Geometry Regents Exam Questions at Random
www.jmap.org

Geometry Regents at Random

1 Which equation represents a line that is parallel to the line whose equation is $3x - 2y = 7$?

1) $y = -\frac{3}{2}x + 5$

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

3) $y = \frac{3}{2}x - 5$

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

2 As shown in the diagram below, $CD$ is a median of $\triangle ABC$.

Which statement is always true?

1) $AD \cong DB$

2) $AC \cong AD$

3) $\angle ACD \cong \angle CDB$

4) $\angle BCD \cong \angle ACD$

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

1) $y = 2x - 6$

2) $y = -2x + 4$

3) $y = \frac{1}{2}x + \frac{5}{2}$

4) $y = -\frac{1}{2}x + \frac{19}{2}$

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

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

1) 5

2) 13

3) 16

4) 32

5 Given the statement: One is a prime number. What is the negation and the truth value of the negation?

1) One is not a prime number; true

2) One is not a prime number; false

3) One is a composite number; true

4) One is a composite number; false

6 What are the coordinates of $A'$, the image of $A(-3,4)$, after a rotation of $180^\circ$ about the origin?

1) $(4,-3)$

2) $(-4,-3)$

3) $(3,4)$

4) $(3,-4)$
7. As shown in the diagram below, a landscaper uses a cylindrical lawn roller on a lawn. The roller has a radius of 9 inches and a width of 42 inches. To the nearest square inch, the area the roller covers in one complete rotation is
1) 2,374
2) 2,375
3) 10,682
4) 10,688

8. In trapezoid $RSTV$ with bases $RS$ and $VT$, diagonals $RT$ and $SV$ intersect at $Q$. If trapezoid $RSTV$ is not isosceles, which triangle is equal in area to $\triangle RSV$?
1) $\triangle RQV$
2) $\triangle RST$
3) $\triangle RVT$
4) $\triangle SVT$

9. Write an equation of the line that is the perpendicular bisector of the line segment having endpoints $(3, -1)$ and $(3, 5)$. [The use of the grid below is optional]

10. If distinct planes $R$ and $S$ are both perpendicular to line $\ell$, which statement must always be true?
1) Plane $R$ is parallel to plane $S$.
2) Plane $R$ is perpendicular to plane $S$.
3) Planes $R$ and $S$ and line $\ell$ are all parallel.
4) The intersection of planes $R$ and $S$ is perpendicular to line $\ell$. 
11 Trapezoid $QRST$ is graphed on the set of axes below.

Under which transformation will there be no invariant points?
1) $r_y = 0$
2) $r_x = 0$
3) $r_{(0,0)}$
4) $r_y = x$

12 Transversal $EF$ intersects $AB$ and $CD$, as shown in the diagram below.

Which statement could always be used to prove $\overrightarrow{AB} \parallel \overrightarrow{CD}$?
1) $\angle 2 \cong \angle 4$
2) $\angle 7 \cong \angle 8$
3) $\angle 3$ and $\angle 6$ are supplementary
4) $\angle 1$ and $\angle 5$ are supplementary

13 Two intersecting lines are shown in the diagram below. Sketch the locus of points that are equidistant from the two lines. Sketch the locus of points that are a given distance, $d$, from the point of intersection of the given lines. State the number of points that satisfy both conditions.

14 In the diagram of $\triangle MAH$ below, $\overline{MH} \cong \overline{AH}$ and medians $\overline{AB}$ and $\overline{MT}$ are drawn. Prove: $\angle MBA \cong \angle ATM$
15 A right prism has a square base with an area of 12 square meters. The volume of the prism is 84 cubic meters. Determine and state the height of the prism, in meters.

16 After the transformation \( r_{y=x} \), the image of \( \Delta ABC \) is \( \Delta A'B'C' \). If \( AB = 2x + 13 \) and \( A'B' = 9x - 8 \), find the value of \( x \).

17 The endpoints of \( \overline{AB} \) are \( A(3,-4) \) and \( B(7,2) \). Determine and state the length of \( AB \) in simplest radical form.

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

19 The coordinates of point \( P \) are \( (7,1) \). What are the coordinates of the image of \( P \) after \( R_{90^\circ} \) about the origin?
1) \( (1,7) \)
2) \( (-7,-1) \)
3) \( (1,-7) \)
4) \( (-1,7) \)

20 In the diagram below, circles \( A \) and \( B \) are tangent at point \( C \) and \( AB \) is drawn. Sketch all common tangent lines.

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

If \( m\overline{AB} = 104 \) and \( m\overline{CD} = 168 \), what is \( m\overline{BD} \)?
1) 38
2) 44
3) 88
4) 96
22 What is the equation of circle $O$ shown in the diagram below?

![Diagram of a circle with center O](image)

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

25 Find, in simplest radical form, the length of the line segment with endpoints whose coordinates are $(-1, 4)$ and $(3, -2)$.

26 How many points are 5 units from a line and also equidistant from two points on the line?
   1) 1
   2) 2
   3) 3
   4) 0

27 Triangle $ABC$ has vertices $A(6, 6)$, $B(9, 0)$, and $C(3, -3)$. State and label the coordinates of $\Delta A'B'C'$, the image of $\Delta ABC$ after a dilation of $D_{\frac{1}{3}}$.

28 If line $\ell$ is perpendicular to distinct planes $\mathcal{P}$ and $\mathcal{Q}$, then planes $\mathcal{P}$ and $\mathcal{Q}$
   1) are parallel
   2) contain line $\ell$
   3) are perpendicular
   4) intersect, but are not perpendicular
29 Which set of equations represents two circles that have the same center?

1) \( x^2 + (y + 4)^2 = 16 \) and \( (x + 4)^2 + y^2 = 16 \)

2) \( (x + 3)^2 + (y - 3)^2 = 16 \) and \( (x - 3)^2 + (y + 3)^2 = 25 \)

3) \( (x - 7)^2 + (y - 2)^2 = 16 \) and \( (x + 7)^2 + (y + 2)^2 = 25 \)

4) \( (x - 2)^2 + (y - 5)^2 = 16 \) and \( (x - 2)^2 + (y - 5)^2 = 25 \)

30 In circle \( O \) shown below, chords \( AB \) and \( CD \) and radius \( OA \) are drawn, such that \( AB \cong CD \), \( OE \perp AB \), \( OF \perp CD \), \( OF = 16 \), \( CF = y + 10 \), and \( CD = 4y - 20 \).

Determine the length of \( DF \). Determine the length of \( OA \).

31 On the set of axes below, graph the locus of points 4 units from the \( x \)-axis and equidistant from the points whose coordinates are \((-2, 0)\) and \((8, 0)\). Mark with an \( \text{X} \) all points that satisfy both conditions.
32 Quadrilateral $MATH$ has coordinates $M(-6,-3)$, $A(-1,-3)$, $T(-2,-1)$, and $H(-4,-1)$. The image of quadrilateral $MATH$ after the composition $r_{x-axis} \circ T_{7,5}$ is quadrilateral $M''A''T''H''$. State and label the coordinates of $M''A''T''H''$. [The use of the set of axes below is optional.]

33 Given: $\triangle ABC$, $BD$ bisects $\angle ABC$, $BD \perp AC$  
Prove: $AB \cong CB$

34 In $\triangle ABC$ shown below, $L$ is the midpoint of $BC$, $M$ is the midpoint of $AB$, and $N$ is the midpoint of $AC$.  

If $MN = 8$, $ML = 5$, and $NL = 6$, the perimeter of trapezoid $BMNC$ is  
1) 35  
2) 31  
3) 28  
4) 26

35 Using a compass and straightedge, construct the perpendicular bisector of $AB$. [Leave all construction marks.]

36 A right circular cylinder has a height of 7 inches and the base has a diameter of 6 inches. Determine the lateral area, in square inches, of the cylinder in terms of $\pi$. 

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

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

38 Triangle $ABC$ has vertices $A(5, 1), B(1, 4)$ and $C(1, 1)$. State and label the coordinates of the vertices of $\triangle A''B''C''$, the image of $\triangle ABC$, following the composite transformation $T_{1,-1} \circ D_2$.

[The use of the set of axes below is optional.]

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

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

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

41 The diagram below shows the construction of an equilateral triangle.

Which statement justifies this construction?

