Dear Sir

I have to acknowledge the receipt of your favor of May 14. in which you mention that you have finished the 6. first books of Euclid, plane trigonometry, surveying & algebra and ask whether I think a further pursuit of that branch of science would be useful to you. There are some propositions in the latter books of Euclid, & some of Archimedes, which are useful, & I have no doubt you have been made acquainted with them. Trigonometry, so far as this, is most valuable to every man, there is scarcely a day in which he will not resort to it for some of the purposes of common life. The science of calculation also is indispensable as far as the extraction of the square & cube roots; Algebra as far as the quadratic equation & the use of logarithms are often of value in ordinary cases: but all beyond these is but a luxury; a delicious luxury indeed; but not to be indulged in by one who is to have a profession to follow for his subsistence. In this light I view the conic sections, curves of the higher orders, perhaps even spherical trigonometry. Algebraical operations beyond the 2d dimension, and fluxions.

Letter from Thomas Jefferson to William G. Munford, Monticello, June 18, 1799.
1 In the diagram below of $\triangle ACT$, $BE \parallel AT$.

![Diagram](image1.png)

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

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

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

3 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

4 The degree measures of the angles of $\triangle ABC$ are represented by $x$, $3x$, and $5x - 54$. Find the value of $x$.

5 In the diagram below of $\triangle ABC$ with side $AC$ extended through $D$, $m\angle A = 37$ and $m\angle BCD = 117$. Which side of $\triangle ABC$ is the longest side? Justify your answer.

![Diagram](image2.png)

6 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

7 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) $2y + 10x = 8$

8 In $\triangle RST$, $m\angle RST = 46$ and $RS \cong ST$. Find $m\angle STR$. 

1
9. In \( \triangle ABC \), \( \overline{AB} \cong \overline{BC} \). 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) \( AD \cong DC \)

10. 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 = \(\sqrt{C}\)

11. In the diagram of \( \triangle ABC \) below, \( \overline{AB} \cong \overline{AC} \). The measure of \( \angle B \) is 40°.

12. 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 \( \angle A \cong \angle X \)

13. 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.

14. 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

15. 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) \( y - 2x = 3 \)
16. 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) \(\frac{5}{3}\)

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

18. 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) \((x + 2)^2 + (y + 3)^2 = 4\)

19. What is the measure of an interior angle of a regular octagon?

1) 45°
2) 60°
3) 120°
4) 135°

20. 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°

21. Which transformation is not always an isometry?

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

22. 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

23. Given: Quadrilateral \(ABCD\), diagonal \(AFEC\), \(AE \cong FC\), \(BF \perp AC\), \(DE \perp AC\), \(\angle 1 \cong \angle 2\)
Prove: \(ABCD\) is a parallelogram.
24 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 \( \triangle ABC \).

25 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 \( C'' \).

26 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.

27 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) \( \{26,8,15\} \)
28 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

29 In the diagram below of \( \triangle HQP \), side \( HP \) is extended through \( P \) to \( T \), \( m\angle QPT = 6x + 20 \), \( m\angle HQP = x + 40 \), and \( m\angle PHQ = 4x - 5 \). Find \( m\angle QPT \).

30 On the line segment below, use a compass and straightedge to construct equilateral triangle \( ABC \). [Leave all construction marks.]

31 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) \( \frac{3}{2} \)

32 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
33 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

34 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

35 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.

36 Using a compass and straightedge, construct a line that passes through point $P$ and is perpendicular to line $m$. [Leave all construction marks.]

37 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.
38 Which transformation can map the letter $S$ onto itself?
1) glide reflection
2) translation
3) line reflection
4) rotation

39 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 $GH \parallel DE$.

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

41 In the diagram below of circle $O$, chords $AE$ and $DC$ intersect at point $B$, such that $m\angle AC = 36$ and $m\angle DE = 20$.

\[ \text{What is } m\angle ABC? \]
1) 56
2) 36
3) 28
4) 8

42 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
43 In the diagram of $\triangle ABC$ and $\triangle EDC$ below, $AE$ and $BD$ 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

44 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.

45 In the diagram below of isosceles trapezoid $DEFG$, $DE \parallel GF$, $DE = 4x - 2$, $EF = 3x + 2$, $FG = 5x - 3$, and $GD = 2x + 5$. Find the value of $x$.

46 In the diagram below, quadrilateral $ABCD$ is inscribed in circle $O$, $AB \parallel DC$, and diagonals $AC$ and $BD$ are drawn. Prove that $\triangle ACD \cong \triangle BDC$.

47 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) $12$

48 Given the system of equations: $y = x^2 - 4x$

The number of points of intersection is
1) 1
2) 2
3) 3
4) 0

The number of points of intersection is $x = 4$.
49 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 \( R \).

50 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

51 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.

52 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

53 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
54 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) $\left(-\frac{3}{2}, \frac{3}{2}\right)$
3) $\left(-\frac{2}{2}, \frac{3}{2}\right)$
4) $\left(-\frac{2}{2}, \frac{4}{2}\right)$

55 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

56 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) $r_{x=1}$

57 In the diagram of circle $O$ below, chord $CD$ is parallel to diameter $AOB$ and $m\angle ACD = 30$.

What is $m\angle CD$?

1) 150
2) 120
3) 100
4) 60

58 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 $\times$ each point that satisfies both conditions.
59. 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

60. On the set of axes below, solve the following system of equations graphically for all values of $x$ and $y$:

\begin{align*}
y &= (x - 2)^2 + 4 \\
4x + 2y &= 14
\end{align*}

61. 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

62. 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) $\sqrt{110}$
63 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

64 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

65 In isosceles trapezoid $ABCD$, $\overline{AB} \cong \overline{CD}$. 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

66 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) $\frac{-4}{3}$

67 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.

68 A quadrilateral whose diagonals bisect each other and are perpendicular is a
1) rhombus
2) rectangle
3) trapezoid
4) parallelogram

69 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]
70 Which transformation produces a figure similar but not congruent to the original figure?
1) \( T_{1,3} \)
2) \( D_{\frac{1}{2}} \)
3) \( R_{90^\circ} \)
4) \( r_{y=x} \)

71 Using a compass and straightedge, construct the angle bisector of \( \angle ABC \) shown below. [Leave all construction marks.]

74 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.

72 Given: Two is an even integer or three is an even integer.
Determine the truth value of this disjunction. Justify your answer.

73 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) \( m\angle ABC = 60 \)

75 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 \( P \).
76 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) $\frac{1}{2}$

77 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

79 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

80 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 $\frac{1}{9}$
81 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 $\triangle ABC$

82 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

83 Point $A$ is not contained in plane $\mathcal{B}$. How many lines can be drawn through point $A$ that will be perpendicular to plane $\mathcal{B}$?
1) one
2) two
3) zero
4) infinite

84 Given: $JKLM$ is a parallelogram.
$JM \cong LN$
$\angle LMN \cong \angle LNM$
Prove: $JKLM$ is a rhombus.

85 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) $AC + CB = AB$
86 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

87 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 $m\angle BAD$.

88 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

89 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) $y = -2x + 17$
90. Which graph represents a circle with the equation 
\((x - 5)^2 + (y + 1)^2 = 9\)?

1)  

2)  

3)  

4)  

91. 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) \(-6\)

92. In the diagram below of circle \(C\), \(\overline{QR}\) 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 \(R\).

93. Given the equations: 
\(y = x^2 - 6x + 10\) 
\(y + x = 4\)

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 \((3,1)\)
94. In the diagram of circle \( O \) below, chords \( AB \) and \( CD \) are parallel, and \( BD \) is a diameter of the circle. If \( m\widehat{AD} = 60 \), what is \( m\angle CDB \)?
1) 20  
2) 30  
3) 60  
4) 120

95. 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.

96. The lateral faces of a regular pyramid are composed of
1) squares  
2) rectangles  
3) congruent right triangles  
4) congruent isosceles triangles

97. 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) \( \angle C, \angle A, \angle B \)

98. In the diagram below of \( \triangle AGE \) and \( \triangle OLD \), \( \angle GAE \equiv \angle LOD \), and \( AE \equiv OD \).

To prove that \( \triangle AGE \) and \( \triangle OLD \) are congruent by SAS, what other information is needed?
1) \( GE \equiv LD \)  
2) \( AG \equiv OL \)  
3) \( \angle AGE \equiv \angle OLD \)  
4) \( \angle AEG \equiv \angle ODL \)
99 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

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

101 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

102 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.

103 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 $k_2$. 
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 $r_{y-axis} \circ T_{2,-3}$. [The use of the set of axes below is optional.]

$\triangle ABC$ 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) $\frac{\text{perimeter of } \triangle ABC}{\text{perimeter of } \triangle DEF}$

In the diagram of $\triangle ABC$ and $\triangle DEF$ below, $\overline{AB} \cong \overline{DE}$, $\angle A \cong \angle D$, 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
108 The equation of a circle is \((x - 2)^2 + (y + 4)^2 = 4\). Which diagram is the graph of the circle?

109 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) \(\overarc{CA} \cong \overarc{DB}\)

110 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) \(y = \frac{1}{3}x - 2\)

111 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) \(m\angle C < m\angle B\)
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112 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.

113 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 \( \times \) all points that satisfy both conditions.

114 Given: Quadrilateral \( ABCD \) with \( AB \cong CD \), \( AD \cong BC \), and diagonal \( BD \) is drawn
Prove: \( \angle BDC \cong \angle ABD \)

115 One step in a construction uses the endpoints of \( \overline{AB} \) to create arcs with the same radii. The arcs intersect above and below the segment. What is the relationship of \( \overline{AB} \) and the line connecting the points of intersection of these arcs?
1) collinear
2) congruent
3) parallel
4) perpendicular

116 In the diagram below of circle \( O \), secant \( \overline{AB} \) intersects circle \( O \) at \( D \), secant \( \overline{AOC} \) intersects circle \( O \) at \( E \), \( AE = 4 \), \( AB = 12 \), and \( DB = 6 \).

What is the length of \( \overline{OC} \)?
1) 4.5
2) 7
3) 9
4) 14

117 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) \( y = -2x - 9 \)
118 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

119 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.

120 The volume of a cylinder is 12,566.4 cm³. The height of the cylinder is 8 cm. Find the radius of the cylinder to the nearest tenth of a centimeter.

121 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.]

122 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
123 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.]

124 Given $\triangle ABC$ with base $AFEDC$, median $BF$, altitude $BD$, and $BE$ bisects $\angle ABC$, which conclusion is valid?

125 In the diagram below of $\triangle TEM$, medians $TB$, $EC$, and $MA$ intersect at $D$, and $TB = 9$. Find the length of $TD$.

126 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 $2:1$.

127 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 $k$.
128 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 $\triangle ABC$.

129 The rectangle $ABCD$ shown in the diagram below will be reflected across the $x$-axis.

130 Write an equation for circle $O$ shown on the graph below.

131 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) $AB$ and $DC$
2) $AB$ and $BC$
3) $AD$ and $BC$
4) $AC$ and $BD$

132 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.
133 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

134 If two different lines are perpendicular to the same plane, they are

1) collinear  
2) coplanar  
3) congruent  
4) consecutive

135 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.]

136 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) \((7,-4)\)

137 The endpoints of \( CD \) are \( C(-2,-4) \) and \( D(6,2) \).

What are the coordinates of the midpoint of \( CD \)?

1) \((2,3)\)  
2) \((2,-1)\)  
3) \((4,-2)\)  
4) \((4,3)\)
138 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.

139 Juliann plans on drawing ΔABC, where the measure of ∠A can range from 50° to 60° and the measure of ∠B can range from 90° to 100°. Given these conditions, what is the correct range of measures possible for ∠C?

1) 20° to 40°
2) 30° to 50°
3) 80° to 90°
4) 120° to 130°

140 In the diagram below of ΔACD, E is a point on AD and B is a point on AC, such that EB || DC. If AE = 3, ED = 6, and DC = 15, find the length of EB.

141 In the diagram below of parallelogram ABCD with diagonals AC and BD, m∠1 = 45 and m∠DCB = 120.

What is the measure of ∠2?
1) 15°
2) 30°
3) 45°
4) 60°
142 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) \( m\angle CBD = \frac{1}{2} m\angle ABD \)

143 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) \(2\sqrt{5}\)

144 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) \((4x + 4,2y)\)

145 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) \(\angle DBG \cong \angle EBG\)

146 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) \(108^\circ\)
147 If the endpoints of \( AB \) are \( A(-4,5) \) and \( B(2,-5) \), what is the length of \( AB \)?

1) \( 2\sqrt{34} \)
2) \( 2 \)
3) \( \sqrt{61} \)
4) \( 8 \)

148 In \( \triangle ABC \), \( m\angle A = x \), \( m\angle B = 2x + 2 \), and \( m\angle C = 3x + 4 \). What is the value of \( x \)?

1) \( 29 \)
2) \( 31 \)
3) \( 59 \)
4) \( 61 \)

149 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) \( 27 \)

150 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) \( 288\pi \)

151 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.

152 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) \( \angle CDB \cong \angle BAC \)

153 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) \( 3y = -2x + 12 \)
154 Which expression represents the volume, in cubic centimeters, of the cylinder represented in the diagram below?

1) $162\pi$
2) $324\pi$
3) $972\pi$
4) $3,888\pi$

156 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) $(x - 5)^2 + (y + 1)^2 = 9$

155 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) $\frac{\text{perimeter of } \triangle ABC}{\text{perimeter of } \triangle DEF} = \frac{3}{2}$

157 The diagram below illustrates the construction of $\overrightarrow{PS}$ parallel to $\overrightarrow{RQ}$ through point $P$.

Which statement justifies this construction?

1) $m\angle 1 = m\angle 2$
2) $m\angle 1 = m\angle 3$
3) $\overline{PR} \cong \overline{RQ}$
4) $\overline{PS} \cong \overline{RQ}$
158 The diagram below shows a right pentagonal prism.

[Diagram of a right pentagonal prism]

Which statement is always true?
1) $BC \parallel ED$
2) $FG \parallel CD$
3) $FJ \parallel IH$
4) $GB \parallel HC$

159 Find an equation of the line passing through the point $(6,5)$ and perpendicular to the line whose equation is $2y + 3x = 6$.

