G.27  TOP: Circle Proofs

86 ANS:
2. The diameter of a circle is \( \perp \) to a tangent at the point of tangency.  
4. An angle inscribed in a semicircle is a right angle.  
5. All right angles are congruent.  
7. AA.  
8. Corresponding sides of congruent triangles are in proportion.  
9. The product of the means equals the product of the extremes.

PTS: 6  REF: 011438ge  STA: G.G.27  TOP: Circle Proofs

87 ANS:
Parallelogram \( DEFG \), \( K \) and \( H \) are points on \( \overrightarrow{DE} \) such that \( \angle DGK \cong \angle EFH \) and \( \overrightarrow{GK} \) and \( \overrightarrow{FH} \) are drawn (given).  
\[ \overrightarrow{DG} \cong \overrightarrow{EF} \] (opposite sides of a parallelogram are congruent).  
\[ \overrightarrow{DG} \parallel \overrightarrow{EF} \] (opposite sides of a parallelogram are parallel).  
\[ \angle D \cong \angle FEH \] (corresponding angles formed by parallel lines and a transversal are congruent).

\[ \triangle DGK \cong \triangle EFH \text{ (ASA)}. \]  
\[ \overrightarrow{DK} \cong \overrightarrow{EH} \text{ (CPCTC)}. \]


88 ANS:
\[ m_{\overline{AB}} = \left( \frac{-6 + 2}{2}, \frac{-2 + 8}{2} \right) = D(2,3) \]  
\[ m_{\overline{BC}} = \left( \frac{2 + 6}{2}, \frac{8 + (-2)}{2} \right) = E(4,3) \]  
\[ F(0,-2). \]  
To prove that \( ADEF \) is a parallelogram, show that both pairs of opposite sides of the parallelogram are parallel by showing the opposite sides have the same slope:  
\[ m_{\overline{AD}} = \frac{3 - (-2)}{-2 - 6} = \frac{5}{4} \]  
\[ \overrightarrow{AF} \parallel \overrightarrow{DE} \] because all horizontal lines have the same slope.  
\[ ADEF \] is not a rhombus because not all sides are congruent.  
\[ AD = \sqrt{5^2 + 4^2} = \sqrt{41} \]  
\[ AF = 6 \]

PTS: 6  REF: 081138ge  STA: G.G.69  TOP: Quadrilaterals in the Coordinate Plane
Since both opposite sides have equal slopes and are parallel, $JKLM$ is a parallelogram.

$JM = \sqrt{(-3 - 3)^2 + (1 - 4)^2} = \sqrt{45}$. $JKLM$ is not congruent to $ML$, so $JKLM$ is not a rhombus since not all sides are congruent.

$x(x + 16) = 15^2 \quad 25 \cdot 34 = y^2$

$x^2 + 16x - 225 = 0 \quad 5\sqrt{34} = y$

$(x + 25)(x - 9) = 0$

$x = 9$

Because $AB \parallel DC$, $\overline{AD} \cong \overline{BC}$ since parallel chords intersect congruent arcs. $\angle BDC \cong \angle ACD$ because inscribed angles that intercept congruent arcs are congruent. $\overline{AD} \cong \overline{BC}$ since congruent chords intersect congruent arcs. $\angle DAC \cong \angle DBC$ because inscribed angles that intercept the same arc are congruent. Therefore, $\triangle ACD \cong \triangle BDC$ because of AAS.

$\triangle MAH$, $\overline{MH} \cong \overline{AH}$ and medians $\overline{AB}$ and $\overline{MT}$ are given. $\overline{MA} \cong \overline{AM}$ (reflexive property). $\triangle MAH$ is an isosceles triangle (definition of isosceles triangle). $\angle AMB \cong \angle MAT$ (isosceles triangle theorem). $B$ is the midpoint of $\overline{MH}$ and $T$ is the midpoint of $\overline{AH}$ (definition of median). $m_{\overline{MB}} = \frac{1}{2} m_{\overline{MH}}$ and $m_{\overline{AT}} = \frac{1}{2} m_{\overline{AH}}$ (definition of midpoint). $\overline{MB} \cong \overline{AT}$ (multiplication postulate). $\triangle MBA \cong \triangle ATM$ (SAS). $\angle MBA \cong \angle ATM$ (CPCTC).
93 ANS:

\[ 8x - 5 = 3x + 30, \quad 4z - 8 = 3z, \quad 9y + 8 + 5y - 2 = 90. \]

\[ 5x = 35 \quad z = 8 \quad 14y + 6 = 90 \]

\[ x = 7 \quad 14y = 84 \quad y = 6 \]


94 ANS:

PTS: 6 REF: 011038ge STA: G.G.70 TOP: Quadratic-Linear Systems
ANS:

\[ M\left(\frac{-7+3}{2}, \frac{4+6}{2}\right) = M(-5,5) \]
\[ m_{MN} = \frac{5-3}{-5-0} = \frac{2}{-5}, \] Since both opposite sides have equal slopes and are

\[ N\left(\frac{-3+3}{2}, \frac{6+0}{2}\right) = N(0,3) \]
\[ m_{PQ} = \frac{-4-2}{2-3} = \frac{-2}{5}, \]

\[ P\left(\frac{3+1}{2}, \frac{0+-8}{2}\right) = P(2,-4) \]
\[ m_{NA} = \frac{3-4}{0-2} = \frac{7}{-2}, \]

\[ Q\left(\frac{-7+1}{2}, \frac{4+-8}{2}\right) = Q(-3,-2) \]
\[ m_{QM} = \frac{-2-5}{-3-5} = \frac{-7}{2}. \]

Since both opposite sides have equal slopes and are parallel, \( MNPQ \) is a parallelogram. \[ MN = \sqrt{(-5-0)^2 + (5-3)^2} = \sqrt{29}. \]
\[ NA = \sqrt{(0-2)^2 + (3-4)^2} = \sqrt{53}, \]

\[ MN \] is not congruent to \( NP \), so \( MNPQ \) is not a rhombus since not all sides are congruent.

ANS:

Square \( ABCD \); \( E \) and \( F \) are points on \( BC \) such that \( BE \cong FC \); \( AF \) and \( DE \) drawn (Given).

\( AB \cong CD \) (All sides of a square are congruent). \( \angle ABF \cong \angle DCE \) (All angles of a square are equiangular).

\( EF \cong FE \) (Reflexive property). \( BE + EF \cong FC + FE \) (Additive property of line segments). \( BF \cong CE \) (Angle addition). \( \triangle ABF \cong \triangle DCE \) (SAS). \( AF \cong DE \) (CPCTC).
The length of each side of quadrilateral is 5. Since each side is congruent, quadrilateral $MATH$ is a rhombus. The slope of $MH$ is 0 and the slope of $HT$ is $-\frac{4}{3}$. Since the slopes are not negative reciprocals, the sides are not perpendicular and do not form right angles. Since adjacent sides are not perpendicular, quadrilateral $MATH$ is not a square.

Quadrilateral $ABCD$, $AD \cong BC$ and $\angle DAE \cong \angle BCE$ are given. $AD \parallel BC$ because if two lines are cut by a transversal so that a pair of alternate interior angles are congruent, the lines are parallel. $ABCD$ is a parallelogram because if one pair of opposite sides of a quadrilateral are both congruent and parallel, the quadrilateral is a parallelogram. $AE \cong CE$ because the diagonals of a parallelogram bisect each other. $\angle FEA \cong \angle GEC$ as vertical angles. $\triangle AEF \cong \triangle CEG$ by ASA.