1) $\angle A + \angle B + \angle C = 180$
2) $m\angle A = m\angle B = m\angle C$
3) $AB = AC = BC$
4) $AB + BC > AC$

39 Triangle $ABC$ has vertices at $A(3, 0)$, $B(9, -5)$, and $C(7, -8)$. Find the length of $AC$ in simplest radical form.
42 If $\triangle MNP \cong \triangle VWX$ and $PM$ is the shortest side of $\triangle MNP$, what is the shortest side of $\triangle VWX$?
1) $XV$
2) $WX$
3) $VW$
4) $NP$

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

44 In $\triangle ABC$, $\angle A \approx \angle B$ and $\angle C$ is an obtuse angle. Which statement is true?
1) $AC \cong AB$ and $BC$ is the longest side.
2) $AC \cong BC$ and $AB$ is the longest side.
3) $AC \cong AB$ and $BC$ is the shortest side.
4) $AC \cong BC$ and $AB$ is the shortest side.

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

Which statement justifies why $AB \cong CB$?
1) Distance is preserved under reflection.
2) Orientation is preserved under reflection.
3) Points on the line of reflection remain invariant.
4) Right angles remain congruent under reflection.
46 In the diagram of $\triangle ABC$ below, $\overline{AB}$ is extended to point $D$.

If $m\angle CAB = x + 40$, $m\angle ACB = 3x + 10$, $m\angle CBD = 6x$, what is $m\angle CAB$?

1) 13
2) 25
3) 53
4) 65

47 A student wrote the following equations:

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

The lines represented by these equations are

1) parallel
2) the same line
3) perpendicular
4) intersecting, but not perpendicular

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

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

48 Triangle $ABC$ is similar to triangle $DEF$. The lengths of the sides of $\triangle ABC$ are 5, 8, and 11. What is the length of the shortest side of $\triangle DEF$ if its perimeter is 60?

1) 10
2) 12.5
3) 20
4) 27.5
50 Which diagram shows the construction of a 45° angle?

1)

2)

3)

4)

51 If $\triangle RST \sim \triangle ABC$, $m\angle A = x^2 - 8x$, $m\angle C = 4x - 5$, and $m\angle R = 5x + 30$, find $m\angle C$. [Only an algebraic solution can receive full credit.]

52 Lines $p$ and $q$ are intersected by line $r$, as shown below.

If $m\angle 1 = 7x - 36$ and $m\angle 2 = 5x + 12$, for which value of $x$ would $p \parallel q$?

1) 17
2) 24
3) 83
4) 97

53 As shown below, the medians of $\triangle ABC$ intersect at $D$.

If the length of $BE$ is 12, what is the length of $BD$?

1) 8
2) 9
3) 3
4) 4
54 On the ray drawn below, using a compass and straightedge, construct an equilateral triangle with a vertex at $R$. The length of a side of the triangle must be equal to a length of the diagonal of rectangle $ABCD$.

55 State whether the lines represented by the equations $y = \frac{1}{2} x - 1$ and $y + 4 = -\frac{1}{2} (x - 2)$ are parallel, perpendicular, or neither. Explain your answer.

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

57 The lateral area of a right circular cone is equal to $120\pi$ cm$^2$. If the base of the cone has a diameter of 24 cm, what is the length of the slant height, in centimeters?
1) 2.5
2) 5
3) 10
4) 15.7
58 The coordinates of the vertices of parallelogram \( SWAN \) are \( S(2, -2), W(-2, -4), A(-4, 6), \) and \( N(0, 8). \) State and label the coordinates of parallelogram \( S''W''A''N'' \), the image of \( SWAN \) after the transformation \( T_{4, -2} \circ D_{1/2}. \) [The use of the set of axes below is optional.]

59 In a coordinate plane, the locus of points 5 units from the \( x \)-axis is the
1) lines \( x = 5 \) and \( x = -5 \)
2) lines \( y = 5 \) and \( y = -5 \)
3) line \( x = 5, \) only
4) line \( y = 5, \) only

60 In the diagram below of circle \( O, \overline{PAC} \) and \( \overline{PBD} \) are secants. If \( m\overline{CD} = 70 \) and \( m\overline{AB} = 20, \) what is the degree measure of \( \angle P? \)
1) 25
2) 35
3) 45
4) 50

61 Square \( ABCD \) has vertices \( A(-2, -3), B(4, -1), C(2, 5), \) and \( D(-4, 3). \) What is the length of a side of the square?
1) \( 2\sqrt{5} \)
2) \( 2\sqrt{10} \)
3) \( 4\sqrt{5} \)
4) \( 10\sqrt{2} \)

62 If the vertices of \( \triangle ABC \) are \( A(-2, 4), B(-2, 8), \) and \( C(-5, 6), \) then \( \triangle ABC \) is classified as
1) right
2) scalene
3) isosceles
4) equilateral
63. Which equation represents the circle whose center is \((-5, 3)\) and that passes through the point \((-1, 3)\)?

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

64. What is the measure of the largest exterior angle that any regular polygon can have?

1) 60º
2) 90º
3) 120º
4) 360º

65. In the diagram below, \(\triangle XYV \cong \triangle TSV\).

Which statement can not be proven?

1) \(\angle XYV \cong \angle TVS\)
2) \(\angle VYX \cong \angle VUT\)
3) \(XY \cong TS\)
4) \(YY \cong SV\)

66. In the diagram of circle \(O\) below, diameter \(RS\), chord \(AS\), tangent \(TS\), and secant \(TAR\) are drawn.

Complete the following proof to show \((RS)^2 = RA \cdot RT\)

<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. circle (O), diameter (RS), chord (AS), tangent (TS), and secant (TAR)</td>
<td>1. Given</td>
</tr>
<tr>
<td>2. (RS \perp TS)</td>
<td>2.</td>
</tr>
<tr>
<td>3. (\angle BST) is a right angle</td>
<td>3. (\perp) lines form right angles</td>
</tr>
<tr>
<td>4. (\angle BAS) is a right angle</td>
<td>4.</td>
</tr>
<tr>
<td>5. (\triangle BST \cong \triangle BAS)</td>
<td>5.</td>
</tr>
<tr>
<td>6. (\angle R = \angle R)</td>
<td>6. Reflexive property</td>
</tr>
<tr>
<td>7. (\triangle BST \cong \triangle BAS)</td>
<td>7.</td>
</tr>
<tr>
<td>8. (RS = RA = RT)</td>
<td>8.</td>
</tr>
<tr>
<td>9. ((RS)^2 = RA \cdot RT)</td>
<td>9.</td>
</tr>
</tbody>
</table>

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

1) If an angle is a right angle, then it measures 90 degrees.
2) An angle is a right angle if it measures 90 degrees.
3) If an angle is not a right angle, then it does not measure 90 degrees.
4) If an angle does not measure 90 degrees, then it is not a right angle.
68 The solution of the system of equations \( y = x^2 - 2 \) and \( y = x \) is
1) \((1, 1)\) and \((-2, -2)\)
2) \((2, 2)\) and \((-1, -1)\)
3) \((1, 1)\) and \((2, 2)\)
4) \((-2, -2)\) and \((-1, -1)\)

69 Determine, in degrees, the measure of each interior angle of a regular octagon.

70 Which equation represents circle \( A \) shown in the diagram below?

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

71 When the system of equations \( y + 2 = (x - 4)^2 \) and \( 2x + y - 6 = 0 \) is solved graphically, the solution is
1) \((-4, -2)\) and \((-2, 2)\)
2) \((4, -2)\) and \((2, 2)\)
3) \((-4, 2)\) and \((-6, 6)\)
4) \((4, 2)\) and \((6, 6)\)

72 Given: \( \triangle ABD, \overline{BC} \) is the perpendicular bisector of \( AD \)

Which statement can not always be proven?
1) \( \overline{AC} \cong \overline{DC} \)
2) \( \overline{BC} \cong \overline{CD} \)
3) \( \angle ACB \cong \angle DCB \)
4) \( \triangle ABC \cong \triangle DBC \)

73 Using a compass and straightedge, construct a line perpendicular to line \( \ell \) through point \( P \). [Leave all construction marks.]
74 The diagram below shows rectangle $ABCD$ with points $E$ and $F$ on side $AB$. Segments $CE$ and $DF$ intersect at $G$, and $\angle ADG \cong \angle BCG$. Prove: $\overline{AE} \cong \overline{BF}$