160 In plane $\mathcal{P}$, lines $m$ and $n$ intersect at point $A$. If line $k$ is perpendicular to line $m$ and line $n$ at point $A$, then line $k$ is
1) contained in plane $\mathcal{P}$
2) parallel to plane $\mathcal{P}$
3) perpendicular to plane $\mathcal{P}$
4) skew to plane $\mathcal{P}$

161 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.

162 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) $x + \frac{2}{3}x = 6$

163 In the diagram below of quadrilateral $ABCD$ with diagonal $BD$, $\angle A = 93$, $\angle ADB = 43$, $\angle C = 3x + 5$, $\angle BDC = x + 19$, and $\angle DBC = 2x + 6$. Determine if $AB$ is parallel to $DC$. Explain your reasoning.
164 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.

165 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

166 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

167 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 $B''(22,-4)$

168 The diagram below shows $\overline{AB}$ and $\overline{DE}$.

Which transformation will move $\overline{AB}$ onto $\overline{DE}$ such that point $D$ is the image of point $A$ and point $E$ is the image of point $B$?
1) $T_{3,-3}$
2) $D_{\frac{1}{2}}$
3) $R_{90^\circ}$
4) $r_{y=x}$

169 In $\triangle ABC$, point $D$ is on $\overline{AB}$, and point $E$ is on $\overline{BC}$ such that $DE \parallel AC$. If $DB = 2$, $DA = 7$, and $DE = 3$, what is the length of $\overline{AC}$?
1) 8
2) 9
3) 10.5
4) 13.5
170 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

171 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?

172 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) $\sqrt{145}$

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

What is the length of $CD$?

1) 16
2) 13
3) 12
4) 10

174 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) $y = -\frac{1}{2}x - \frac{25}{2}$
175 In the diagram below, $\triangle ABC \sim \triangle EFG$, $m\angle C = 4x + 30$, and $m\angle G = 5x + 10$. Determine the value of $x$.

176 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) $x^2 + y^2 = 16$

177 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.

178 Using a compass and straightedge, and $\overline{AB}$ below, construct an equilateral triangle with all sides congruent to $AB$. [Leave all construction marks.]
179 Which diagram shows the construction of an equilateral triangle?

1) 

2) 

3) 

4) 

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

1) 

2) 

3) 

4) 

181 In right $\triangle DEF$, $m\angle D = 90$ and $m\angle F$ is 12 degrees less than twice $m\angle E$. Find $m\angle E$.

182 A transformation of a polygon that always preserves both length and orientation is

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

183 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) $m\angle P > m\angle R > m\angle Q$
184 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) $(2,-4)$

185 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 $m\angle TAS$.

186 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.

187 In the diagram below, the vertices of $\triangle DEF$ are the midpoints of the sides of equilateral 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

188 In the diagram below of circle $C$, $m\widehat{QT} = 140$, and $m\angle P = 40$.

What is $m\widehat{RS}$?

1) 50
2) 60
3) 90
4) 110
189 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 \( AB > BC \)

190 What is the solution of the following system of equations?
\[
\begin{align*}
y &= (x + 3)^2 - 4 \\
y &= 2x + 5
\end{align*}
\]
1) \((0, -4)\)
2) \((-4, 0)\)
3) \((-4, -3)\) and \((0, 5)\)
4) \((-3, -4)\) and \((5, 0)\)

191 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

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

193 In the diagram below of \( \triangle ABC \), medians \( AD, BE \), and \( CF \) intersect at \( G \).

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

194 Tangents \( PA \) and \( PB \) are drawn to circle \( O \) from an external point, \( P \), and radii \( OA \) and \( OB \) are drawn. If \( \angle APB = 40^\circ \), what is the measure of \( \angle AOB \)?
1) \( 140^\circ \)
2) \( 100^\circ \)
3) \( 70^\circ \)
4) \( 50^\circ \)
195 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

196 Using a compass and straightedge, construct the bisector of the angle shown below. [Leave all construction marks.]

197 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

198 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.

199 The figure in the diagram below is a triangular prism.

Which statement must be true?
1) \( \overline{DE} \cong \overline{AB} \)
2) \( \overline{AD} \cong \overline{BC} \)
3) \( \overline{AD} \parallel \overline{CE} \)
4) \( \overline{DE} \parallel \overline{BC} \)
200 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.

201 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) $BC < AC < AB$

202 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 and label $\triangle DEG$ and $\triangle D'E'G'$. State the coordinates of the vertices $D'$, $E'$, and $G'$. Justify that this transformation preserves distance.

203 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 $AB \parallel A'B'$.

204 A support beam between the floor and ceiling of a house forms a 90° 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) 45°
2) 60°
3) 90°
4) 180°

205 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
206 Given: \( \triangle ABC \) and \( \triangle EDC \), \( C \) is the midpoint of \( BD \) and \( AE \).
Prove: \( AB \parallel DE \)

207 In the diagram below, the length of the legs \( AC \) and \( BC \) 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 \( AD \) to the nearest tenth of a centimeter?
1) 3.6
2) 6.0
3) 6.4
4) 4.0

208 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

209 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) \( R_{180^\circ} \circ D_2 \)
2) \( R_{90^\circ} \circ D_2 \)
3) \( D_\frac{1}{2} \circ R_{180^\circ} \)
4) \( D_\frac{1}{2} \circ R_{90^\circ} \)

210 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) \( (1,-1) \)

211 The endpoints of \( PQ \) are \( P(-3,1) \) and \( Q(4,25) \).
Find the length of \( PQ \).
212. In the diagram below of $\triangle ABC$, $D$ is a point on $AB$, $AC = 7$, $AD = 6$, and $BC = 18$.

The length of $DB$ could be
1) 5
2) 12
3) 19
4) 25

213. 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 $\sqrt{13}$

214. Find an equation of the line passing through the point (5,4) and parallel to the line whose equation is $2x + y = 3$.

215. 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$^3$.

216. 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

217. In the diagram below of circle $O$, chords $AD$ and $BC$ intersect at $E$, $m\angle AC = 87$, and $m\angle BD = 35$.

What is the degree measure of $\angle CEA$?
1) 87
2) 61
3) 43.5
4) 26
218 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

219 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) \( m\angle DBF = m\angle EBF \)

220 Write an equation of the line that passes through the point \((6, -5)\) and is parallel to the line whose equation is \(2x - 3y = 11\).
222. In the diagram below of circle $O$, chord $AB \parallel$ chord $CD$, and chord $CD \parallel$ chord $EF$.

Which statement must be true?
1) $CE \cong DF$
2) $AC \cong DF$
3) $AC \cong CE$
4) $EF \cong CD$

223. 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) $x^2 + 6x + 8$

224. 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 $h$.

225. 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 $\triangle XYZ$.

226. 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 $SE$. 

(Not drawn to scale)
227 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) $R_{90}$

228 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 $n$.

229 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) $\angle ABC \cong \angle EDF$

230 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) $\frac{(n-2) \cdot 180}{n}$

231 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 $T_{-3,1} \circ D_2$.

232 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) $(x+7)^2 + (y-3)^2 = 16$
233 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) $(-1,3)$

234 A sphere has a diameter of 18 meters. Find the volume of the sphere, in cubic meters, in terms of $\pi$.

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

![Circle graph]

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

236 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) $2\sqrt{41}$

237 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) $(x-3)^2 + (y+5)^2 = 16$

238 Triangle $PQR$ has angles in the ratio of $2:3:5$. Which type of triangle is $\triangle PQR$?

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

239 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) $y = -\frac{2}{5}x + \frac{8}{3}$
240 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

241 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) \(y = -\frac{3}{2}x + 2\)

242 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

243 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) \(3x + 4y = 14\)

244 What is the image of the point \( (2, -3) \) after the transformation \( r_{y-axis} \)?
1) \((2, 3)\)
2) \((-2, -3)\)
3) \((-2, 3)\)
4) \((-3, 2)\)

245 When a dilation is performed on a hexagon, which property of the hexagon will not be preserved in its image?
1) parallelism
2) orientation
3) length of sides
4) measure of angles

246 In the diagram below, two parallel lines intersect circle \( O \) at points \( A, B, C, \) and \( D \), with \( m\overline{AB} = x + 20 \) and \( m\overline{DC} = 2x - 20 \). Find \( m\overline{AB} \).
247 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

248 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)

249 The diagram below represents a rectangular solid.

Which statement must be true?
1) $\triangle ABC \cong \triangle XYZ$.

250 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.

251 Which statement must be true?
1) $\angle C \cong \angle Y$
2) $\angle A \cong \angle X$
3) $AC \cong YZ$
4) $CB \cong XZ$

252 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) $y = -2x - 5$
253 In the diagram below of $\triangle ACD$, $B$ is a point on $AC$ such that $\triangle ADB$ is an equilateral triangle, and $\triangle DBC$ is an isosceles triangle with $DB = BC$. Find $m\angle C$.

254 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.

255 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 $N'O'$

256 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

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

What is the length of $\overrightarrow{VC}$?

1) $3\frac{1}{2}$
2) $7\frac{1}{7}$
3) 14
4) 24
258 In \( \triangle RST \), \( \angle R = 58 \) and \( \angle S = 73 \). Which inequality is true?
1) \( RT < TS < RS \)
2) \( RS < RT < TS \)
3) \( RT < RS < TS \)
4) \( RS < TS < RT \)

259 In the diagram below, \( MATH \) is a rhombus with diagonals \( AH \) and \( MT \).

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

260 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) \(\frac{1}{2}\)

261 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) \(288\pi\)

262 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 \( AF \). Then, point \( G \), the intersection of \( AF \) and side \( BC \) of \( \triangle ABC \), is labeled.

Which statement must be true?
1) \( \overrightarrow{AF} \) bisects side \( BC \)
2) \( \overrightarrow{AF} \) bisects \( \angle BAC \)
3) \( \overrightarrow{AF} \perp \overrightarrow{BC} \)
4) \( \triangle ABG \sim \triangle ACG \)

263 Determine whether the two lines represented by the equations \( y = 2x + 3 \) and \( 2y + x = 6 \) are parallel, perpendicular, or neither. Justify your response.
264 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

265 In the diagram below of circle \( O \), chord \( AB \) bisects chord \( CD \) at \( E \). If \( AE = 8 \) and \( BE = 9 \), find the length of \( CE \) in simplest radical form.

266 In the diagram below of \( \triangle ACE \), medians \( AD, EB, \) and \( CF \) intersect at \( G \). The length of \( FG \) is 12 cm.

What is the length, in centimeters, of \( GC \)?
1) 24
2) 12
3) 6
4) 4

267 In the diagram below of \( \triangle ABC \), \( AE \cong BE \), \( AF \cong CF \), and \( CD \cong BD \).

Point \( P \) must be the
1) centroid
2) circumcenter
3) Incenter
4) orthocenter
268 Write an equation of the circle graphed in the diagram below.

269 In the diagram below of \( \triangle GJK \), \( H \) is a point on \( GJ \), \( HJ \cong JK \), \( \angle G = 28 \), and \( \angle GJK = 70 \). Determine whether \( \triangle GHK \) is an isosceles triangle and justify your answer.

270 If the vertex angles of two isosceles triangles are congruent, then the triangles must be
1) acute
2) congruent
3) right
4) similar

271 In the diagram below of \( \triangle ABC \), side \( BC \) is extended to point \( D \), \( \angle A = x \), \( \angle B = 2x + 15 \), and \( \angle ACD = 5x + 5 \).

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

272 Find, in degrees, the measures of both an interior angle and an exterior angle of a regular pentagon.

273 Given: \( AD \) bisects \( BC \) at \( E \).
\[
\begin{align*}
\overline{AB} & \perp \overline{BC} \\
\overline{DC} & \perp \overline{BC}
\end{align*}
\]
Prove: \( AB \cong DC \)
274 In the diagram below, \( EF \) 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

275 As shown in the diagram of \( \triangle ACD \) below, \( B \) is a point on \( AC \) and \( DB \) is drawn.

If \( \angle A = 66^\circ \), \( \angle DBC = 18^\circ \), and \( \angle C = 24^\circ \), what is the longest side of \( \triangle ABD \)?
1) \( AB \)
2) \( DC \)
3) \( AD \)
4) \( BD \)

276 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 \( m\angle A = 56 \), \( m\angle DB = 112 \), and the ratio of \( m\angle AC : m\angle CB = 3 : 1 \).

Determine \( m\angle CEB \). Determine \( m\angle F \). Determine \( m\angle DAC \).

277 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) \( y = \frac{3}{2}x + 6 \)
280 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

281 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

282 In the diagram below, $\overrightarrow{AB}$ is perpendicular to plane $AEFG$.

Which plane must be perpendicular to plane $AEFG$?

1) $ABCE$
2) $BCDH$
3) $CDFE$
4) $HDFG$
283. 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.

284. 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

285. As shown on the graph below, \(\Delta R'S'T'\) is the image of \(\Delta RST\) under a single transformation.

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

286. 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
287 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) $4\sqrt{2}$

288 The diagram below shows $\triangle ABC$, with $AEB$, $ADC$, and $\angle ACB \cong \angle AED$. Prove that $\triangle ABC$ is similar to $\triangle ADE$.

289 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

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

Which statement must be true?
1) $\overline{AC} \cong \overline{BD}$
2) $\overline{AB} \cong \overline{CD}$
3) $\overline{AB} \cong \overline{CD}$
4) $\overline{ABD} \cong \overline{CDB}$
291 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

292 The diagram below shows the construction of $AB$ 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.

293 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

294 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

295 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
296 The graph below shows $JT$ and its image, $J'T'$, after a transformation.

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

297 Using a compass and straightedge, construct a line perpendicular to $AB$ through point $P$. [Leave all construction marks.]

298 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

299 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°

300 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.]
301 The number of degrees in the sum of the interior angles of a pentagon is
1) 72
2) 360
3) 540
4) 720

302 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

303 In circle $O$ shown below, diameter $DB$ is perpendicular to chord $AC$ at $E$.

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

304 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

305 In the diagram below of $\triangle ABC$, $D$ is a point on $AB$, $E$ is a point on $BC$, $AC \parallel DE$, $CE = 25$ inches, $AD = 18$ inches, and $DB = 12$ inches. Find, to the nearest tenth of an inch, the length of $EB$. 
306. 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 $R$.

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

308. 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 $90^\circ$.

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

310. 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) $(x - 5)^2 + (y - 4)^2 = 25$

311. Given: $\triangle ABC$ with vertices $A(-6,-2), B(2,8)$, and $C(6,-2)$. $AB$ has midpoint $D$, $BC$ has midpoint $E$, and $AC$ has midpoint $F$.
Prove: $ADEF$ is a parallelogram
$ADEF$ is not a rhombus
[The use of the grid is optional.]

312. 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.
313 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 $\triangle CAB$

314 If $\triangle JKL \cong \triangle MNO$, which statement is always true?
1) $\angle KLi \cong \angle NMO$
2) $\angle KJL \cong \angle MNO$
3) $\overline{JL} \cong \overline{MO}$
4) $\overline{JK} \cong \overline{ON}$

315 Using a compass and straightedge, construct the bisector of $\angle CBA$. [Leave all construction marks.]

316 The coordinates of the endpoints of $\overline{FG}$ are $(-4,3)$ and $(2,5)$. Find the length of $\overline{FG}$ in simplest radical form.

317 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) $y = -\frac{1}{3}x + 3$

318 In the diagram below, $\triangle ABC \sim \triangle DEF$, $DE = 4$, $AB = x$, $AC = x + 2$, and $DF = x + 6$. Determine the length of $\overline{AB}$. [Only an algebraic solution can receive full credit.]

319 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
320 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 $CE$.

321 Solve the following system of equations graphically.

$$2x^2 - 4x = y + 1$$
$$x + y = 1$$

322 Find the slope of a line perpendicular to the line whose equation is $2y - 6x = 4$.

323 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

324 On the diagram below, use a compass and straightedge to construct the bisector of $\angle XYZ$. [Leave all construction marks.]
325 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

326 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) \( m \angle D = m \angle F \)

327 Write the negation of the statement “2 is a prime number,” and determine the truth value of the negation.

328 A packing carton in the shape of a triangular prism is shown in the diagram below.

![Diagram of a triangular prism]

What is the volume, in cubic inches, of this carton?
1) 20
2) 60
3) 120
4) 240

329 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

330 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 \( \pi \).

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

332 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) \( \angle BAC \cong \angle EDF \)

333 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) \((-5,2)\)
334 Which graph represents a circle whose equation is 
\((x + 2)^2 + y^2 = 16\)?

1) 

2) 

3) 

4) 

335 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) \((-4b, -3a)\)

336 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) \(8x + 20\)

337 In \(\triangle AED\) with \(ABCD\) 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) \(EC \cong EA\)
338 In the diagram below, \( \ell \parallel m \) and \( \overline{QR} \perp \overline{ST} \) at \( R \).

If \( \angle 1 = 63 \), find \( \angle 2 \).

339 Triangle \( TAP \) has coordinates \( T(-1,4) \), \( A(2,4) \), and \( P(2,0) \). On the set of axes below, graph and label \( \triangle T'AP' \), the image of \( \triangle TAP \) after the translation \((x,y) \rightarrow (x - 5,y - 1)\).

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

1)  

2)  

3)  

4)
341 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\}

342 In the diagram below of circle \(O\), radius \(OC\) is 5 cm. Chord \(AB\) is 8 cm and is perpendicular to \(OC\) at point \(P\).

What is the length of \(OP\), in centimeters?
1) 8
2) 2
3) 3
4) 4

343 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

344 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 \(T_{3,-2}\). 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.

345 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
346 Which graph represents a circle with the equation \((x - 3)^2 + (y + 1)^2 = 4\)?

1)  
2)  
3)  
4)  

347 In \(\triangle PQR\), \(\angle PRQ\) is a right angle and \(\overline{RT}\) is drawn perpendicular to hypotenuse \(\overline{PQ}\). If \(PT = x\), \(RT = 6\), and \(TQ = 4x\), what is the length of \(\overline{PQ}\)?

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

348 The volume, in cubic centimeters, of a sphere whose diameter is 6 centimeters is

1) \(12\pi\)  
2) \(36\pi\)  
3) \(48\pi\)  
4) \(288\pi\)  

349 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° about the origin. State the coordinates of the vertices of \(\triangle R'S'T'\). [The use of the set of axes below is optional.]
350 On the set of axes below, solve the system of equations graphically and state the coordinates of all points in the solution.

\[ y = (x - 2)^2 - 3 \]
\[ 2y + 16 = 4x \]

351 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 \( m\angle LMK \).

352 In the diagram of quadrilateral \( ABCD \), \( AB \parallel CD \), \( \angle ABC \equiv \angle CDA \), 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

353 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.]
354 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) $DE \cong EB$

356 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) $\triangle DCE \cong \triangle BCE$

355 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 $r_{x-axis}$. [The use of the grid is optional.]

357 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.]
358. 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) \( \overline{AC} \cong \overline{CB} \)
2) \( \overline{DH} \cong \overline{BH} \)
3) \( \overline{AB} \cong \overline{GH} \)
4) \( \overline{AG} \cong \overline{BH} \)

359. 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

360. 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

361. 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.]

362. 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.

363. 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) \( (x-2)^2 + (y+8)^2 = 81 \)
364 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

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

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

366 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) \( (x - 2)^2 + (y + 2)^2 = 3 \)

367 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) \( \frac{AB + BC + AC}{RS + ST + RT} = \frac{AB}{RS} \)
368 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 \( F. \)

If \( AB = 20, \ AE = 12, \) and \( CF = 15, \) what is the length of \( AC? \)
1) 8
2) 15
3) 23
4) 27

369 In the diagram below of \( \triangle ABC, \ \overline{BC} \) 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

370 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) \( \frac{5}{3} \)

371 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 \( \times \) all points that satisfy both conditions.
372 Which diagram shows the construction of the perpendicular bisector of $AB$?

1) 

2) 

3) 

4) 

373 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.

374 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

375 On the diagram below, use a compass and straightedge to construct the bisector of $\angle ABC$. [Leave all construction marks.]

376 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

377 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) $(5,-2)$
378 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) \(y = \frac{1}{2}x + 1\)

379 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 not sufficient to show that planes \(R\) and \(S\) are perpendicular?
1) \(FA \perp DE\)
2) \(AD \perp AF\)
3) \(BC \perp FJ\)
4) \(DE \perp BC\)

380 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) \(\frac{1}{10}\)

381 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) \(3x + y = 0\)

382 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: \(\triangle AEF \cong \triangle CEG\)
383 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 \( D \).

384 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

385 In scalene triangle \( ABC \), \( \angle B = 45 \) and \( \angle C = 55 \).
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) \( BC, AB, AC \)

386 In the diagram below of \( \triangle DAE \) and \( \triangle BCE \), \( \overline{AB} \) and \( \overline{CD} \) 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

387 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) \( y = \frac{5}{3}x + 1 \)
388 If two distinct planes, A and B, are perpendicular to line c, then which statement is true?
1) Planes A and B are parallel to each other.
2) Planes A and B are perpendicular to each other.
3) The intersection of planes A and B is a line parallel to line c.
4) The intersection of planes A and B is a line perpendicular to line c.

389 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.

390 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

391 As shown in the diagram below, 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

392 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) $(9, 6)$
393 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

394 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) $(x + 5)^2 + (y - 6)^2 = 25$

395 What is the length of $\overline{AB}$ with endpoints $A(-1,0)$ and $B(4,-3)$?

1) $\sqrt{6}$
2) $\sqrt{18}$
3) $\sqrt{34}$
4) $\sqrt{50}$

396 In the diagram below, $\overline{AB}$, $\overline{BC}$, and $\overline{AC}$ are tangents to circle $O$ at points $F$, $E$, and $D$, respectively, $AF = 6$, $CD = 5$, and $BE = 4$.

What is the perimeter of $\triangle ABC$?

1) 15
2) 25
3) 30
4) 60

397 Pentagon $PQRST$ has $\overline{PQ}$ parallel to $\overline{TS}$. After a translation of $T_{2,-5}$, which line segment is parallel to $\overline{P'Q'}$?

1) $\overline{R'S'}$
2) $\overline{R'Q'}$
3) $\overline{T'S'}$
4) $\overline{T'P'}$
398 In the diagram of $\triangle KLM$ below, $m\angle L = 70$, $m\angle M = 50$, and $MK$ is extended through $N$.

What is the measure of $\angle LKN$?
1) $60^\circ$
2) $120^\circ$
3) $180^\circ$
4) $300^\circ$

399 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.

400 Point $M$ is the midpoint of $\overline{AB}$. 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) $(-7,-2)$

401 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.

402 In the diagram below of $\triangle ADE$, $B$ is a point on $\overline{AE}$ and $C$ is a point on $\overline{AD}$ such that $\overline{BC} \parallel \overline{ED}$, $AC = x - 3$, $BE = 20$, $AB = 16$, and $AD = 2x + 2$. Find the length of $\overline{AC}$.
403 In the diagram below of \( \triangle BCD \), side \( \overline{DB} \) is extended to point \( A \).

Which statement must be true?
1) \( m\angle C > m\angle D \)
2) \( m\angle ABC < m\angle D \)
3) \( m\angle ABC > m\angle C \)
4) \( m\angle ABC > m\angle C + m\angle D \)

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

If \( m\overline{CD} = 70 \), what is \( m\overline{AC} \)?
1) 110
2) 70
3) 55
4) 35

405 What is the measure of each interior angle of a regular hexagon?
1) 60°
2) 120°
3) 135°
4) 270°

406 Which quadrilateral has diagonals that always bisect its angles and also bisect each other?
1) rhombus
2) rectangle
3) parallelogram
4) isosceles trapezoid

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

408 In the diagram below, trapezoid \( ABCD \), with bases \( \overline{AB} \) and \( \overline{DC} \), is inscribed in circle \( O \), with diameter \( \overline{DC} \). If \( m\overline{AB}=80 \), find \( m\overline{BC} \).
409 On the diagram of \( \triangle ABC \) shown below, use a compass and straightedge to construct the perpendicular bisector of \( AC \). [Leave all construction marks.]

410 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 90º about the origin. [The use of the set of axes below is optional.]

411 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) \((-15,-8)\)

412 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) \(17\)

413 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) \(y = 2x - 1\)
414 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

415 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) $AB + CD = AD$

416 Using a compass and straightedge, on the diagram below of $RS$, construct an equilateral triangle with $RS$ as one side. [Leave all construction marks.]

417 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

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

\[
\begin{align*}
y &= x^2 - 4x + 6 \\
y &= x + 2
\end{align*}
\]

1) (1,4)
2) (4,6)
3) (1,3) and (4,6)
4) (3,1) and (6,4)
419 Given that $ABCD$ is a parallelogram, a student wrote the proof below to show that a pair of its opposite angles are congruent.

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.

420 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: $\angle AOP \cong \angle BOP$

421 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

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

423 In the diagram below of rhombus $ABCD$, $m\angle C = 100$.

What is $m\angle DBC$?
1) 40
2) 45
3) 50
4) 80
424 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 $PS$.

425 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) $\angle ADB \cong \angle CDB$
2) $\angle ABC \cong \angle ADC$
3) $AB \cong CD$
4) $AD \cong CD$

426 In the diagram below of $\triangle P AO$, $AP$ 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

427 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.]
428 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) \( 3 < AC < 7 \)

429 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) \( 2(m\angle ABC) = m\angle CBD \)

430 In rhombus \( ABCD \), the diagonals \( AC \) and \( BD \) intersect at \( E \). If \( AE = 5 \) and \( BE = 12 \), what is the length of \( AB \)?

1) 7
2) 10
3) 13
4) 17

431 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

432 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) \( 2\sqrt{26} \)

433 In the diagram below, \( BFCE \), \( AB \perp BE \), \( DE \perp BE \), and \( \angle BFD \cong \angle ECA \). Prove that \( \triangle ABC \sim \triangle DEF \).
434 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

435 In the diagram below, quadrilateral JUMP is inscribed in a circle.

![Quadrilateral JUMP](image)

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

436 Which equation represents the perpendicular bisector of 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) \( y = 2x - 12 \)

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

![Right Triangle ABC](image)

What is the length of BD?
1) \( 3\sqrt{7} \)
2) \( 4\sqrt{7} \)
3) \( 7\sqrt{3} \)
4) 12

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

439 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.
440 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

441 In the diagram below, $LATE$ is an isosceles trapezoid with $\overline{LE} \cong \overline{AT}$, $LA = 24$, $ET = 40$, and $AT = 10$. Altitudes $\overline{LF}$ and $\overline{AG}$ are drawn.

What is the length of $\overline{LF}$?
1) 6
2) 8
3) 3
4) 4

442 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.

443 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.

444 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

445 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 $r_{x-\text{axis}} \circ r_{y=x}$ is performed on trapezoid $ABCD$. State the coordinates of trapezoid $A'B'C'D'$.
[The use of the set of axes below is optional.]
446 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?

![Cylindrical Tank Diagram]

447 In \( \triangle ABC \) shown below, \( P \) is the centroid and \( BF = 18 \).

![Triangle Diagram]

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

448 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) \( (x - 4)^2 + y^2 = 36 \)

449 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.

450 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.

![Graph with Loci and Labels]
451 In the diagram below, line $p$ intersects line $m$ and line $n$.

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

452 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 $P$.