75 As shown in the diagram below, a right pyramid has a square base, $ABCD$, and $EF$ is the slant height. Which statement is not true?
1) $\overline{EA} \cong \overline{EC}$
2) $\overline{EB} \cong \overline{EF}$
3) $\triangle AEB \cong \triangle BEC$
4) $\triangle CED$ is isosceles

76 The volume of a sphere is approximately 44.6022 cubic centimeters. What is the radius of the sphere, to the nearest tenth of a centimeter?
1) 2.2
2) 3.3
3) 4.4
4) 4.7

77 The diagram below shows the construction of line $m$, parallel to line $\ell$, through point $P$.

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

78 A right circular cylinder with a height of 5 cm has a base with a diameter of 6 cm. Find the lateral area of the cylinder to the nearest hundredth of a square centimeter. Find the volume of the cylinder to the nearest hundredth of a cubic centimeter.
79. If $\triangle ABC \cong \triangle JKL \cong \triangle RST$, then $\overline{BC}$ must be congruent to:
   1) $\overline{JL}$
   2) $\overline{JK}$
   3) $\overline{ST}$
   4) $\overline{RS}$

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

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

Which statement is not always true?
   1) $\overline{SL} \cong \overline{TL}$
   2) $\overline{RS} = \overline{DR}$
   3) $\overline{RL} \cong \overline{LE}$
   4) $(\overline{DL})(\overline{LE}) = (\overline{SL})(\overline{LT})$

82. Quadrilateral $ABCD$ with vertices $A(-7, 4)$, $B(-3, 6), C(3, 0)$, and $D(1, -8)$ is graphed on the set of axes below. Quadrilateral $MNPQ$ is formed by joining $M, N, P,$ and $Q$, the midpoints of $\overline{AB}, \overline{BC}, \overline{CD},$ and $\overline{AD}$, respectively. Prove that quadrilateral $MNPQ$ is a parallelogram. Prove that quadrilateral $MNPQ$ is not a rhombus.

83. A circle with the equation $(x + 6)^2 + (y - 7)^2 = 64$ does not include points in Quadrant
   1) I
   2) II
   3) III
   4) IV

84. The measure of an interior angle of a regular polygon is 120°. How many sides does the polygon have?
   1) 5
   2) 6
   3) 3
   4) 4
85 Which equation represents circle $O$ shown in the graph below?

[Diagram of a circle with the center at the origin and a point on the circle labeled O]

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

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

[Diagram of a triangle with points A, B, C, D, and E]

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

87 What is the difference between the sum of the measures of the interior angles of a regular pentagon and the sum of the measures of the exterior angles of a regular pentagon?

1) 36
2) 72
3) 108
4) 180

88 Line $\ell$ passes through the point $(5, 3)$ and is parallel to line $k$ whose equation is $5x + y = 6$. An equation of line $\ell$ is

1) $y = \frac{1}{5}x + 2$
2) $y = -5x + 28$
3) $y = \frac{1}{5}x - 2$
4) $y = -5x - 28$

89 In the diagram below, diameter $AB$ bisects chord $CD$ at point $E$ in circle $F$.

[Diagram of a circle with diameter AB, chord CD, and point E]

If $AE = 2$ and $FB = 17$, then the length of $CE$ is

1) 7
2) 8
3) 15
4) 16
90. Trapezoid $TRAP$, with median $\overline{MQ}$, is shown in the diagram below. Solve algebraically for $x$ and $y$.

91. What is the equation for circle $O$ shown in the graph below?

92. Triangle $ABC$ has the coordinates $A(1,2)$, $B(5,2)$, and $C(5,5)$. Triangle $ABC$ is rotated $180^\circ$ about the origin to form triangle $A'B'C'$. Triangle $A'B'C'$ is

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

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

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

94. The midpoint of $\overline{AB}$ is $M(4,2)$. If the coordinates of $A$ are $(6,-4)$, what are the coordinates of $B$?

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

95. What is the equation of the circle with its center at $(-1,2)$ and that passes through the point $(1,2)$?

1) $(x + 1)^2 + (y - 2)^2 = 4$
2) $(x - 1)^2 + (y + 2)^2 = 4$
3) $(x + 1)^2 + (y - 2)^2 = 2$
4) $(x - 1)^2 + (y + 2)^2 = 2$
96 Secants $\overline{JKL}$ and $\overline{JMN}$ are drawn to circle $O$ from an external point, $J$. If $JK = 8$, $LK = 4$, and $JM = 6$, what is the length of $JN$?  
1) 16  
2) 12  
3) 10  
4) 8

97 The sides of a triangle are 8, 12, and 15. The longest side of a similar triangle is 18. What is the ratio of the perimeter of the smaller triangle to the perimeter of the larger triangle?  
1) 2:3  
2) 4:9  
3) 5:6  
4) 25:36

98 In the diagram below of right triangle $ABC$, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$.  

If $AD = 3$ and $DB = 12$, what is the length of altitude $\overline{CD}$?  
1) 6  
2) $6\sqrt{5}$  
3) 3  
4) $3\sqrt{5}$

99 In $\triangle ABC$, $m\angle A = 60$, $m\angle B = 80$, and $m\angle C = 40$. Which inequality is true?  
1) $AB > BC$  
2) $AC > BC$  
3) $AC < BA$  
4) $BC < BA$

100 Consider the relationship between the two statements below.  
If $\sqrt{16 + 9} \neq 4 + 3$, then $5 \neq 4 + 3$  
If $\sqrt{16 + 9} = 4 + 3$, then $5 = 4 + 3$  
These statements are  
1) inverses  
2) converses  
3) contrapositives  
4) biconditionals

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

Which pair of edges are not coplanar?  
1) $\overline{BF}$ and $\overline{CG}$  
2) $\overline{BF}$ and $\overline{DH}$  
3) $\overline{EF}$ and $\overline{CD}$  
4) $\overline{EF}$ and $\overline{BC}$
102 In the diagram below of quadrilateral $ABCD$, $E$ and $F$ are points on $AB$ and $CD$, respectively, $BE \cong DF$, and $AE \cong CF$.

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

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

What is $m\angle ACR$?
1) 125
2) 115
3) 65
4) 55

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

105 On the set of axes below, graph the locus of points 4 units from $(0, 1)$ and the locus of points 3 units from the origin. Label with an $X$ any points that satisfy both conditions.

106 The bases of a right triangular prism are $\triangle ABC$ and $\triangle DEF$. Angles $A$ and $D$ are right angles, $AB = 6$, $AC = 8$, and $AD = 12$. What is the length of edge $BE$?
1) 10
2) 12
3) 14
4) 16
107 Which graph could be used to find the solution to the following system of equations?

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

108 In a park, two straight paths intersect. The city wants to install lampposts that are both equidistant from each path and also 15 feet from the intersection of the paths. How many lampposts are needed?

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

109 Plane \( A \) and plane \( B \) are two distinct planes that are both perpendicular to line \( \ell \). Which statement about planes \( A \) and \( B \) is true?

1) Planes \( A \) and \( B \) have a common edge, which forms a line.
2) Planes \( A \) and \( B \) are perpendicular to each other.
3) Planes \( A \) and \( B \) intersect each other at exactly one point.
4) Planes \( A \) and \( B \) are parallel to each other.
110  The diagram below shows $\triangle ABD$, with $\overrightarrow{AB}$, $\overrightarrow{BE} \perp AD$, and $\angle EBD \cong \angle CBD$.

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

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

112  How many points in the coordinate plane are 3 units from the origin and also equidistant from both the $x$-axis and the $y$-axis?
1) 1
2) 2
3) 8
4) 4

113  As shown in the diagram below, $\overline{FD}$ and $\overline{CB}$ intersect at point $A$ and $\overline{ET}$ is perpendicular to both $\overline{FD}$ and $\overline{CB}$ at $A$.

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

114  A rectangular prism has a base with a length of 25, a width of 9, and a height of 12. A second prism has a square base with a side of 15. If the volumes of the two prisms are equal, what is the height of the second prism?
1) 6
2) 8
3) 12
4) 15
115 The equation of a line is $y = \frac{2}{3}x + 5$. What is an equation of the line that is perpendicular to the given line and that passes through the point (4, 2)?

1) $y = \frac{2}{3}x - \frac{2}{3}$
2) $y = \frac{3}{2}x - 4$
3) $y = -\frac{3}{2}x + 7$
4) $y = -\frac{3}{2}x + 8$

116 Triangle $ABC$ shown below is a right triangle with altitude $AD$ drawn to the hypotenuse $BC$.

![Triangle ABC diagram]

If $BD = 2$ and $DC = 10$, what is the length of $AB$?

1) $2\sqrt{2}$
2) $2\sqrt{5}$
3) $2\sqrt{6}$
4) $2\sqrt{30}$

117 Which graph represents a circle whose equation is $x^2 + (y - 1)^2 = 9$?

1) ![Graph 1]
2) ![Graph 2]
3) ![Graph 3]
4) ![Graph 4]

118 Write an equation of a circle whose center is $(-3, 2)$ and whose diameter is 10.
119 Points $A(5, 3)$ and $B(7, 6)$ lie on $\overrightarrow{AB}$. Points $C(6, 4)$ and $D(9, 0)$ lie on $\overrightarrow{CD}$. Which statement is true?

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

120 What are the coordinates of the center and the length of the radius of the circle whose equation is $(x + 1)^2 + (y - 5)^2 = 16$?

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

121 In the diagram of $\triangle BCD$ shown below, $\overrightarrow{BA}$ is drawn from vertex $B$ to point $A$ on $\overrightarrow{DC}$, such that $\overrightarrow{BC} \cong \overrightarrow{BA}$.

In $\triangle DAB$, $m\angle D = x$, $m\angle DAB = 5x - 30$, and $m\angle DBA = 3x - 60$. In $\triangle ABC$, $AB = 6y - 8$ and $BC = 4y - 2$. [Only algebraic solutions can receive full credit.] Find $m\angle D$. Find $m\angle BAC$. Find the length of $BC$. Find the length of $DC$.

122 What is the perimeter of a square whose diagonal is $3\sqrt{2}$?
1) 18
2) 12
3) 9
4) 6

123 In $\triangle ABC$, $m\angle A = 3x + 1$, $m\angle B = 4x - 17$, and $m\angle C = 5x - 20$. Which type of triangle is $\triangle ABC$?
1) right
2) scalene
3) isosceles
4) equilateral

124 In triangles $ABC$ and $DEF$, $AB = 4$, $AC = 5$, $DE = 8$, $DF = 10$, and $\angle A \cong \angle D$. Which method could be used to prove $\triangle ABC \sim \triangle DEF$?
1) AA
2) SAS
3) SSS
4) ASA

125 Using a compass and straightedge, construct the bisector of $\angle MJH$. [Leave all construction marks.]
126 The coordinates of the vertices of \( \triangle ABC \) are \( A(-6, 5) \), \( B(-4, 8) \), and \( C(1, 6) \). State and label the coordinates of the vertices of \( \triangle A'B'C'' \), the image of \( \triangle ABC \) after the composition of transformations \( T_{(-4,5)} \circ r_{y\text{-axis}} \). [The use of the set of axes below is optional.]

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

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

128 If \( \triangle ABC \) and its image, \( \triangle A'B'C' \), are graphed on a set of axes, \( \triangle ABC \cong \triangle A'B'C' \) under each transformation except
1) \( D_2 \)
2) \( R_{90^\circ} \)
3) \( r_{y=x} \)
4) \( T_{(-2,3)} \)

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

Which quadrilateral does not always have congruent diagonals?
1) isosceles trapezoid
2) rectangle
3) rhombus
4) square
131 Which set of numbers could not represent the lengths of the sides of a right triangle?
1) \{1, 3, \sqrt{10}\}
2) \{2, 3, 4\}
3) \{3, 4, 5\}
4) \{8, 15, 17\}

132 A tree, \(T\), is 6 meters from a row of corn, \(c\), as represented in the diagram below. A farmer wants to place a scarecrow 2 meters from the row of corn and also 5 meters from the tree. Sketch both loci. Indicate, with an \(X\), all possible locations for the scarecrow.

134 As shown in the diagram of rectangle \(ABCD\) below, diagonals \(AC\) and \(BD\) intersect at \(E\).

If \(AE = x + 2\) and \(BD = 4x - 16\), then the length of \(AC\) is
1) 6
2) 10
3) 12
4) 24

135 What are the coordinates of the center of a circle if the endpoints of its diameter are \(A(8, -4)\) and \(B(-3, 2)\)?
1) \((2.5, 1)\)
2) \((2.5, -1)\)
3) \((5.5, -3)\)
4) \((5.5, 3)\)

136 What is an equation of the circle with center \((-5, 4)\) and a radius of 7?
1) \((x - 5)^2 + (y + 4)^2 = 14\)
2) \((x - 5)^2 + (y + 4)^2 = 49\)
3) \((x + 5)^2 + (y - 4)^2 = 14\)
4) \((x + 5)^2 + (y - 4)^2 = 49\)

137 In \(\triangle ABC\), \(m\angle A = x^2 + 12\), \(m\angle B = 11x + 5\), and \(m\angle C = 13x - 17\). Determine the longest side of \(\triangle ABC\).
138 What is the perimeter of a rhombus whose diagonals are 16 and 30?
1) 92
2) 68
3) 60
4) 17

139 In the diagram of circle O below, chord CD is parallel to diameter AOB and mCD = 110.

What is mDB?
1) 35
2) 55
3) 70
4) 110

140 In right triangle ABC below, CD is the altitude to hypotenuse AB. If CD = 6 and the ratio of AD to AB is 1:5, determine and state the length of BD. [Only an algebraic solution can receive full credit.]

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

What is the length of AB?
1) 5√3
2) 6
3) 3√5
4) 9

142 In the diagram below, AC and BC are tangent to circle O at A and B, respectively, from external point C.

If mACB = 38, what is mAOB?
1) 71
2) 104
3) 142
4) 161
143 Triangle ABC is shown in the diagram below.

If \( \overline{DE} \) joins the midpoints of \( \overline{ADC} \) and \( \overline{AEB} \), which statement is not true?

1) \( \overline{DE} = \frac{1}{2} \overline{CB} \)
2) \( \overline{DE} \parallel \overline{CB} \)
3) \( \frac{AD}{DC} = \frac{DE}{CB} \)
4) \( \triangle ABC \sim \triangle AED \)

144 What is the equation of a line passing through the point \( (6, 1) \) and parallel to the line whose equation is \( 3x = 2y + 4 \)?

1) \( y = -\frac{2}{3} x + 5 \)
2) \( y = -\frac{2}{3} x - 3 \)
3) \( y = \frac{3}{2} x - 8 \)
4) \( y = \frac{3}{2} x - 5 \)

145 What is the slope of the line perpendicular to the line represented by the equation \( 2x + 4y = 12 \)?

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

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

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

147 A circle has the equation \( (x - 3)^2 + (y + 4)^2 = 10 \). Find the coordinates of the center of the circle and the length of the circle’s radius.

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

What is the ratio of \( m\angle AOC \) to \( m\angle ABC \)?

1) 1 : 1
2) 2 : 1
3) 3 : 1
4) 1 : 2
149. The coordinates of two vertices of square $ABCD$ are $A(2, 1)$ and $B(4, 4)$. Determine the slope of side $BC$.

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

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

151. In circle $O$, diameter $AB$ intersects chord $CD$ at $E$. If $CE = ED$, then $\angle CEA$ is which type of angle?
1) straight
2) obtuse
3) acute
4) right

152. In the diagram of $\triangle ABC$ below, medians $\overline{AD}$ and $\overline{BE}$ intersect at point $F$.

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

153. 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
154 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) $(1,-1)$

155 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) $y - 2x = 3$

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

157 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) $(2,-4)$

158 In the diagram below, $\triangle ABC$ is shown with $\overline{AC}$ extended through point $D$.

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

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

160 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) $2\sqrt{5}$
161 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

162 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) $m\angle DBF = m\angle EBF$

163 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

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

What is $m\angle CD$?
1) 150
2) 120
3) 100
4) 60
165 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 $m\angle TAS$.