453 On the set of axes below, solve the following system of equations graphically and state the coordinates of all points in the solution.

\[(x + 3)^2 + (y - 2)^2 = 25\]
\[2y + 4 = -x\]

454 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) $\sqrt{233}$
455 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

456 The length of $AB$ 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 $X$ all points that satisfy both conditions.
ID: A

Geometry Regents at Random

Answer Section

1. ANS: 2
   \[
   \frac{3}{7} = \frac{6}{x}
   \]
   \[3x = 42\]
   \[x = 14\]
   PTS: 2  REF: 081027ge  STA: G.G.46  TOP: Side Splitter Theorem

2. ANS: 3  PTS: 2
   REF: 011010ge  STA: G.G.71
   TOP: Equations of Circles

3. ANS: 3  PTS: 2
   REF: fall0825ge  STA: G.G.21
   TOP: Centroid, Orthocenter, Incenter and Circumcenter

4. 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

5. ANS:
   \[\overline{AC}.\ m\angle BCA = 63 \text{ and } m\angle ABC = 80. \ \overline{AC} \text{ is the longest side as it is opposite the largest angle.}\]
   PTS: 2  REF: 080934ge  STA: G.G.34  TOP: Angle Side Relationship

6. ANS: 3  PTS: 2
   REF: 080913ge  STA: G.G.28
   TOP: Triangle Congruency
7 ANS: 3
\[ m = \frac{-A}{B} = \frac{5}{2}, \quad m = \frac{-A}{B} = \frac{10}{4} = \frac{5}{2} \]

PTS: 2 REF: 011014ge STA: G.G.63 TOP: Parallel and Perpendicular Lines

8 ANS:
\[ 67. \quad \frac{180 - 46}{2} = 67 \]

PTS: 2 REF: 011029ge STA: G.G.31 TOP: Isosceles Triangle Theorem

9 ANS: 3
PTS: 2
REF: 011007ge STA: G.G.31
TOP: Isosceles Triangle Theorem

10 ANS: 3
PTS: 2
REF: fall0814ge STA: G.G.73
TOP: Equations of Circles

11 ANS: 4
\[ 180 - (40 + 40) = 100 \]

PTS: 2 REF: 080903ge STA: G.G.31 TOP: Isosceles Triangle Theorem

12 ANS: 4

PTS: 2 REF: 081001ge STA: G.G.29 TOP: Triangle Congruency

13 ANS:
36, because a dilation does not affect angle measure. 10, because a dilation does affect distance.

PTS: 4 REF: 011035ge STA: G.G.59 TOP: Properties of Transformations

14 ANS: 4
sum of interior \( \angle s \) = 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

15 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
16 ANS: 2

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.

PTS: 2 REF: fall0828ge STA: G.G.62 TOP: Parallel and Perpendicular Lines

17 ANS: 2 PTS: 2 REF: 060910ge STA: G.G.71

TOP: Equations of Circles

18 ANS: 1

\[ M_x = -\frac{-2+6}{2} = 2. \quad M_y = \frac{3+3}{2} = 3. \]

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

19 ANS: 4

\( (n - 2)180 = (8 - 2)180 = 1080. \quad \frac{1080}{8} = 135. \)

PTS: 2 REF: fall0827ge STA: G.G.37 TOP: Interior and Exterior Angles of Polygons

20 ANS: 1

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°.

PTS: 2 REF: 060909ge STA: G.G.30 TOP: Interior and Exterior Angles of Triangles

21 ANS: 2 PTS: 2 REF: 011006ge STA: G.G.56

TOP: Identifying Transformations

22 ANS: 3 PTS: 2 REF: 060928ge STA: G.G.8

TOP: Planes

23 ANS:

![Diagram]

\( FE \cong FE \) (Reflexive Property); \( AE - FE \cong FC - EF \) (Line Segment Subtraction Theorem); \( AF \cong CE \) (Substitution); \( \angle BFA \cong \angle DEC \) (All right angles are congruent); \( \triangle BFA \cong \triangle DEC \) (AAS); \( AB \cong CD \) and \( BF \cong DE \) (CPCTC); \( \angle BFC \cong \angle DEA \) (All right angles are congruent); \( \triangle BFC \cong \triangle DEA \) (SAS); \( AD \cong CB \) (CPCTC); \( ABCD \) is a parallelogram (opposite sides of quadrilateral \( ABCD \) are congruent)

PTS: 6 REF: 080938ge STA: G.G.41 TOP: Special Quadrilaterals

24 ANS:

37. Since \( \overline{DE} \) is a midsegment, \( AC = 14. \quad 10 + 13 + 14 = 37 \)

PTS: 2 REF: 061030ge STA: G.G.42 TOP: Midsegments
25 ANS:

\[ A''(8,2), B''(2,0), C''(6,-8) \]

PTS: 4  REF: 081036ge  STA: G.G.58  TOP: Compositions of Transformations

26 ANS: 1
Translations and reflections do not affect distance.


27 ANS: 2
\[ 6 + 17 > 22 \]

PTS: 2  REF: 080916ge  STA: G.G.33  TOP: Triangle Inequality Theorem

28 ANS: 1
\[ \triangle PRT \] and \[ \triangle SRQ \] share \( \angle R \) and it is given that \( \angle RPT \cong \angle RSQ \).

PTS: 2  REF: fall0821ge  STA: G.G.44  TOP: Similarity Proofs

29 ANS:
\[
\begin{align*}
6x + 20 &= x + 40 + 4x - 5 \\
6x + 20 &= 5x + 35 \\
x &= 15 \\
6((15) + 20) &= 110
\end{align*}
\]

PTS: 2  REF: 081031ge  STA: G.G.32  TOP: Exterior Angle Theorem

30 ANS:

PTS: 2  REF: 081032ge  STA: G.G.20  TOP: Constructions
31 ANS: 4
The slope of $y = \frac{2}{3}x - 5$ is $-\frac{2}{3}$. Perpendicular lines have slope that are opposite reciprocals.

PTS: 2 REF: 080917ge STA: G.G.62 TOP: Parallel and Perpendicular Lines

32 ANS: 1 PTS: 2 REF: 061013ge STA: G.G.50 TOP: Tangents KEY: point of tangency

33 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

34 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

35 ANS: 4 PTS: 2 REF: fall0802ge STA: G.G.24 TOP: Negations

36 ANS:

PTS: 2 REF: 060930ge STA: G.G.19 TOP: Constructions
37 ANS:

![Diagram](image1)

PTS: 4  REF: 011037ge  STA: G.G.23  TOP: Locus

38 ANS: 4  PTS: 2  REF: 061015ge  STA: G.G.56
TOP: Identifying Transformations

39 ANS:

![Diagram](image2)

PTS: 4  REF: fall0835ge  STA: G.G.42  TOP: Midsegments

40 ANS: 4

(4) is not true if \( \angle PQR \) is obtuse.

PTS: 2  REF: 060924ge  STA: G.G.32  TOP: Exterior Angle Theorem

41 ANS: 3

\[
\frac{36 + 20}{2} = 28
\]

PTS: 2  REF: 061019ge  STA: G.G.51  TOP: Arcs Determined by Angles

KEY: inside circle

42 ANS: 3

![Diagram](image3)

PTS: 2  REF: 080920ge  STA: G.G.42  TOP: Midsegments
\( \angle ACB \) and \( \angle ECD \) are congruent vertical angles and \( \angle CAB \cong \angle CED \).

\[ \begin{align*}
\text{ANS:} & \quad 2 \\
\text{PTS:} & \quad 2 \\
\text{REF:} & \quad 060917\text{ge} \\
\text{STA:} & \quad \text{G.G.44} \\
\text{TOP:} & \quad \text{Similarity Proofs}
\end{align*} \]

44. \( \angle ACB \) and \( \angle ECD \) are congruent vertical angles and \( \angle CAB \cong \angle CED \).

\[ \begin{align*}
\text{ANS:} & \quad 4 \\
\text{PTS:} & \quad 2 \\
\text{REF:} & \quad 060913\text{ge} \\
\text{STA:} & \quad \text{G.G.26} \\
\text{TOP:} & \quad \text{Conditional Statements}
\end{align*} \]

45. \( 3. \) The non-parallel sides of an isosceles trapezoid are congruent. \( 2x + 5 = 3x + 2 \)

\[ x = 3 \]

\[ \begin{align*}
\text{PTS:} & \quad 2 \\
\text{REF:} & \quad 080929\text{ge} \\
\text{STA:} & \quad \text{G.G.40} \\
\text{TOP:} & \quad \text{Trapezoids}
\end{align*} \]

46. \( 46. \) The non-parallel sides of an isosceles trapezoid are congruent. \( 2x + 5 = 3x + 2 \)

\[ x = 3 \]

\[ \begin{align*}
\text{ANS:} & \quad \frac{6x + 10}{2} \\
\text{PTS:} & \quad 2 \\
\text{REF:} & \quad 080929\text{ge} \\
\text{STA:} & \quad \text{G.G.40} \\
\text{TOP:} & \quad \text{Trapezoids}
\end{align*} \]

47. \( \text{ANS:} \) \( 1 \)

\[ -2 \left( -\frac{1}{2} y = 6x + 10 \right) \]

\[ y = -12x - 20 \]

\[ \begin{align*}
\text{PTS:} & \quad 2 \\
\text{REF:} & \quad 061027\text{ge} \\
\text{STA:} & \quad \text{G.G.63} \\
\text{TOP:} & \quad \text{Parallel and Perpendicular Lines}
\end{align*} \]

48. \( \text{ANS:} \) \( 1 \)

\[ y = x^2 - 4x = (4)^2 - 4(4) = 0. \quad (4, 0) \text{ is the only intersection.} \]

\[ \begin{align*}
\text{PTS:} & \quad 2 \\
\text{REF:} & \quad 060923\text{ge} \\
\text{STA:} & \quad \text{G.G.70} \\
\text{TOP:} & \quad \text{Quadratic-Linear Systems}
\end{align*} \]

49. \( \text{ANS:} \) \( 2 \)

\[ \text{PTS:} \quad 2 \\
\text{REF:} \quad \text{fall}0806\text{ge} \]

\[ \text{STA:} \quad \text{G.G.9} \]

50. \( \text{ANS:} \) \( 2 \)

The length of the midsegment of a trapezoid is the average of the lengths of its bases. \( \frac{x + 30}{2} = 44 \)

\[ x + 30 = 88 \]

\[ x = 58 \]

\[ \begin{align*}
\text{PTS:} & \quad 2 \\
\text{REF:} & \quad 011001\text{ge} \\
\text{STA:} & \quad \text{G.G.40} \\
\text{TOP:} & \quad \text{Trapezoids}
\end{align*} \]
Because $OC$ is a radius, its length is 5. Since $CE = 2\ OE = 3$. $\triangle EDO$ is a 3-4-5 triangle. If $ED = 4$, $BD = 8$.

ANS: 2

\[
4(4x - 3) = 3(2x + 8)
\]

\[
16x - 12 = 6x + 24
\]

\[
10x = 36
\]

\[
x = 3.6
\]

ANS: 4

\[
M_x = \frac{-6 + 1}{2} = \frac{-5}{2}; \ M_y = \frac{1 + 8}{2} = \frac{9}{2}.
\]

ANS: 2

Parallel chords intercept congruent arcs. $m\widehat{AC} = m\widehat{BD} = 30$. $180 - 30 - 30 = 120$.

ANS: 1
The sum of the interior angles of a pentagon is $(5-2)\times 180 = 540$. 

\[ a^2 + (5\sqrt{2})^2 = (2\sqrt{15})^2 \]
\[ a^2 + (25 \times 2) = 4 \times 15 \]
\[ a^2 + 50 = 60 \]
\[ a^2 = 10 \]
\[ a = \sqrt{10} \]
65 ANS: 3

\[
\frac{36-20}{2} = 8. \quad \sqrt{17^2 - 8^2} = 15
\]

PTS: 2          REF: 061016ge      STA: G.G.40      TOP: Trapezoids

66 ANS: 3

\[m = \frac{-A}{B} = -\frac{3}{4}\]

PTS: 2          REF: 011025ge      STA: G.G.62      TOP: Parallel and Perpendicular Lines

67 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

68 ANS: 1

TOP: Special Quadrilaterals

69 ANS:

\[y = \frac{4}{3}x - 6. \quad M_x = \frac{-1+7}{2} = 3\]

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

70 ANS: 2

A dilation affects distance, not angle measure.

PTS: 2          REF: 080906ge      STA: G.G.60      TOP: Identifying Transformations
71 ANS:

72 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.

73 ANS: 1
Since $AC \cong BC$, $m \angle A = m \angle B$ under the Isosceles Triangle Theorem.

74 ANS:
\[2 \sqrt{3}. \quad x^2 = 3 \cdot 4\]
\[x = \sqrt{12} = 2 \sqrt{3}\]

75 ANS: 4

76 ANS: 3

77 ANS: 4

78 ANS: 4

The marked 60º angle and the angle above it are on the same straight line and supplementary. This unmarked supplementary angle is 120º. Because the unmarked 120º angle and the marked 120º angle are alternate exterior angles and congruent, $d \parallel e$.
80 ANS: 1

\[ \begin{align*}
3x + 15 + 2x - 1 &= 6x + 2 \\
5x + 14 &= 6x + 2 \\
x &= 12
\end{align*} \]

PTS: 2 REF: 011021ge STA: G.G.32 TOP: Exterior Angle Theorem

81 ANS: 4 PTS: 2 REF: 080925ge STA: G.G.21
TOP: Centroid, Orthocenter, Incenter and Circumcenter

82 ANS: 1 PTS: 2 REF: 080911ge STA: G.G.73
TOP: Equations of Circles

83 ANS: 1 PTS: 2 REF: 081008ge STA: G.G.3
TOP: Planes

84 ANS: 
\[ JK \cong LM \text{ because opposite sides of a parallelogram are congruent. } LM \cong LN \text{ because of the Isosceles Triangle Theorem. } LM \cong JM \text{ because of the transitive property. } JKLM \text{ is a rhombus because all sides are congruent.} \]

PTS: 4 REF: 011036ge STA: G.G.41 TOP: Special Quadrilaterals

85 ANS: 3 PTS: 2 REF: fall0804ge STA: G.G.18
TOP: Constructions

86 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

87 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

88 ANS: 2 PTS: 2 REF: 011003ge STA: G.G.55
TOP: Properties of Transformations
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 = \(b\)

Perpendicular lines have slope the opposite and reciprocal of each other.

\[
m = -3
\]

\[
m_{\perp} = \frac{1}{3}
\]

\[
(6,-4). \quad C_x = \frac{Q_x + R_x}{2}, \quad C_y = \frac{Q_y + R_y}{2}.
\]

3.5 = \(\frac{1 + R_x}{2}\)

2 = \(\frac{8 + R_y}{2}\)

7 = 1 + R_x

4 = 8 + R_y

6 = R_x

\(-4 = R_y\)

\[
y + x = 4 \quad x^2 - 6x + 10 = -x + 4 \quad y + x = 4 \quad y + 2 = 4
\]

\[
y = -x + 4 \quad x^2 - 5x + 6 = 0 \quad y + 3 = 4 \quad y = 2
\]

\[
(x - 3)(x - 2) = 0 \quad y = 1
\]

\[
x = 3 \text{ or } 2
\]
94 ANS: 2
Parallel chords intercept congruent arcs. \( \overline{AD} = \overline{BC} = 60 \). \( m\angle CDB = \frac{1}{2} m\overline{BC} = 30 \).

PTS: 2  REF: 060906ge  STA: G.G.52  TOP: Chords
95 ANS:
\[ \angle D, \angle G \text{ and } 24^\circ \text{ or } \angle E, \angle F \text{ and } 84^\circ. \] \( m\overline{FE} = \frac{2}{15} \times 360 = 48 \). Since the chords forming \( \angle D \) and \( \angle G \) are intercepted by \( \overline{FE} \), their measure is 24°. \( m\overline{GD} = \frac{7}{15} \times 360 = 168 \). Since the chords forming \( \angle E \) and \( \angle F \) are intercepted by \( \overline{GD} \), their measure is 84°.

PTS: 4  REF: fall0836ge  STA: G.G.51  TOP: Arcs Determined by Angles
KEY: inscribed
96 ANS: 4  PTS: 2  REF: 060904ge  STA: G.G.13
TOP: Solids
97 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
98 ANS: 2

PTS: 2  REF: 081007ge  STA: G.G.28  TOP: Triangle Congruency
99 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
100 ANS: 2
\[ M_x = \frac{2 + (-4)}{2} = -1. \quad M_y = \frac{-3 + 6}{2} = \frac{3}{2}. \]

PTS: 2  REF: fall0813ge  STA: G.G.66  TOP: Midpoint
KEY: general
101 ANS: 2  PTS: 2  REF: 011011ge  STA: G.G.22
TOP: Locus
102 ANS: 1  PTS: 2  REF: 061009ge  STA: G.G.26
TOP: Converse and Biconditional
103 ANS: 3  PTS: 2  REF: fall0816ge  STA: G.G.1
TOP: Planes
104 ANS:

PTS: 4 REF: 060937ge STA: G.G.54 TOP: Compositions of Transformations
KEY: grids

105 ANS: 4 PTS: 2 REF: 081023ge STA: G.G.45 TOP: Similarity KEY: perimeter and area

106 ANS: 1 PTS: 2 REF: 081028ge STA: G.G.21 TOP: Centroid, Orthocenter, Incenter and Circumcenter

107 ANS: 3

PTS: 2 REF: 060902ge STA: G.G.28 TOP: Triangle Congruency

108 ANS: 2 PTS: 2 REF: 011020ge STA: G.G.74 TOP: Graphing Circles

109 ANS: 2

PTS: 2 REF: 061026GE STA: G.G.51 TOP: Arcs Determined by Angles
KEY: inscribed
The slope of \( y = -3x + 2 \) is \(-3\). The perpendicular slope is \( \frac{1}{3} \).

\[
-1 = \frac{1}{3} (3) + b
\]

\[
b = -2
\]
The slope of \( y = \frac{1}{2} x + 5 \) is \( \frac{1}{2} \). The slope of a perpendicular line is \(-2\). 

\[ 5 = (-2)(-2) + b \]

\[ b = 1 \]

\[ d = \sqrt{(146 - (-4))^2 + (52 - 2)^2} = \sqrt{25,000} \approx 158.1 \]

\[ V = \pi r^2 h \]

\[ 12566.4 = \pi r^2 \cdot 8 \]

\[ r^2 = \frac{12566.4}{8\pi} \]

\[ r \approx 22.4 \]

\[ \overline{AB} \parallel \overline{CD} \] and \( \overline{AD} \parallel \overline{CB} \) because their slopes are equal. \( ABCD \) is a parallelogram because opposite sides are parallel. \( \overline{AB} \neq \overline{BC} \). \( ABCD \) is not a rhombus because all sides are not equal. \( \overline{AB} \perp \overline{BC} \) because their slopes are not opposite reciprocals. \( ABCD \) is not a rectangle because \( \angle ABC \) is not a right angle.
122 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

123 ANS: \( 15 + 5\sqrt{5} \).

PTS: 4 REF: 060936ge STA: G.G.69 TOP: Triangles in the Coordinate Plane

124 ANS: 4
Median \( \overline{BF} \) bisects \( \overline{AC} \) so that \( \overline{CF} \cong \overline{FA} \).

PTS: 2 REF: fall0810ge STA: G.G.24 TOP: Statements

125 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

126 ANS: 4
Corresponding angles of similar triangles are congruent.

PTS: 2 REF: fall0826ge STA: G.G.45 TOP: Similarity

KEY: perimeter and area

127 ANS: 4 PTS: 2 REF: 011012ge STA: G.G.1 TOP: Planes
128 ANS:
20. The sides of the triangle formed by connecting the midpoints are half the sides of the original triangle.

\[5 + 7 + 8 = 20.\]

PTS: 2 REF: 060929ge STA: G.G.42 TOP: Midsegments

129 ANS: 1 PTS: 2 REF: 061005ge STA: G.G.55
TOP: Properties of Transformations

130 ANS:
\[(x + 1)^2 + (y - 2)^2 = 36\]

PTS: 2 REF: 081034ge STA: G.G.72 TOP: Equations of Circles

131 ANS: 2
Adjacent sides of a rectangle are perpendicular and have opposite and reciprocal slopes.

PTS: 2 REF: 061028ge STA: G.G.69 TOP: Quadrilaterals in the Coordinate Plane

132 ANS: 2 PTS: 2 REF: 061002ge STA: G.G.24
TOP: Negations

133 ANS: 4 PTS: 2 REF: 011019ge STA: G.G.44
TOP: Similarity Proofs

134 ANS: 2 PTS: 2 REF: 080927ge STA: G.G.4
TOP: Planes

135 ANS:
Midpoint: \(\left(\frac{-4 + 4}{2}, \frac{2 + (-4)}{2}\right) = (0, -1)\). Distance: \(d = \sqrt{(-4 - 4)^2 + (2 - (-4))^2} = \sqrt{100} = 10\)

\[r = 5\]

\[r^2 = 25\]

\[x^2 + (y + 1)^2 = 25\]


136 ANS: 3 PTS: 2 REF: 060905ge STA: G.G.54
TOP: Reflections KEY: basic

137 ANS: 2
\[M_x = \frac{-2 + 6}{2} = 2, \quad M_y = \frac{-4 + 2}{2} = -1\]

PTS: 2 REF: 080910ge STA: G.G.66 TOP: Midpoint
KEY: general
138 ANS:

![Diagram of a circle with points and angles labeled]

PTS: 4 REF: fall0837ge STA: G.G.23 TOP: Locus

139 ANS: 1

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° ($180° - (60° + 100°)$).

PTS: 2 REF: 060901ge STA: G.G.30 TOP: Interior and Exterior Angles of Triangles

140 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

141 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

142 ANS: 2 PTS: 2 REF: 011004ge STA: G.G.17 TOP: Constructions

143 ANS: 4

\[ d = \sqrt{(-3 - 1)^2 + (2 - 0)^2} = \sqrt{16 + 4} = \sqrt{20} = \sqrt{4 \cdot 5} = 2\sqrt{5} \]

PTS: 2 REF: 011017ge STA: G.G.67 TOP: Distance

144 ANS: 2

\[ M_x = \frac{3x + 5 + x - 1}{2} = \frac{4x + 4}{2} = 2x + 2. \]

\[ M_y = \frac{3y + (-y)}{2} = \frac{2y}{2} = y. \]

PTS: 2 REF: 081019ge STA: G.G.66 TOP: Midpoint

KEY: general
145 ANS: 4

$BG$ is also an angle bisector since it intersects the concurrence of $CD$ and $AE$

PTS: 2 REF: 061025ge STA: G.G.21
KEY: Centroid, Orthocenter, Incenter and Circumcenter

146 ANS: 1

$\angle A = \frac{(n - 2)180}{n} = \frac{(5 - 2)180}{5} = 108 \quad \angle AEB = \frac{180 - 108}{2} = 36$

PTS: 2 REF: 081022ge STA: G.G.37 TOP: Interior and Exterior Angles of Polygons

147 ANS: 1

$d = \sqrt{(−4 - 2)^2 + (5 − (−5))^2} = \sqrt{36 + 100} = \sqrt{136} = \sqrt{4 \cdot 34} = 2\sqrt{34}$.

PTS: 2 REF: 080919ge STA: G.G.67 TOP: Distance
KEY: general

148 ANS: 1

$x + 2x + 2 + 3x + 4 = 180$

$6x + 6 = 180$

$x = 29$

PTS: 2 REF: 011002ge STA: G.G.30 TOP: Interior and Exterior Angles of Triangles

149 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

150 ANS: 4

$SA = 4\pi r^2 \quad V = \frac{4}{3} \pi r^3 = \frac{4}{3} \pi \cdot 6^3 = 288\pi$

$144\pi = 4\pi r^2$

$36 = r^2$

$6 = r$

PTS: 2 REF: 081020ge STA: G.G.16 TOP: Surface Area

151 ANS: 2 PTS: 2 REF: 061007ge STA: G.G.35
TOP: Parallel Lines and Transversals

152 ANS: 4 PTS: 2 REF: 080905ge STA: G.G.29
TOP: Triangle Congruency
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 $y = \frac{3}{2}x + 3$.

$V = \pi r^2 h = \pi \cdot 6^2 \cdot 27 = 972\pi$

Because the triangles are similar, $\frac{m\angle A}{m\angle D} = 1$

$y = \frac{2}{3}x + 1$. $2y + 3x = 6$ \hspace{1cm} $y = mx + b$

\[2y = -3x + 6 \hspace{1cm} 5 = \frac{2}{3}(6) + b\]

\[y = \frac{3}{2}x + 3 \hspace{1cm} 5 = 4 + b\]

\[m = \frac{3}{2} \hspace{1cm} 1 = b\]

\[m_\perp = \frac{2}{3}\]

$S_A = 4\pi r^2 = 4\pi \cdot 6^2 = 144\pi \approx 452$

The centroid divides each median into segments whose lengths are in the ratio $2 : 1$. 
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

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

ANS: 4
\[ 180 - (50 + 30) = 100 \]

PTS: 2  REF: 081006ge  STA: G.G.45  TOP: Similarity

ANS: 2
\[ y + \frac{1}{2}x = 4 \quad 3x + 6y = 12 \]
\[ y = \frac{1}{2}x + 4 \quad 6y = -3x + 12 \]
\[ m = \frac{1}{2} \]
\[ y = \frac{1}{2}x + 2 \]

PTS: 2  REF: 081014ge  STA: G.G.63  TOP: Parallel and Perpendicular Lines

ANS: 1
After the translation, the coordinates are \( A'(−1,5) \) and \( B'(3,4) \). After the dilation, the coordinates are \( A''(−2,10) \) and \( B''(6,8) \).

PTS: 2  REF: fall0823ge  STA: G.G.58  TOP: Compositions of Transformations

ANS: 4  PTS: 2  REF: 061018ge  STA: G.G.56  TOP: Identifying Transformations
169 \text{ ANS: } 4
\[ \triangle ABC \sim \triangle DBE. \quad \frac{AB}{DB} = \frac{AC}{DE} \]
\[ \frac{9}{2} = \frac{x}{3} \]
\[ x = 13.5 \]

PTS: 2 \quad \text{REF: } 060927\text{ge} \quad \text{STA: } G.G.46 \quad \text{TOP: } \text{Side Splitter Theorem}

170 \text{ ANS: } 4
\text{Let } AD = x. \quad 36x = 12^2
\[ x = 4 \]

PTS: 2 \quad \text{REF: } 080922\text{ge} \quad \text{STA: } G.G.47 \quad \text{TOP: } \text{Similarity}

171 \text{ ANS: } 2016.
\[ V = \frac{1}{3} Bh = \frac{1}{3} s^2 h = \frac{1}{3} 12^2 \cdot 42 = 2016 \]

PTS: 2 \quad \text{REF: } 080930\text{ge} \quad \text{STA: } G.G.13 \quad \text{TOP: } \text{Volume}

172 \text{ ANS: } 4
\[ d = \sqrt{(-6 - 2)^2 + (4 - (-5))^2} = \sqrt{64 + 81} = \sqrt{145} \]

PTS: 2 \quad \text{REF: } 081013\text{ge} \quad \text{STA: } G.G.67 \quad \text{TOP: } \text{Distance}

173 \text{ ANS: } 3
\[ 4(x + 4) = 8^2 \]
\[ 4x + 16 = 64 \]
\[ x = 12 \]

PTS: 2 \quad \text{REF: } 060916\text{ge} \quad \text{STA: } G.G.53 \quad \text{TOP: } \text{Segments Intercepted by Circle}

174 \text{ ANS: } 2
\text{The slope of a line in standard form is } \frac{-A}{B}, \text{ so the slope of this line is } \frac{-2}{-1} = 2. \text{ A parallel line would also have a slope of } 2. \text{ Since the answers are in slope intercept form, find the } y\text{-intercept: } \quad y = mx + b \]
\[ -11 = 2(-3) + b \]
\[ -5 = b \]

PTS: 2 \quad \text{REF: } \text{fall0812ge} \quad \text{STA: } G.G.65 \quad \text{TOP: } \text{Parallel and Perpendicular Lines}
20. \(5x + 10 = 4x + 30\)

\[x = 20\]

PTS: 2  REF: 060934ge  STA: G.G.45  TOP: Similarity  
KEY: basic

176 ANS: 4

The radius is 4.  \(r^2 = 16\).