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

167 In $\triangle ABC$, $AB \cong BC$. 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) $AD \cong DC$

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

169 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) $(7, -4)$

170 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) $-\frac{4}{3}$
171 In the diagram below of regular pentagon \( ABCDE \), \( EB \) is drawn.

What is the measure of \( \angle AEB \)?
1) 36º
2) 54º
3) 72º
4) 108º

172 In the diagram below of \( \triangle ACD \), \( E \) is a point on \( AD \) and \( B \) is a point on \( AC \), such that \( EB \parallel DC \). If \( AE = 3 \), \( ED = 6 \), and \( DC = 15 \), find the length of \( EB \).

173 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) \( 3,888\pi \)

174 Using a compass and straightedge, construct the bisector of the angle shown below. [Leave all construction marks.]
175 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) $-\frac{5}{3}$

176 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

177 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) $m\angle P > m\angle R > m\angle Q$

178 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

179 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 $k$.

180 Which transformation is not always an isometry?

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

181 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 $\triangle XYZ$.
182 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

183 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

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

185 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) $288\pi$

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

187 In the diagram below of circle $O$, chords $\overline{DF}$, $\overline{DE}$, $\overline{FG}$, and $\overline{EG}$ are drawn such that $m\overline{DF} : m\overline{FE} : m\overline{EG} : m\overline{GD} = 5:2:1:7$. Identify one pair of inscribed angles that are congruent to each other and give their measure.
188 Using a compass and straightedge, construct the angle bisector of $\angle ABC$ shown below. [Leave all construction marks.]

189 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

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

1) $\angle FAB \cong \angle AFB$  
2) $\angle AFB \cong \angle CBD$  
3) $\overline{CE} \cong \overline{EA}$  
4) $\overline{CF} \cong \overline{FA}$

191 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]
192 On the line segment below, use a compass and straightedge to construct equilateral triangle $ABC$. [Leave all construction marks.]

193 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) $\sqrt{145}$

194 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) $(4, 3)$

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

1) $45^\circ$
2) $60^\circ$
3) $120^\circ$
4) $135^\circ$

196 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) $-6$

197 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) $\overline{AC} \cong \overline{BC}$
2) $\overline{CD} \cong \overline{AD}$
3) $\angle CDE \cong \angle BAD$
4) $\angle CDB \cong \angle BAC$
198 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) \( \frac{\text{m} \angle A}{\text{m} \angle D} = \frac{3}{2} \)
3) \( \frac{\text{area of } \triangle ABC}{\text{area of } \triangle DEF} = \frac{9}{4} \)
4) \( \frac{\text{perimeter of } \triangle ABC}{\text{perimeter of } \triangle DEF} = \frac{3}{2} \)

199 The rectangle \( ABCD \) shown in the diagram below will be reflected across the \( x \)-axis.

What will not be preserved?

1) slope of \( AB \)
2) parallelism of \( AB \) and \( CD \)
3) length of \( AB \)
4) measure of \( \angle A \)

200 Write an equation of the circle whose diameter \( \overline{AB} \) has endpoints \( A(-4, 2) \) and \( B(4, -4) \). [The use of the grid below is optional.]

201 In the diagram below of \( \triangle HQP \), side \( \overline{HP} \) is extended through \( P \) to \( T \), \( \text{m} \angle QPT = 6x + 20 \), \( \text{m} \angle HQP = x + 40 \), and \( \text{m} \angle PHQ = 4x - 5 \). Find \( \text{m} \angle QPT \).
202. 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

203. Given: $JKLM$ is a parallelogram.

$JM \approx LN$

$\angle LNM \approx \angle LNM$

Prove: $JKLM$ is a rhombus.

204. Given: Quadrilateral $ABCD$, diagonal $AFEC$, $AE \approx FC$, $BF \perp AC$, $DE \perp AC$, $\angle 1 \approx \angle 2$

Prove: $ABCD$ is a parallelogram.

205. 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) $m\angle C < m\angle B$

206. 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 $h$. 

38
207 In the diagram below of circle $C$, $QR$ is a diameter, and $Q(1, 8)$ and $C(3.5, 2)$ are points on a coordinate plane. Find and state the coordinates of point $R$.

![Diagram of circle with points Q and C and diameter QR]

208 In an equilateral triangle, what is the difference between the sum of the exterior angles and the sum of the interior angles?

1) $180^\circ$
2) $120^\circ$
3) $90^\circ$
4) $60^\circ$

209 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 $(5, 0)$

210 Which diagram shows the construction of an equilateral triangle?
211  Triangle $\triangle DEG$ has the coordinates $D(1,1)$, $E(5,1)$, and $G(5,4)$. Triangle $\triangle DEG$ is rotated $90^\circ$ 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.

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

213  Triangle $\triangle ABC$ 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.]

214  In the diagram below, the vertices of $\triangle DEF$ are the midpoints of the sides of equilateral triangle $\triangle ABC$, and the perimeter of $\triangle ABC$ is 36 cm.

What is the length, in centimeters, of $\overline{EF}$?

1) 6
2) 12
3) 18
4) 4
215 Side $PQ$ of $\triangle PQR$ is extended through $Q$ to point $T$. Which statement is not always true?
1) $m\angle QRT > m\angle R$
2) $m\angle QRT > m\angle P$
3) $m\angle QRT = m\angle P + m\angle R$
4) $m\angle QRT > m\angle PQR$

216 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

217 In the diagram below of $\triangle ABC$, $\overline{CD}$ is the bisector of $\angle BCA$, $\overline{AE}$ is the bisector of $\angle CAB$, and $\overline{BG}$ is drawn.

Which statement must be true?
1) $DG = EG$
2) $AG = BG$
3) $\angle AEB \cong \angle AEC$
4) $\angle DBG \cong \angle EBG$

218 Based on the construction below, which statement must be true?

219 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) $r_{y = x}$

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

What is the measure of $\angle A$?
1) $40^\circ$
2) $50^\circ$
3) $70^\circ$
4) $100^\circ$

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

What is $m\overset{\frown}{RS}$?
1) $50$
2) $60$
3) $90$
4) $110$

223 In the diagram below of circle $O$, chords $\overline{AD}$ and $\overline{BC}$ intersect at $E$.

Which relationship must be true?
1) $\triangle CAE \cong \triangle DBE$
2) $\triangle AEC \sim \triangle BDE$
3) $\angle ACB \cong \angle CBD$
4) $\overline{CA} \cong \overline{DB}$

224 A support beam between the floor and ceiling of a house forms a $90^\circ$ 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) $45^\circ$
2) $60^\circ$
3) $90^\circ$
4) $180^\circ$

225 In $\triangle KLM$, $m\angle K = 36$ and $KM = 5$. The transformation $D_2$ is performed on $\triangle KLM$ to form $\triangle K'M'M'$. Find $m\angle K'$. Justify your answer. Find the length of $K'M'$. Justify your answer.
226 Which transformation of the line \( x = 3 \) results in an image that is perpendicular to the given line?

1) \( r_{x\text{-axis}} \)
2) \( r_{y\text{-axis}} \)
3) \( r_{y=x} \)
4) \( r_{x=1} \)

227 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

228 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

229 Given the system of equations: \( y = x^2 - 4x \)

\[ x = 4 \]

The number of points of intersection is

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

230 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?

231 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.
232 What is an equation for the circle shown in the graph below?

![Graph of a circle](image)

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

233 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

234 Which transformation can map the letter S onto itself?

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

235 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.

236 In the diagram below, a right circular cone has a diameter of 8 inches and a height of 12 inches.

![Diagram of a cone](image)

What is the volume of the cone to the nearest cubic inch?

1) 201
2) 481
3) 603
4) 804

237 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
238 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

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

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

240 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 \(AB \parallel A'B'\).

241 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

242 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) \(2y + 10x = 8\)
243 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) \( \angle C, \angle A, \angle B \)

244 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

245 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.

246 The equation of a circle is \((x - 2)^2 + (y + 4)^2 = 4\). Which diagram is the graph of the circle?
247 In the diagram below, $\triangle ABC \sim \triangle EFG$, $\angle C = 4x + 30$, and $\angle G = 5x + 10$. Determine the value of $x$.

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

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

249 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.