PTS: 2  REF: 061014ge  STA: G.G.72  TOP: Equations of Circles

177 ANS: 4  PTS: 2  REF: 011009ge  STA: G.G.19  
TOP: Constructions

178 ANS:

PTS: 2  REF: 011032ge  STA: G.G.20  TOP: Constructions

179 ANS: 1  PTS: 2  REF: 061012ge  STA: G.G.20  
TOP: Constructions

180 ANS: 3  PTS: 2  REF: 060925ge  STA: G.G.17  
TOP: Constructions

181 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

182 ANS: 2  PTS: 2  REF: 081015ge  STA: G.G.55  
TOP: Properties of Transformations

183 ANS: 1  PTS: 2  REF: 061010ge  STA: G.G.34  
TOP: Angle Side Relationship

184 ANS: 1

\(A'(2,4)\)

PTS: 2  REF: 011023ge  STA: G.G.54  TOP: Compositions of Transformations  
KEY: basic

25
185 ANS: 

\[ 8x - 5 = 3x + 30 \]
\[ 4z - 8 = 3z \]
\[ 9y + 8 + 5y - 2 = 90 \]

\[ 5x = 35 \]
\[ z = 8 \]
\[ 14y + 6 = 90 \]

\[ x = 7 \]
\[ z = 8 \]
\[ 14y = 84 \]

\[ y = 6 \]


186 ANS: 3 PTS: 2 REF: 011028ge STA: G.G.26 TOP: Conditional Statements

187 ANS: 1

PTS: 2 REF: 081003ge STA: G.G.42 TOP: Midsegments

188 ANS: 2

\[ \frac{140 - RS}{2} = 40 \]
\[ 140 - RS = 80 \]
\[ RS = 60 \]

PTS: 2 REF: 081025ge STA: G.G.51 TOP: Arcs Determined by Angles

KEY: outside circle

189 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
190 ANS: 3
\[(x + 3)^2 - 4 = 2x + 5\]
\[x^2 + 6x + 9 - 4 = 2x + 5\]
\[x^2 + 4x = 0\]
\[x(x + 4) = 0\]
\[x = 0, -4\]

PTS: 2  REF: 081004ge  STA: G.G.70  TOP: Quadratic-Linear Systems

191 ANS: 1  PTS: 2  REF: 081009ge  STA: G.G.73
TOP: Equations of Circles

192 ANS: 3  PTS: 2  REF: 080928ge  STA: G.G.50
TOP: Tangents  KEY: common tangency

193 ANS: 1
The centroid divides each median into segments whose lengths are in the ratio 2 : 1.
\[\overline{GC} = 2\overline{FG}\]
\[\overline{GC} + \overline{FG} = 24\]
\[2\overline{FG} + \overline{FG} = 24\]
\[3\overline{FG} = 24\]
\[\overline{FG} = 8\]

PTS: 2  REF: 081018ge  STA: G.G.43  TOP: Centroid

194 ANS: 1  PTS: 2  REF: 081012ge  STA: G.G.50
TOP: Tangents  KEY: two tangents

195 ANS: 3

PTS: 2  REF: 061011ge  STA: G.G.70  TOP: Quadratic-Linear Systems

196 ANS:

PTS: 2  REF: fall0832ge  STA: G.G.17  TOP: Constructions
197 ANS: 4
\[ L = 2\pi rh = 2\pi \cdot 5 \cdot 11 \approx 345.6 \]

PTS: 2      REF: 061006ge      STA: G.G.14      TOP: Volume

198 ANS:

\[ \text{Car A} \]
\[ \text{Car B} \]

PTS: 2      REF: 061006ge      STA: G.G.14      TOP: Volume

199 ANS: 3
The lateral edges of a prism are parallel.

PTS: 2      REF: fall0808ge      STA: G.G.10      TOP: Solids

200 ANS:
\[ 375\pi = \pi rl = \pi(15)(25) = 375\pi \]

PTS: 2      REF: 061006ge      STA: G.G.14      TOP: Volume

201 ANS: 2
Longest side of a triangle is opposite the largest angle. Shortest side is opposite the smallest angle.

PTS: 2      REF: 061006ge      STA: G.G.14      TOP: Volume

202 ANS:

\[ D'(-1,1), E'(-1,5), G'(-4,5) \]

PTS: 4      REF: 061006ge      STA: G.G.14      TOP: Volume
203 ANS:

\[ 3y + 1 = 6x + 4, \quad 2y + 1 = x - 9 \]
\[ 3y = 6x + 3, \quad 2y = x - 10 \]
\[ y = 2x + 1, \quad y = \frac{1}{2}x - 5 \]

PTS: 2    REF: fall0830ge    STA: G.G.55    TOP: Properties of Transformations

204 ANS: 3    PTS: 2    REF: 081002ge    STA: G.G.9
TOP: Planes

205 ANS: 4

\[ 3y + 1 = 6x + 4, \quad 2y + 1 = x - 9 \]
\[ 3y = 6x + 3, \quad 2y = x - 10 \]
\[ y = 2x + 1, \quad y = \frac{1}{2}x - 5 \]

PTS: 2    REF: fall0822ge    STA: G.G.63    TOP: Parallel and Perpendicular Lines

206 ANS:

\[ \overline{AC} \cong \overline{EC} \] and \[ \overline{DC} \cong \overline{BC} \] 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. \( \overline{BD} \) is a transversal intersecting \( \overline{AB} \) and \( \overline{ED} \). Therefore \( \overline{AB} \parallel \overline{DE} \) because \( \angle CDE \) and \( \angle CBA \) are congruent alternate interior angles.


207 ANS: 1
\[ \overline{AB} = 10 \] since \( \triangle ABC \) is a 6-8-10 triangle. \[ 6^2 = 10x \]
\[ 3.6 = x \]

PTS: 2    REF: 060915ge    STA: G.G.47    TOP: Similarity
KEY: leg

208 ANS: 4    PTS: 2    REF: fall0818ge    STA: G.G.61
TOP: Analytical Representations of Transformations

209 ANS: 3    PTS: 2    REF: 060908ge    STA: G.G.60
TOP: Identifying Transformations
ANS: 1

\[(x, y) \mapsto (x + 3, y + 1)\]

**PTS:** 2  
**REF:** fall0803ge  
**STA:** G.G.54  
**TOP:** Translations

211 ANS:

\[d = \sqrt{(-3 - 4)^2 + (1 - 25)^2} = \sqrt{49 + 576} = \sqrt{625} = 25.\]

**PTS:** 2  
**REF:** fall0831ge  
**STA:** G.G.67  
**TOP:** Distance  
**KEY:** general

212 ANS: 2

\[7 + 18 > 6 + 12\]

**PTS:** 2  
**REF:** fall0819ge  
**STA:** G.G.33  
**TOP:** Triangle Inequality Theorem

213 ANS: 4  
**PTS:** 2  
**REF:** 060922ge  
**STA:** G.G.73  
**TOP:** Equations of Circles

214 ANS:

\[y = -2x + 14. \text{ The slope of } 2x + y = 3 \text{ is } \frac{-A}{B} = \frac{-2}{1} = -2. \quad y = mx + b \quad .\]

\[4 = (-2)(5) + b\]

\[b = 14\]

**PTS:** 2  
**REF:** 060931ge  
**STA:** G.G.65  
**TOP:** Parallel and Perpendicular Lines

215 ANS:

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

216 ANS: 4  
**PTS:** 2  
**REF:** fall0824ge  
**STA:** G.G.50  
**TOP:** Tangents  
**KEY:** common tangency

217 ANS: 2

\[\frac{87 + 35}{2} = \frac{122}{2} = 61\]

**PTS:** 2  
**REF:** 011015ge  
**STA:** G.G.51  
**TOP:** Arcs Determined by Angles  
**KEY:** inside circle

218 ANS: 2  
**PTS:** 2  
**REF:** 061022ge  
**STA:** G.G.62  
**TOP:** Parallel and Perpendicular Lines

219 ANS: 3  
**PTS:** 2  
**REF:** 080902ge  
**STA:** G.G.17  
**TOP:** Constructions
220 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

221 ANS: 3

PTS: 2 REF: fall0805ge STA: G.G.70 TOP: Quadratic-Linear Systems

222 ANS: 1
Parallel lines intercept congruent arcs.

PTS: 2 REF: 061001ge STA: G.G.52 TOP: Chords

223 ANS: 1
\[3x^2 + 18x + 24\]
\[3(x^2 + 6x + 8)\]
\[3(x + 4)(x + 2)\]

PTS: 2 REF: fall0815ge STA: G.G.12 TOP: Volume

224 ANS:
\[2.4. \ 5a = 4^2 \quad 5b = 3^2 \quad h^2 = ab\]
\[a = 3.2 \quad b = 1.8 \quad h^2 = 3.2 \cdot 1.8\]
\[h = \sqrt{5.76} = 2.4\]

PTS: 4 REF: 081037ge STA: G.G.47 TOP: Similarity

KEY: altitude
225 ANS:

226 ANS:
18. If the ratio of $TA$ to $AC$ is 1:3, the ratio of $TE$ to $ES$ is also 1:3. $x + 3x = 24$. $3(6) = 18$. $x = 6$
Geometry Regents at Random

Answer Section

227 ANS: 2 PTS: 2 REF: 061201ge STA: G.G.59
TOP: Properties of Transformations

228 ANS: 4 PTS: 2 REF: 061118ge STA: G.G.1
TOP: Planes

229 ANS: 4 PTS: 2 REF: 081216ge STA: G.G.45
TOP: Similarity KEY: basic

230 ANS: 3 PTS: 2 REF: 061218ge STA: G.G.36
TOP: Interior and Exterior Angles of Polygons

231 ANS:

\[ G''(3,3), H''(7,7), S''(-1,9) \]

PTS: 4 REF: 081136ge STA: G.G.58 TOP: Compositions of Transformations

232 ANS: 3 PTS: 2 REF: 011116ge STA: G.G.71
TOP: Equations of Circles

233 ANS: 1

The diagonals of a parallelogram intersect at their midpoints. \[ M_{AC} \left( \frac{1 + 3}{2}, \frac{5 + (-1)}{2} \right) = (2,2) \]

PTS: 2 REF: 061209ge STA: G.G.69 TOP: Quadrilaterals in the Coordinate Plane
234 \text{ ANS: } V = \frac{4}{3} \pi \cdot 9^3 = 972\pi

\text{PTS: 2} \quad \text{REF: 081131ge} \quad \text{STA: G.G.16} \quad \text{TOP: Surface Area}

235 \text{ ANS: 2} \quad \text{PTS: 2} \quad \text{REF: 081212ge} \quad \text{STA: G.G.72} \\
\text{TOP: Equations of Circles}

236 \text{ ANS: 4} \\
\frac{d}{\sqrt{(-5-3)^2 + (4-(-6))^2}} = \sqrt{64 + 100} = \sqrt{164} = \sqrt{4 \cdot 41} = 2\sqrt{41}

\text{PTS: 2} \quad \text{REF: 011121ge} \quad \text{STA: G.G.67} \quad \text{TOP: Distance} \\
\text{KEY: general}

237 \text{ ANS: 3} \quad \text{PTS: 2} \quad \text{REF: 081209ge} \quad \text{STA: G.G.71} \\
\text{TOP: Equations of Circles}

238 \text{ ANS: 4} \\
\frac{5}{2+3+5} \times 180 = 90

\text{PTS: 2} \quad \text{REF: 081119ge} \quad \text{STA: G.G.30} \quad \text{TOP: Interior and Exterior Angles of Triangles}

239 \text{ ANS: 1} \\
m = \frac{3}{2} \quad y = mx + b \\
2 = \frac{3}{2} (1) + b \\
\frac{1}{2} = b

\text{PTS: 2} \quad \text{REF: 081217ge} \quad \text{STA: G.G.65} \quad \text{TOP: Parallel and Perpendicular Lines}

240 \text{ ANS: 2} \quad \text{PTS: 2} \quad \text{REF: 081120ge} \quad \text{STA: G.G.8} \\
\text{TOP: Planes}

241 \text{ ANS: 4} \\
m = \frac{-A}{B} = \frac{-3}{2} \quad y = mx + b \\
-1 = \left(\frac{-3}{2}\right)(2) + b \\
-1 = -3 + b \\
2 = b

\text{PTS: 2} \quad \text{REF: 061226ge} \quad \text{STA: G.G.65} \quad \text{TOP: Parallel and Perpendicular Lines}
\[ \frac{8}{2} = \frac{12}{x}. \]

8x = 24

x = 3

PTS: 2  REF: 061216ge  STA: G.G.46  TOP: Side Splitter Theorem

243  ANS: 2

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.

\[ y - 2 = \frac{-4}{3} (x + 5) \]

\[ 3y - 6 = -4x - 20 \]

\[ 4x + 3y = -14 \]

PTS: 2  REF: 061123ge  STA: G.G.65  TOP: Parallel and Perpendicular Lines

244  ANS: 2  PTS: 2  REF: 081108ge  STA: G.G.54

TOP: Reflections  KEY: basic

245  ANS: 3  PTS: 2  REF: 081204ge  STA: G.G.59

TOP: Properties of Transformations

246  ANS:

\[ 2x - 20 = x + 20. \]

\[ \overline{AB} = x + 20 = 40 + 20 = 60 \]

\[ x = 40 \]

PTS: 2  REF: 011229ge  STA: G.G.52  TOP: Chords

247  ANS: 3  PTS: 2  REF: 011202ge  STA: G.G.21

TOP: Centroid, Orthocenter, Incenter and Circumcenter

248  ANS: 3

\[ (3,-2) \rightarrow (2,3) \rightarrow (8,12) \]

PTS: 2  REF: 011126ge  STA: G.G.54  TOP: Compositions of Transformations  KEY: basic

249  ANS: 1  PTS: 2  REF: 011221ge  STA: G.G.10

TOP: Solids

250  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
251 ANS: 2  PTS: 2  REF: 081102ge  STA: G.G.29  TOP: Triangle Congruency

252 ANS: 3
The slope of $2y = x + 2$ is $\frac{1}{2}$, which is the opposite reciprocal of $-2$.  
$3 = -2(4) + b$  
$11 = b$

253 ANS:

254 ANS:


256 ANS: 1  PTS: 2  REF: 081121ge  STA: G.G.39  TOP: Special Parallelograms

257 ANS: 3
$\frac{5}{7} = \frac{10}{x}$

$5x = 70$

$x = 14$


259 ANS: 2
The diagonals of a rhombus are perpendicular.  $180 - (90 + 12) = 78$

260 ANS: 3

PTS: 2  REF: 011204ge  STA: G.G.39  TOP: Special Parallelograms
The slope of \( x + 2y = 3 \) is \( m = \frac{-A}{B} = \frac{-1}{2} \). \( m_1 = 2 \).

\[ V = \frac{4}{3} \pi r^3 = \frac{4}{3} \pi \cdot \left( \frac{6}{2} \right)^3 \approx 36\pi \]

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.

\[ x^2 = 9 \cdot 8 \]
\[ x = \sqrt{72} \]
\[ x = \sqrt{36 \sqrt{2}} \]
\[ x = 6\sqrt{2} \]

\( (x - 5)^2 + (y + 4)^2 = 36 \)
No, \( \angle KGH \) is not congruent to \( \angle GKH \).

\[
\begin{align*}
\text{PTS: 2} & \quad \text{REF: 081135ge} & \quad \text{STA: G.G.31} & \quad \text{TOP: Isosceles Triangle Theorem} \\
\text{270 ANS: 4} & \quad \text{PTS: 2} & \quad \text{REF: 061124ge} & \quad \text{STA: G.G.31} \\
\text{TOP: Isosceles Triangle Theorem} \\
\text{271 ANS: 3} & \quad \text{PTS: 2} & \quad \text{REF: 011127ge} & \quad \text{STA: G.G.32} & \quad \text{TOP: Exterior Angle Theorem} \\
\text{272 ANS:} & \quad \text{PTS: 2} & \quad \text{REF: 011131ge} & \quad \text{STA: G.G.37} & \quad \text{TOP: Interior and Exterior Angles of Polygons} \\
\text{273 ANS:} & \quad \text{PTS: 4} & \quad \text{REF: 061235ge} & \quad \text{STA: G.G.27} & \quad \text{TOP: Triangle Proofs} \\
\text{274 ANS: 1} & \quad \text{PTS: 2} & \quad \text{REF: 081221ge} & \quad \text{STA: G.G.40} & \quad \text{TOP: Trapezoids}
\end{align*}
\]
275 ANS: 1

276 ANS:

\[ 52, 40, 80. \quad 360 - (56 + 112) = 192. \quad \frac{192 - 112}{2} = 40. \quad \frac{112 + 48}{2} = 80 \]

\[ \frac{1}{4} \times 192 = 48 \]

\[ \frac{56 + 48}{2} = 52 \]

277 ANS: 4

\[ y = mx + b \]

\[ 3 = \frac{3}{2}(-2) + b \]

\[ 3 = -3 + b \]

\[ 6 = b \]

278 ANS: 3

PTS: 2

279 ANS: 2

PTS: 2

280 ANS: 1

PTS: 2

281 ANS: 1

PTS: 2

282 ANS: 1

PTS: 2
283 ANS:

![Diagram](image)

PTS: 4  REF: 011135ge  STA: G.G.23  TOP: Locus

284 ANS: 4

\[
\sqrt{25^2 - \left(\frac{26 - 12}{2}\right)^2} = 24
\]

PTS: 2  REF: 011219ge  STA: G.G.40  TOP: Trapezoids

285 ANS: 3  PTS: 2  REF: 061122ge  STA: G.G.56  TOP: Identifying Transformations

286 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

287 ANS: 4

\[
\sqrt{6^2 - 2^2} = \sqrt{32} = \sqrt{16 \times 2} = 4\sqrt{2}
\]

PTS: 2  REF: 081124ge  STA: G.G.49  TOP: Chords

288 ANS:

\[\angle ACB \cong \angle AED\] is given. \(\angle A \cong \angle A\) because of the reflexive property. Therefore \(\triangle ABC \sim \triangle ADE\) because of AA.

PTS: 2  REF: 081133ge  STA: G.G.44  TOP: Similarity Proofs
289 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

290 ANS: 1
Parallel lines intercept congruent arcs.

PTS: 2 REF: 061105ge STA: G.G.52 TOP: Chords

291 ANS: 1

PTS: 2 REF: 061211ge STA: G.G.31 TOP: Isosceles Triangle Theorem

292 ANS: 2 PTS: 2 REF: 061208ge STA: G.G.19 TOP: Constructions

293 ANS: 4

\[20 + 8 + 10 + 6 = 44.\]

PTS: 2 REF: 061211ge STA: G.G.42 TOP: Midsegments


295 ANS: 3 PTS: 2 REF: 081128ge STA: G.G.39 TOP: Special Parallelograms

296 ANS: 2 PTS: 2 REF: 061227ge STA: G.G.56 TOP: Identifying Transformations
297 ANS: 

\[
\begin{align*}
\text{PTS: 2} & \quad \text{REF: 081233ge} \quad \text{STA: G.G.19} \quad \text{TOP: Constructions} \\
\text{298 ANS: 4} & \quad \text{PTS: 2} \quad \text{REF: 081101ge} \quad \text{STA: G.G.25} \\
& \quad \text{TOP: Compound Statements} \quad \text{KEY: conjunction} \\
\text{299 ANS: 2} & \quad \text{PTS: 2} \quad \text{REF: 081214ge} \quad \text{STA: G.G.50} \\
& \quad \text{TOP: Tangents} \quad \text{KEY: point of tangency} \\
\end{align*}
\]

\[
M\left(\frac{-7+5}{2}, \frac{2+4}{2}\right) = M(-1,3). \\
N\left(\frac{3+5}{2}, \frac{-4+4}{2}\right) = N(4,0). \\
\overline{MN} \text{ is a midsegment.}
\]

\[
\text{PTS: 4} \quad \text{REF: 011237ge} \quad \text{STA: G.G.42} \quad \text{TOP: Midsegments}
\]

\[
(n - 2)180 = (5 - 2)180 = 540
\]

\[
\text{PTS: 2} \quad \text{REF: 011223ge} \quad \text{STA: G.G.36} \quad \text{TOP: Interior and Exterior Angles of Polygons}
\]

\[
\text{302 ANS: 2} \quad \text{PTS: 2} \quad \text{REF: 011203ge} \quad \text{STA: G.G.73} \\
& \quad \text{TOP: Equations of Circles}
\]

\[
\text{303 ANS: 2}
\]

\[
\sqrt{17^2 - 15^2} = 8. \quad 17 - 8 = 9
\]

\[
\text{PTS: 2} \quad \text{REF: 061221ge} \quad \text{STA: G.G.49} \quad \text{TOP: Chords}
\]

\[
\text{304 ANS: 2} \quad \text{PTS: 2} \quad \text{REF: 061121ge} \quad \text{STA: G.G.22} \\
& \quad \text{TOP: Locus}
\]
305 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


308 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

309 ANS: 3
\( \frac{3}{8 + 3 + 4} \times 180 = 36 \)

PTS: 2 REF: 011210ge STA: G.G.30 TOP: Interior and Exterior Angles of Triangles

310 ANS: 1 PTS: 2 REF: 061223ge STA: G.G.73 TOP: Equations of Circles

311 ANS:
\( m_{AB} = \left( \frac{-6 + 2}{2}, \frac{-2 + 8}{2} \right) = D(2,3) \)
\( m_{BC} = \left( \frac{2 + 6}{2}, \frac{8 + 2}{2} \right) = E(4,3) \)
\( F(0,-2) \)
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: \( m_{AD} = \frac{3 - 2}{2 - 6} = \frac{5}{4} \)
\( m_{DE} = \frac{5}{4} \)
\( m_{EF} = \frac{3 - 2}{4 - 0} = \frac{5}{4} \)

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

312 ANS:
9.1. \((11)(8)h = 800\)
\( h \approx 9.1 \)

PTS: 2 REF: 061131ge STA: G.G.12 TOP: Volume
313 ANS: 3 PTS: 2 REF: 081227ge STA: G.G.42
TOP: Midsegments

314 ANS: 3 PTS: 2 REF: 061102ge STA: G.G.29
TOP: Triangle Congruency

315 ANS:

316 ANS:
\[ \sqrt{(-4 - 2)^2 + (3 - 5)^2} = \sqrt{36 + 4} = \sqrt{40} = \sqrt{4}\sqrt{10} = 2\sqrt{10}. \]

PTS: 2 REF: 061232ge STA: G.G.17 TOP: Constructions

317 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: 061232ge STA: G.G.67 TOP: Distance

318 ANS:
\[ 2 \quad \frac{x + 2}{x} = \frac{x + 6}{4} \]
\[ x^2 + 6x = 4x + 8 \]
\[ x^2 + 2x - 8 = 0 \]
\[ (x + 4)(x - 2) = 0 \]
\[ x = 2 \]

PTS: 4 REF: 081137ge STA: G.G.45 TOP: Similarity
KEY: basic

319 ANS: 2 PTS: 2 REF: 081117ge STA: G.G.23
TOP: Locus

320 ANS:
\[ EO = 6. \quad CE = \sqrt{10^2 - 6^2} = 8 \]

PTS: 2 REF: 011234ge STA: G.G.49 TOP: Chords
321 ANS:

322 ANS:
\[ m = \frac{-A}{B} = \frac{6}{2} = 3. \quad m_\perp = \frac{1}{3}. \]

323 ANS: 4

\[ 6^2 = x(x + 5) \]

\[ 36 = x^2 + 5x \]

\[ 0 = x^2 + 5x - 36 \]

\[ 0 = (x + 9)(x - 4) \]

\[ x = 4 \]

324 ANS: 2

KEY: leg

325 ANS: 2

\[ V = \pi r^2 h = \pi \cdot 6^2 \cdot 15 = 540\pi \]

PTS: 4  REF: 061137ge  STA: G.G.70  TOP: Quadratic-Linear Systems


PTS: 4  REF: 011123ge  STA: G.G.47  TOP: Similarity

PTS: 2  REF: 011233ge  STA: G.G.17  TOP: Constructions

PTS: 2  REF: 011117ge  STA: G.G.14  TOP: Volume
326 ANS: 1

\[ 3x + 5 + 4x - 15 + 2x + 10 = 180. \quad m \angle D = 3(20) + 5 = 65. \quad m \angle E = 4(20) - 15 = 65. \]

\[ 9x = 180 \]
\[ x = 20 \]

PTS: 2 REF: 061119ge STA: G.G.30 TOP: Interior and Exterior Angles of Triangles

327 ANS: 2 is not a prime number, false.

PTS: 2 REF: 081229ge STA: G.G.24 TOP: Negations

328 ANS: 3 PTS: 2 REF: 081123ge STA: G.G.12 TOP: Volume

329 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

330 ANS:

\[
V = \pi r^2 h = \pi (5)^2 \cdot 7 = 175\pi
\]

PTS: 2 REF: 081231ge STA: G.G.14 TOP: Volume


332 ANS: 3 PTS: 2 REF: 011209ge STA: G.G.44 TOP: Similarity Proofs

333 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

334 ANS: 3 PTS: 2 REF: 061220ge STA: G.G.74 TOP: Graphing Circles

335 ANS: 1 PTS: 2 REF: 081113ge STA: G.G.54 TOP: Reflections KEY: basic

336 ANS: 2

\[
\frac{4x + 10}{2} = 2x + 5
\]

PTS: 2 REF: 011103ge STA: G.G.42 TOP: Midsegments
337 ANS: 1

\[ AB = CD \]

\[ AB + BC = CD + BC \]

\[ AC = BD \]

PTS: 2  REF: 081207ge  STA: G.G.27  TOP: Line Proofs

338 ANS:

\[ 180 - (90 + 63) = 27 \]

PTS: 2  REF: 061230ge  STA: G.G.35  TOP: Parallel Lines and Transversals

339 ANS:

\[ T'(-6,3), A'(-3,3), P'(-3,-1) \]

PTS: 2  REF: 061229ge  STA: G.G.54  TOP: Translations

340 ANS: 1  PTS: 2  REF: 011207ge  STA: G.G.20

TOP: Constructions

341 ANS: 3

\[ 8^2 + 24^2 \neq 25^2 \]

PTS: 2  REF: 011111ge  STA: G.G.48  TOP: Pythagorean Theorem

342 ANS: 3

PTS: 2  REF: 011112ge  STA: G.G.49  TOP: Chords

343 ANS: 2  PTS: 2  REF: 081202ge  STA: G.G.55

TOP: Properties of Transformations
\( A'(7, -4), B'(7, -1), C'(9, -4) \). The areas are equal because translations preserve distance.

344 ANS:

\[ \begin{align*}
A'(7, -4), & B'(7, -1), C'(9, -4). \text{ The areas are equal because translations preserve distance.}
\end{align*} \]

345 ANS: 2

346 ANS: 2

347 ANS: 4

\[ x \cdot 4x = 6^2, \quad PQ = 4x + x = 5x = 5(3) = 15 \]

\[ 4x^2 = 36 \]

\[ x = 3 \]

348 ANS: 2

\[ V = \frac{4}{3} \pi r^3 = \frac{4}{3} \pi \cdot 3^3 = 36\pi \]

349 ANS:

\[ R'(-3, -2), S'(-4, 4), \text{ and } T'(2, 2). \]

350 ANS:

\[ \begin{align*}
\text{PTS: 6} & \quad \text{REF: 061238ge} \quad \text{STA: G.G.70} \quad \text{TOP: Quadratic-Linear Systems}
\end{align*} \]
351 ANS:

30. $3x + 4x + 5x = 360$. \( \overrightarrow{LN} : \overrightarrow{NK} : \overrightarrow{KL} = 90:120:150 \). \( \frac{150 - 90}{2} = 30 \)

\[ x = 20 \]

PTS: 4 REF: 061136ge STA: G.G.51 TOP: Arcs Determined by Angles

KEY: outside circle

352 ANS: 1 PTS: 2 REF: 011122ge STA: G.G.28

TOP: Triangle Congruency

353 ANS:

\[ (7,5) \ m_{\overrightarrow{AB}} = \left( \frac{3 + 7}{2}, \frac{3 + 9}{2} \right) = (5,6) \ m_{\overrightarrow{BC}} = \left( \frac{7 + 11}{2}, \frac{9 + 3}{2} \right) = (9,6) \]

PTS: 2 REF: 081134ge STA: G.G.21

TOP: Centroid, Orthocenter, Incenter and Circumcenter

354 ANS: 3 PTS: 2 REF: 061111ge STA: G.G.38

TOP: Parallelograms

355 ANS:

\[ \text{Opposite sides of a parallelogram are congruent and the diagonals of a parallelogram bisect each other.} \]

PTS: 2 REF: 011130ge STA: G.G.54 TOP: Reflections

KEY: grids

356 ANS: 3
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.

358 ANS: 4
Parallel lines intercept congruent arcs.

359 ANS: 2
TOP: Triangles in the Coordinate Plane

360 ANS: 4
TOP: Centroid, Orthocenter, Incenter and Circumcenter

361 ANS: 

362 ANS: 3
TOP: Special Parallelograms

363 ANS: 4
TOP: Equations of Circles

364 ANS: 4
TOP: Interior and Exterior Angles of Triangles
\[
3x + x + 20 + x + 20 = 180
\]

\[
5x = 40
\]

\[
x = 28
\]

- **365 ANS:** 2
- **TOP:** Isosceles Triangle Theorem
- **PTS:** 2
- **REF:** 081222ge
- **STA:** G.G.31