250 Which graph represents a circle with the equation $(x - 5)^2 + (y + 1)^2 = 9$?

1) 
2) 
3) 
4)
251 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 $k_2$.

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

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

253 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.

254 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) $\sqrt{110}$

255 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) $y = -2x - 9$

256 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.
257 In the diagram of circle $O$, chords $AE$ and $DC$ intersect at point $B$, such that $m\angle AC = 36$ and $m\angle DE = 20$.

What is $m\angle ABC$?
1) 56
2) 36
3) 28
4) 8

258 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) $y = -2x + 17$

259 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) $(4x + 4, 2y)$

260 In the diagram of circle $O$ below, chords $AB$ and $CD$ are parallel, and $BD$ is a diameter of the circle.

If $m\angle AD = 60$, what is $m\angle CDB$?
1) 20
2) 30
3) 60
4) 120

261 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.]
262 Square $LMNO$ is shown in the diagram below.

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

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

263 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) $-3$

264 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

265 The diagram below shows a right pentagonal prism.

Which statement is always true?

1) $\overline{BC} \parallel \overline{ED}$
2) $\overline{FG} \parallel \overline{CD}$
3) $\overline{FJ} \parallel \overline{IH}$
4) $\overline{GB} \parallel \overline{HC}$
266 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) $AC + CB = AB$

267 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.

268 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

269 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
270 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.

271 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) $m\angle ABC = 60$

272 Which graph could be used to find the solution to the following system of equations?

\[
\begin{align*}
y &= -x + 2 \\
y &= x^2
\end{align*}
\]
273 In the diagram below of circle $O$, chords $\overline{AB}$ and $\overline{CD}$ 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

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

275 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 $AB > BC$

276 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

277 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
278 Using a compass and straightedge, construct a line that passes through point \( P \) and is perpendicular to line \( m \). [Leave all construction marks.]

279 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

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

281 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.

282 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) \( y = -\frac{1}{2}x - \frac{25}{2} \)
283 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.

284 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

285 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 \( C'' \).

286 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
287 The endpoints of $\overline{PQ}$ are $P(-3, 1)$ and $Q(4, 25)$. Find the length of $\overline{PQ}$.

288 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) $y = \frac{1}{3}x - 2$

289 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.

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

291 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) $x^2 + 6x + 8$

292 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 $\times$ all points that satisfy both conditions.
293 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

294 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

295 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 $\sqrt{13}$

296 The endpoints of $AB$ are $A(3, 2)$ and $B(7, 1)$. If $A''B''$ is the result of the transformation of $AB$ 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 $B''(22, -4)$

297 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 $m\angle BAD$.

298 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

299 $\triangle ABC$ 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) $\frac{\text{perimeter of } \triangle ABC}{\text{perimeter of } \triangle DEF}$

300 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
301 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 $\triangle ABC$.

302 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.

303 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) $\frac{1}{2}$

304 In the diagram below, $\overline{SQ}$ and $\overline{PR}$ intersect at $T$, $\overline{PQ}$ is drawn, and $\overline{PS} \parallel \overline{QR}$.

What technique can be used to prove that $\triangle PST \sim \triangle RQT$?

1) SAS  
2) SSS  
3) ASA  
4) AA
305 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) $BC < AC < AB$

306 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.

307 In the diagram below of $\triangle AGE$ and $\triangle OLD$, $\angle GAE \cong \angle LOD$, and $AE \cong OD$.

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

1) $GE \cong LD$
2) $AG \cong OL$
3) $\angle AGE \cong \angle OLD$
4) $\angle AEG \cong \angle ODL$

308 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

309 In the diagram below of parallelogram $ABCD$ with diagonals $AC$ and $BD$, $m\angle 1 = 45$ and $m\angle DCB = 120$.

What is the measure of $\angle 2$?

1) 15°
2) 30°
3) 45°
4) 60°
310 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

311 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) \( 3y = -2x + 12 \)

312 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 \( x \).

313 Which geometric principle is used in the construction shown below?
1) The intersection of the angle bisectors of a triangle is the center of the inscribed circle.
2) The intersection of the angle bisectors of a triangle is the center of the circumscribed circle.
3) The intersection of the perpendicular bisectors of the sides of a triangle is the center of the inscribed circle.
4) The intersection of the perpendicular bisectors of the sides of a triangle is the center of the circumscribed circle.

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

315 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\(^3\).
316 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) \( x + \frac{2}{3}x = 6 \)

317 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

318 The diagram below shows \( AB \) and \( DE \).

Which transformation will move \( AB \) onto \( DE \) 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) \( r_{y=x} \)

319 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) \( (x - 2)^2 + (y + 3)^2 = 25 \)
320 After a composition of transformations, the coordinates $A(4, 2)$, $B(4, 6)$, and $C(2, 6)$ become $A''(−2, −1)$, $B''(−2, −3)$, and $C''(−1, −3)$, as shown on the set of axes below.

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

321 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.

322 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.

323 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.

324 In the diagram below, line $k$ is perpendicular to plane $\mathcal{P}$ at point $T$.

Which statement is true?
1) Any point in plane $\mathcal{P}$ also will be on line $k$.
2) Only one line in plane $\mathcal{P}$ will intersect line $k$.
3) All planes that intersect plane $\mathcal{P}$ will pass through $T$.
4) Any plane containing line $k$ is perpendicular to plane $\mathcal{P}$. 
325 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

326 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) \((x - 5)^2 + (y + 1)^2 = 9\)

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

328 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 \(\triangle ABC\)

329 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.

330 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.
331 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 \( \triangle ABC \).

![Diagram of right triangle with altitude drawn to hypotenuse]

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

332 In the diagram below of circle \( O \), chord \( AB \parallel \text{ chord } CD \), and chord \( CD \parallel \text{ chord } EF \).

![Diagram of circle with chords parallel]

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

333 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.]

![Graph with axes]

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

335 Write an equation of the line that passes through the point \((6, -5)\) and is parallel to the line whose equation is \( 2x - 3y = 11 \).
336 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

337 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.

338 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.

339 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.

340 In the diagram below of trapezoid RSUT, RS || 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

341 Given: ΔABC and ΔEDC, C is the midpoint of BD and AE
Prove: AB || DE

342 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 = \(\sqrt{C}\)
343 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.

344 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

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

346 In the diagram below of $\triangle PRT$, $Q$ is a point on $\overline{PR}$, $S$ is a point on $\overline{TR}$, $QS$ 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

347 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

348 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) $\{26, 8, 15\}$
349 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) \(12\)

350 On the set of axes below, solve the following system of equations graphically for all values of \( x \) and \( y \).
   \[ y = (x - 2)^2 + 4 \]
   \[ 4x + 2y = 14 \]

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

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

   If \( CB = 3 \), \( CA = 10 \), and \( CE = 6 \), what is the length of \( ET \)?
   1) \(5\)
   2) \(14\)
   3) \(20\)
   4) \(26\)

353 Using a compass and straightedge, and \( \overline{AB} \) below, construct an equilateral triangle with all sides congruent to \( AB \). [Leave all construction marks.]

354 The lateral faces of a regular pyramid are composed of
   1) squares
   2) rectangles
   3) congruent right triangles
   4) congruent isosceles triangles
355 The figure in the diagram below is a triangular prism.

Which statement must be true?
1) $DE \cong AB$
2) $AD \cong BC$
3) $AD \parallel CE$
4) $DE \parallel BC$

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

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

357 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

358 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) $(x + 3)^2 + (y - 5)^2 = 4$

359 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

360 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) $\frac{3}{2}$
361 In the diagram below of $\triangle ABC$ with side $\overline{AC}$ extended through $D$, $m\angle A = 37$ and $m\angle BCD = 117$. Which side of $\triangle ABC$ is the longest side? Justify your answer.

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

363 Based on the diagram below, which statement is true?

364 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 $R$.

365 In the diagram below of $\triangle ABC$, $\overline{DE}$ is a midsegment of $\triangle ABC$, $DE = 7$, $AB = 10$, and $BC = 13$. Find the perimeter of $\triangle ABC$.

366 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

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

1) $a \parallel b$
2) $a \parallel c$
3) $b \parallel c$
4) $d \parallel e$
368 Two lines, $AB$ and $CRD$, are parallel and 10 inches apart. Sketch the locus of all points that are equidistant from $AB$ and $CRD$ and 7 inches from point $R$. Label with an $X$ each point that satisfies both conditions.

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

Which two statements identify corresponding congruent parts for these triangles?
1) $AB \cong XY$ and $\angle C \cong \angle Y$
2) $AB \cong YZ$ and $\angle C \cong \angle X$
3) $BC \cong XY$ and $\angle A \cong \angle Y$
4) $BC \cong YZ$ and $\angle A \cong \angle X$

370 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 $GH \parallel DE$.

371 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
372 In $\triangle RST$, $m\angle RST = 46$ and $RS \cong ST$. Find $m\angle STR$.

373 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 $\mathcal{P}$

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

1)  
2)  
3)  
4)  

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

376 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

377 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) $(2, 1)$ and $(3, 1)$

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

[Diagram of a circle with quadrilateral ABCD inscribed, showing diagonals AC and BD drawn.]
379 In the diagram below, \( \triangle LATE \) is an isosceles trapezoid with \( LE \cong AT \), \( LA = 24 \), \( ET = 40 \), and \( AT = 10 \). Altitudes \( LF \) and \( AG \) are drawn.

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

380 Given: \( AD \) bisects \( BC \) at \( E \).
\[ AB \perp BC \]
\[ DC \perp BC \]
Prove: \( AB \cong DC \)

381 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 \( \pi \).

382 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 \( T_{-3,1} \circ D_2 \).

383 In the diagram below, \( \triangle ABC \sim \triangle DEF \), \( DE = 4 \), \( AB = x \), \( AC = x + 2 \), and \( DF = x + 6 \). Determine the length of \( AB \). [Only an algebraic solution can receive full credit.]
384 A packing carton in the shape of a triangular prism is shown in the diagram below.

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

385 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) $\triangle DCE \cong \triangle BCE$

386 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.

387 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) $(-4b, -3a)$

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

389 As shown in the diagram below, $EF$ intersects planes $P$, $Q$, and $R$.

If $EF$ 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 $P$. 
390 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.

391 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) \(y = 2x - 1\)

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

What is \(\angle JSM\)?
1) 163
2) 121
3) 42
4) 17

393 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.]
394 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?

395 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)

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

397 In the diagram below of \(\triangle ACE\), medians \(\overline{AD}, \overline{EB}\), and \(\overline{CF}\) 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
398 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) $3x + 4y = 14$

399 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) $y = \frac{1}{2}x + 1$

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

401 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) $2(m\angle ABC) = m\angle CBD$

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

What is $m\angle B$?
1) 5
2) 20
3) 25
4) 55
403 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) $\frac{AB + BC + AC}{RS + ST + RT} = \frac{AB}{RS}$

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

405 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) $(x - 4)^2 + y^2 = 36$

406 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) $y = \frac{5}{3}x + 1$

407 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 $CE$.

408 Plane $\mathcal{R}$ is perpendicular to line $k$ and plane $\mathcal{D}$ is perpendicular to line $k$. Which statement is correct?
1) Plane $\mathcal{R}$ is perpendicular to plane $\mathcal{D}$.
2) Plane $\mathcal{R}$ is parallel to plane $\mathcal{D}$.
3) Plane $\mathcal{R}$ intersects plane $\mathcal{D}$.
4) Plane $\mathcal{R}$ bisects plane $\mathcal{D}$. 
409 The diagram below represents a rectangular solid.

Which statement must be true?
1) $EH$ and $BC$ are coplanar
2) $FG$ and $AB$ are coplanar
3) $EH$ and $AD$ are skew
4) $FG$ and $CG$ are skew

410 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) $2\sqrt{26}$

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

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

413 On the diagram of $\triangle ABC$ shown below, use a compass and straightedge to construct the perpendicular bisector of $AC$. [Leave all construction marks.]

414 In the diagram below, $\ell \parallel m$ and $\overline{QR} \perp \overline{ST}$ at $R$.

If $m\angle 1 = 63$, find $m\angle 2$. 
415 In the diagram of $\triangle KLM$ below, $\angle L = 70$, $\angle M = 50$, and $MK$ is extended through $N$.

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

416 As shown in the diagram below, lines $m$ and $n$ are cut by transversal $p$.

If $\angle 1 = 4x + 14$ and $\angle 2 = 8x + 10$, lines $m$ and $n$ are parallel when $x$ equals
1) 1
2) 6
3) 13
4) 17

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

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

418 The diagram below shows a rectangular prism.

Which pair of edges are segments of lines that are coplanar?
1) $AB$ and $DH$
2) $AE$ and $DC$
3) $BC$ and $EH$
4) $CG$ and $EF$
419 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.]

420 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

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

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

What is the length of $VC$?
1) $3 \frac{1}{2}$
2) $7 \frac{1}{7}$
3) 14
4) 24
423 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) \((x - 3)^2 + (y + 5)^2 = 16\)

424 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 \(N'O'\)

425 In the diagram below, circle \(O\) with center \((2, -8)\) and radius 9.
What is the length of \(CE\)?
1) \(4\sqrt{3}\)
2) \(2\sqrt{3}\)
3) \(8\sqrt{2}\)
4) \(4\sqrt{2}\)

426 The diagram below shows \(\triangle ABC\), with \(\overline{AEB}\), \(\overline{ADC}\), and \(\angle ACB \equiv \angle AED\). Prove that \(\triangle ABC\) is similar to \(\triangle ADE\).

427 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) \((x - 2)^2 + (y + 8)^2 = 81\)

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

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

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

432 In the diagram below of $\triangle P AO$, $\overline{AP}$ is tangent to circle $O$ at point $A$, $OB = 7$, and $BP = 18$.

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

433 Solve the following system of equations graphically.

\[
2x^2 - 4x = y + 1 \\
x + y = 1
\]
434 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) \((x + 7)^2 + (y - 3)^2 = 16\)

435 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.]

436 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

437 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.

438 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

439 In the diagram below, tangent \(ML\) and secant \(MNK\) are drawn to circle \(O\). The ratio \(m\overarc{LN} : m\overarc{NK} : m\overarc{KL}\) is 3:4:5. Find \(m\angle LMK\).

440 The number of degrees in the sum of the interior angles of a pentagon is
1) 72
2) 360
3) 540
4) 720
441 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

442 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

443 Find the slope of a line perpendicular to the line
whose equation is \(2y - 6x = 4\).  

444 In \(\triangle RST\), \(m\angle R = 58\) and \(m\angle S = 73\). Which
inequality is true?

1) \(RT < TS < RS\)
2) \(RS < RT < TS\)
3) \(RT < RS < TS\)
4) \(RS < TS < RT\)

445 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

446 Scalene triangle \(ABC\) is similar to triangle \(DEF\).
Which statement is \textit{false}?

1) \(AB:BC=DE:EF\)
2) \(AC:DF=BC:EF\)
3) \(\angle ACB \cong \angle DFE\)
4) \(\angle ABC \cong \angle EDF\)
447 The coordinates of trapezoid $ABCD$ are $A(-4, 5)$, $B(1, 5)$, $C(1, 2)$, and $D(-6, 2)$. Trapezoid $A'B'C'D'$ is the image after the composition $r_{x-axis} \circ r_{y=x}$ is performed on trapezoid $ABCD$. State the coordinates of trapezoid $A'B'C'D'$. [The use of the set of axes below is optional.]

448 If two distinct planes, $\mathcal{A}$ and $\mathcal{B}$, are perpendicular to line $c$, then which statement is true?
1) Planes $\mathcal{A}$ and $\mathcal{B}$ are parallel to each other.
2) Planes $\mathcal{A}$ and $\mathcal{B}$ are perpendicular to each other.
3) The intersection of planes $\mathcal{A}$ and $\mathcal{B}$ is a line parallel to line $c$.
4) The intersection of planes $\mathcal{A}$ and $\mathcal{B}$ is a line perpendicular to line $c$.

449 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

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

Opposite angles $J$ and $M$ must be
1) right
2) complementary
3) congruent
4) supplementary
451 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.

452 The point $(3, -2)$ is rotated $90^\circ$ 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) $(-8, -12)$

453 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) $\overline{AG} \cong \overline{BH}$

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 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.