**TOP:** Equations of Circles

- **366 ANS:** 1
- **TOP:** 011220ge
- **STA:** G.G.72

**TOP:** Similarity

- **367 ANS:** 3
- **TOP:** 061224ge
- **STA:** G.G.45

**TOP:** Segments Intercepted by Circle

- **368 ANS:** 4
- **KEY:** two tangents
- **REF:** 011208ge
- **STA:** G.G.53

\[
x^2 - 6x + 2x - 3 = 9x + 27
\]

\[
x^2 - 4x - 3 = 9x + 27
\]

\[
x^2 - 13x - 30 = 0
\]

\[
(x - 15)(x + 2) = 0
\]

\[
x = 15, -2
\]

- **369 ANS:** 4
- **TOP:** Exterior Angle Theorem
- **PTS:** 2
- **REF:** 061225ge
- **STA:** G.G.32

**TOP:** Parallel and Perpendicular Lines

- **370 ANS:** 4
- **TOP:** 061127ge
- **STA:** G.G.62

**TOP:** Locus

- **371 ANS:**
- **TOP:** Constructions

- **372 ANS:** 1
- **TOP:** 011120ge
- **STA:** G.G.18

**TOP:** Parallelograms

- **373 ANS:** 3
- **TOP:** 011104ge
- **STA:** G.G.38

**TOP:** Triangles in the Coordinate Plane

- **374 ANS:** 2
- **TOP:** 081226ge
- **STA:** G.G.69
375 ANS:

\[ M_x = \frac{7 + (-3)}{2} = 2. \quad M_y = \frac{-1 + 3}{2} = 1. \]

PTS: 2  REF: 011133ge  STA: G.G.17  TOP: Constructions

376 ANS: 1  PTS: 2  REF: 061113ge  STA: G.G.63

TOP: Parallel and Perpendicular Lines

377 ANS: 2

\[ m = \frac{-A}{B} = \frac{-4}{2} = -2 \quad y = mx + b \]

\[ 2 = -2(2) + b \]

\[ 6 = b \]

PTS: 2  REF: 011106ge  STA: G.G.66  TOP: Midpoint

378 ANS: 2

\[ m = \frac{-A}{B} = \frac{-20}{-2} = 10. \quad m_\perp = \frac{1}{10} \]

PTS: 2  REF: 061219ge  STA: G.G.62  TOP: Parallel and Perpendicular Lines


TOP: Planes

380 ANS: 2

\[ m = \frac{-A}{B} = \frac{-20}{-2} = 10. \quad m_\perp = \frac{1}{10} \]

PTS: 2  REF: 061219ge  STA: G.G.62  TOP: Parallel and Perpendicular Lines

381 ANS: 3

The slope of \(9x - 3y = 27\) is \(m = \frac{-A}{B} = \frac{-9}{-3} = 3\), which is the opposite reciprocal of \(-\frac{1}{3}\).


382 ANS:

Quadrilateral \(ABCD\), \(\overline{AD} \cong \overline{BC}\) and \(\angle DAE \cong \angle BCE\) are given. \(\overline{AD} \parallel \overline{BC}\) 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. \(\overline{AE} \cong \overline{CE}\) because the diagonals of a parallelogram bisect each other. \(\angle FEA \cong \angle GEC\) as vertical angles. \(\triangle AEF \cong \triangle CEG\) by ASA.


383 ANS: 2  PTS: 2  REF: 011109ge  STA: G.G.9

TOP: Planes

20
384 ANS: 2
\[6x + 42 = 18x - 12\]
\[54 = 12x\]
\[x = \frac{54}{12} = 4.5\]

PTS: 2 REF: 011201ge STA: G.G.35 TOP: Parallel Lines and Transversals

385 ANS: 4
\[m\angle A = 80\]

PTS: 2 REF: 011115ge STA: G.G.34 TOP: Angle Side Relationship

386 ANS: 1

PTS: 2 REF: 081210ge STA: G.G.28 TOP: Triangle Congruency

387 ANS: 3
PTS: 2 REF: 011217ge STA: G.G.64 TOP: Parallel and Perpendicular Lines

388 ANS: 1
PTS: 2 REF: 061108ge STA: G.G.9 TOP: Planes

389 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

390 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
391 ANS: 4

PTS: 2 REF: 081114ge STA: G.G.28 TOP: Triangle Congruency

392 ANS: 3 PTS: 2 REF: 011110ge STA: G.G.21
KEY: Centroid, Orthocenter, Incenter and Circumcenter

393 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

394 ANS: 1 PTS: 2 REF: 061110ge STA: G.G.72
TOP: Equations of Circles

395 ANS: 3
\[d = \sqrt{(-1-4)^2 + (0-(-3))^2} = \sqrt{25+9} = \sqrt{34}\]

PTS: 2 REF: 061217ge STA: G.G.67 TOP: Distance
KEY: general

396 ANS: 3

PTS: 2 REF: 011101ge STA: G.G.53 TOP: Segments Intercepted by Circle
KEY: two tangents

397 ANS: 3 PTS: 2 REF: 081104ge STA: G.G.55
TOP: Properties of Transformations

398 ANS: 2 PTS: 2 REF: 061107ge STA: G.G.32
TOP: Exterior Angle Theorem

399 ANS: 4 PTS: 2 REF: 011118ge STA: G.G.25
TOP: Compound Statements
400 ANS: 4

\[-5 = \frac{-3 + x}{2}. \quad 2 = \frac{6 + y}{2}\]

\[-10 = -3 + x \quad 4 = 6 + y\]

\[-7 = x \quad -2 = y\]

PTS: 2    REF: 081203ge    STA: G.G.66    TOP: Midpoint

401 ANS:

402 ANS:

32. \(\frac{16}{20} = \frac{x - 3}{x + 5}\)  \(
\overline{AC} = x - 3 = 35 - 3 = 32
\)

\[16x + 80 = 20x - 60\]

\[140 = 4x\]

\[35 = x\]

PTS: 4    REF: 011137ge    STA: G.G.46    TOP: Side Splitter Theorem

403 ANS: 3    PTS: 2    REF: 081111ge    STA: G.G.32

TOP: Exterior Angle Theorem

404 ANS: 3

\[\frac{180 - 70}{2} = 55\]

PTS: 2    REF: 061205ge    STA: G.G.52    TOP: Chords

405 ANS: 2

\[(n - 2)180 = (6 - 2)180 = 720. \quad \frac{720}{6} = 120.\]

PTS: 2    REF: 081125ge    STA: G.G.37    TOP: Interior and Exterior Angles of Polygons

406 ANS: 1    PTS: 2    REF: 061125ge    STA: G.G.39

TOP: Special Parallelograms

407 ANS: 4

\(\overline{AB}\) is a vertical line, so its perpendicular bisector is a horizontal line through the midpoint of \(\overline{AB}\), which is \((0,3)\).

PTS: 2    REF: 011225ge    STA: G.G.68    TOP: Perpendicular Bisector
408 \[ \frac{180 - 80}{2} = 50 \]

PTS: 2 \ REF: 081129ge \ STA: G.G.52 \ TOP: Chords

409 ANS: 

\[ A'(-2, 1), B'(-3, -4), \text{ and } C'(5, -3) \]

PTS: 2 \ REF: 081130ge \ STA: G.G.18 \ TOP: Constructions

410 ANS: 

\[ 3 - 5 + 3 = -2 \quad 2 + -4 = -2 \]

PTS: 2 \ REF: 081230ge \ STA: G.G.54 \ TOP: Rotations

411 ANS: 3

\[ 4x + 14 + 8x + 10 = 180 \]

\[ 12x = 156 \]

\[ x = 13 \]

PTS: 2 \ REF: 081213ge \ STA: G.G.35 \ TOP: Parallel Lines and Transversals
ANS: 3

\( y = mx + b \)

\[-1 = 2(2) + b \]

\[-5 = b \]

PTS: 2
REF: 011224ge
STA: G.G.65
TOP: Parallel and Perpendicular Lines

ANS: 3

\[ x^2 + 7^2 = (x + 1)^2 \]

\[ x + 1 = 25 \]

\[ x^2 + 49 = x^2 + 2x + 1 \]

\[ 48 = 2x \]

\[ 24 = x \]

PTS: 2
REF: 081127ge
STA: G.G.48
TOP: Pythagorean Theorem

ANS: 2

\[ AC = BD \]

\[ AC - BC = BD - BC \]

\[ AB = CD \]

PTS: 2
REF: 061206ge
STA: G.G.27
TOP: Line Proofs

ANS:

PTS: 2
REF: 061130ge
STA: G.G.20
TOP: Constructions

TOP: Volume
418 ANS: 3

419 ANS: 3 PTS: 2 REF: 081208ge STA: G.G.27 TOP: Quadrilateral Proofs

420 ANS:

\[ OA \cong OB \text{ because all radii are equal. } OP \cong OP \text{ because of the reflexive property. } OA \perp PA \text{ and } OB \perp PB \text{ because tangents to a circle are perpendicular to a radius at a point on a circle. } \angle PAO \text{ and } \angle PBO \text{ are right angles because of the definition of perpendicular. } \angle PAO \cong \angle PBO \text{ because all right angles are congruent. } \triangle AOP \cong \triangle BOP \text{ because of HL. } \angle AOP \cong \angle BOP \text{ because of CPCTC.} \]


422 ANS: 2 PTS: 2 REF: 011206ge STA: G.G.32 TOP: Exterior Angle Theorem

423 ANS: 1 PTS: 2 REF: 011218ge STA: G.G.3 TOP: Planes

424 ANS:

\[ x(x + 2) = 12 \cdot 2. \quad RT = 6 + 4 = 10. \quad y \cdot y = 18 \cdot 8 \]

\[ x^2 + 2x - 24 = 0 \]

\[ (x + 6)(x - 4) = 0 \]

\[ x = 4 \]

\[ y^2 = 144 \]

\[ y = 12 \]

\[
\sqrt{25^2 - 7^2} = 24
\]

PTS: 2  REF: 081105ge  STA: G.G.50  TOP: Tangents
KEY: point of tangency

427 ANS: 
Yes. A reflection is an isometry.

PTS: 2  REF: 061132ge  STA: G.G.56  TOP: Identifying Transformations

428 ANS: 
\[5 - 3 = 2, 5 + 3 = 8\]

PTS: 2  REF: 011228ge  STA: G.G.33  TOP: Triangle Inequality Theorem

429 ANS: 2

PTS: 2  REF: 081106ge  STA: G.G.17  TOP: Constructions

430 ANS: 3
\[
\sqrt{5^2 + 12^2} = 13
\]

PTS: 2  REF: 061116ge  STA: G.G.39  TOP: Special Parallelograms

431 ANS: 2

PTS: 2  REF: 061101ge  STA: G.G.18  TOP: Constructions

432 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

433 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

434 ANS: 4

PTS: 2  REF: 011108ge  STA: G.G.27  TOP: Angle Proofs

435 ANS: 4

PTS: 2  REF: 011124ge  STA: G.G.51  TOP: Arcs Determined by Angles
KEY: inscribed

436 ANS: 1
\[
m = \left(\frac{8 + 0}{2}, \frac{2 + 6}{2}\right) = (4,4) \quad m = \frac{6 - 2}{0 - 8} = \frac{4}{-8} = \frac{1}{2} \quad m_{\perp} = 2 \quad y = mx + b
\]
\[
4 = 2(4) + b
\]
\[
-4 = b
\]

PTS: 2  REF: 081126ge  STA: G.G.68  TOP: Perpendicular Bisector
437 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

438 ANS: 4 PTS: 2 REF: 081110ge STA: G.G.71
TOP: Equations of Circles

439 ANS: 3 PTS: 2 REF: 081218ge STA: G.G.1
TOP: Planes

440 ANS: 3
7x = 5x + 30
2x = 30
x = 15

PTS: 2 REF: 081109ge STA: G.G.35 TOP: Parallel Lines and Transversals

441 ANS: 1

\[ \frac{40 - 24}{2} = 8, \quad \sqrt{10^2 - 8^2} = 6. \]

PTS: 2 REF: 061204ge STA: G.G.40 TOP: Trapezoids

442 ANS:
The slope of \( x + 2y = 4 \) is \( m = \frac{-A}{B} = \frac{-1}{2} \). The slope of \( 4y - 2x = 12 \) is \( \frac{-A}{B} = \frac{2}{4} = \frac{1}{2} \). Since the slopes are neither equal nor opposite reciprocals, the lines are neither parallel nor perpendicular.

PTS: 2 REF: 061231ge STA: G.G.63 TOP: Parallel and Perpendicular Lines

443 ANS:
\[ V = \pi r^2 h \quad L = 2\pi rh = 2\pi \cdot 5\sqrt{2} \cdot 12 \approx 533.1 \]
\[ 600\pi = \pi r^2 \cdot 12 \]
\[ 50 = r^2 \]
\[ \sqrt{25} \sqrt{2} = r \]
\[ 5\sqrt{2} = r \]

PTS: 4 REF: 011236ge STA: G.G.14 TOP: Volume
444 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

445 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

446 ANS:
\[ L = 2\pi rh = 2\pi \cdot 12 \cdot 22 \approx 1659. \quad \frac{1659}{600} \approx 2.8. \quad 3 \] cans are needed.

PTS: 2  REF: 061233ge  STA: G.G.14  TOP: Lateral Area

447 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

448 ANS: 3  PTS: 2  REF: 061210ge  STA: G.G.71  
TOP: Equations of Circles

449 ANS:
The medians of a triangle are not concurrent. False.

PTS: 2  REF: 061129ge  STA: G.G.24  TOP: Negations

450 ANS:

PTS: 2  REF: 081234ge  STA: G.G.23  TOP: Locus
451 ANS: 2
7x = 5x + 30
2x = 30
x = 15

PTS: 2  REF: 061106ge  STA: G.G.35  TOP: Parallel Lines and Transversals

452 ANS: 4  PTS: 2  REF: 061203ge  STA: G.G.9  TOP: Planes

453 ANS:

454 ANS: 2
\[ d = \sqrt{(-1 - 7)^2 + (9 - 4)^2} = \sqrt{64 + 25} = \sqrt{89} \]

PTS: 4  REF: 081237ge  STA: G.G.70  TOP: Quadratic-Linear Systems

455 ANS: 1
4x = 6 \cdot 10
x = 15

PTS: 2  REF: 081017ge  STA: G.G.53  TOP: Segments Intersected by Circle  KEY: two chords
ID: A

456  ANS:

PTS: 2  REF: 060932ge  STA: G.G.22  TOP: Locus