456 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
457  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) $\frac{5}{3}$

458  Write an equation of the circle graphed in the diagram below.

459  In the diagram below, $BFCE$, $AB \perp BE$, $DE \perp BE$, and $\angle BFD \cong \angle ECA$. Prove that $\triangle ABC \sim \triangle DEF$.

460  In the diagram below of right triangle $ABC$, $\overline{CD}$ is the altitude to hypotenuse $AB$, $CB = 6$, and $AD = 5$.

![Diagram of right triangle with altitude]

What is the length of $BD$?

1) 5
2) 9
3) 3
4) 4

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

![Diagram of transformations]

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
462 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) $(-5, 2)$

463 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.]

464 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

465 In the diagram below of $\triangle ACD$, $B$ is a point on $\overline{AC}$ such that $\triangle ADB$ is an equilateral triangle, and $\triangle DBC$ is an isosceles triangle with $DB \cong BC$. Find $m \angle C$.

466 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 $PQ$?
1) 9
2) 12
3) 3
4) 15

467 The angle formed by the radius of a circle and a tangent to that circle has a measure of
1) $45^\circ$
2) $90^\circ$
3) $135^\circ$
4) $180^\circ$

468 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
469 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 $r_{x \text{-axis}}$. [The use of the grid is optional.]

470 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) $EC \cong EA$

471 Point $A$ lies in plane $B$. How many lines can be drawn perpendicular to plane $B$ through point $A$?

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

472 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 $m\overline{AB}$.

473 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

474 A line segment has endpoints $A(7, -1)$ and $B(-3, 3)$. What are the coordinates of the midpoint of $\overline{AB}$?

1) $(1, 2)$
2) $(2, 1)$
3) $(-5, 2)$
4) $(5, -2)$
475 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) \( AF \perp BC \)
4) \( \triangle ABG \sim \triangle ACG \)

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

477 In the diagram below of circle \( O \), chords \( \overline{AB} \) and \( \overline{CD} \) intersect at \( E \).

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

478 In the diagram below, parallelogram \( ABCD \) has diagonals \( \overline{AC} \) and \( \overline{BD} \) 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) \( DE \cong EB \)

479 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.
480 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

481 In the diagram below of \( \triangle ADE \), \( B \) is a point on \( AE \) and \( C \) is a point on \( AD \) such that \( BC \parallel ED \), \( AC = x - 3 \), \( BE = 20 \), \( AB = 16 \), and \( AD = 2x + 2 \). Find the length of \( AC \).

482 In scalene triangle \( ABC \), \( m\angle B = 45 \) and \( m\angle C = 55 \). What is the order of the sides in length, from longest to shortest?
1) \( AB, BC, AC \)
2) \( BC, AC, AB \)
3) \( AC, BC, AB \)
4) \( BC, AB, AC \)

483 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

484 The two lines represented by the equations below are graphed on a coordinate plane.
\[
\begin{align*}
x + 6y &= 12 \\
3(x - 2) &= -y - 4
\end{align*}
\]
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°.

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

1) \( (x - 3)^2 + (y - 4)^2 = 25 \)
2) \( (x + 3)^2 + (y - 4)^2 = 25 \)
3) \( (x - 3)^2 + (y - 4)^2 = 10 \)
4) \( (x + 3)^2 + (y + 4)^2 = 10 \)
486 In the diagram below, \( \overline{EF} \) is the median of trapezoid \( ABCD \).

487 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

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

489 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) \(2,160\pi\)

490 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

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

1) \( R'Q' \)
2) \( R'S' \)
3) \( T'S' \)
4) \( T'P' \)
492 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: $\triangle AEF \cong \triangle CEG$

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

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

495 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.

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

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

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

What is the perimeter of $\triangle ABC$?
1) 15
2) 25
3) 30
4) 60
498 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.

499 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 $EB$.

500 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.]

501 In the diagram below, trapezoid $ABCD$, with bases $AB$ and $DC$, is inscribed in circle $O$, with diameter $DC$. If $\angle A=80^\circ$, find $\angle B$. 


502 Which graph represents a circle whose equation is 
\[(x + 2)^2 + y^2 = 16?\]

1) \[
\begin{array}{c}
  \text{(x + 2)}^2 + y^2 = 16 \\
  \text{Graph A}
\end{array}
\]

2) \[
\begin{array}{c}
  \text{(x + 2)}^2 + y^2 = 16 \\
  \text{Graph B}
\end{array}
\]

3) \[
\begin{array}{c}
  \text{(x + 2)}^2 + y^2 = 16 \\
  \text{Graph C}
\end{array}
\]

4) \[
\begin{array}{c}
  \text{(x + 2)}^2 + y^2 = 16 \\
  \text{Graph D}
\end{array}
\]

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

\[
\begin{align*}
\triangle DAE & \text{ can be proved congruent to } \triangle BCE \text{ by} \\
1) & \text{ ASA} \\
2) & \text{ SAS} \\
3) & \text{ SSS} \\
4) & \text{ HL}
\end{align*}
\]

503 Plane \(\mathcal{A}\) is parallel to plane \(\mathcal{B}\). Plane \(\mathcal{C}\) intersects plane \(\mathcal{A}\) in line \(m\) and intersects plane \(\mathcal{B}\) in line \(n\).

Lines \(m\) and \(n\) are

1) intersecting
2) parallel
3) perpendicular
4) skew

505 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

506 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) \(\sqrt{50}\)
507 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) $(-1, 3)$

508 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) $PR \cong RQ$
4) $PS \cong RQ$

509 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

510 In the diagram below of circle $O$, chord $\overline{AB}$ bisects chord $\overline{CD}$ at $E$. If $AE = 8$ and $BE = 9$, find the length of $\overline{CE}$ in simplest radical form.

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

512 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.

513 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
514 In the diagram below of circle $O$, chord $AB$ is parallel to chord $CD$.

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

515 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

516 Which diagram shows the construction of the perpendicular bisector of $AB$?
517 In the diagram below, $AB$ is perpendicular to plane $AEFG$.

Which plane must be perpendicular to plane $AEFG$?
1) $ABCE$
2) $BCDH$
3) $CDFE$
4) $HDFG$

518 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

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

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

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

520 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) $y = -2x - 5$

521 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.
522 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.

523 In the diagram below of $\triangle GJK$, $H$ is a point on $\overline{GJ}$, $\overline{HJ} \cong \overline{JK}$, $m\angle G = 28$, and $m\angle GJK = 70$.
Determine whether $\triangle GHK$ is an isosceles triangle and justify your answer.

524 The graph below shows $\overline{JT}$ and its image, $\overline{J'T'}$, after a transformation.
Which transformation would map $\overline{JT}$ onto $\overline{J'T'}$?
1) translation
2) glide reflection
3) rotation centered at the origin
4) reflection through the origin

525 In the diagram below, $\overline{MATH}$ is a rhombus with diagonals $\overline{AH}$ and $\overline{MT}$.
If $m\angle HAM = 12$, what is $m\angle AMT$?
1) 12
2) 78
3) 84
4) 156
526 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.]

527 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: $\angle AOP \cong \angle BOP$

528 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) $R_{90}$

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

If $m\angle CD = 70$, what is $m\angle AC$?
1) 110
2) 70
3) 55
4) 35
530 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

531 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.

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

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

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

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

Point \( P \) must be the
1) centroid
2) circumcenter
3) Incenter
4) orthocenter
Geometry Regents Exam Questions at Random
www.jmap.org

535  Chords \( \overline{AB} \) and \( \overline{CD} \) intersect at \( E \) in circle \( O \), as shown in the diagram below. Secant \( F \overline{DA} \) and tangent \( F \overline{B} \) are drawn to circle \( O \) from external point \( F \) and chord \( AC \) is drawn. The \( m\overline{DA} = 56 \), \( m\overline{DB} = 112 \), and the ratio of \( m\overline{AC} : m\overline{CB} = 3:1 \).

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

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

537  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

538  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 \( n \).

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

Which method can be used to prove \( \triangle ABC \) is congruent to \( \triangle CDA \)?
1) AAS
2) SSA
3) SAS
4) SSS

540  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 16
4) \((5, -3)\) and 4
541 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) \( m \angle ABC > m \angle C + m \angle D \)

542 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.]

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

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

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

545 Write the negation of the statement “2 is a prime number,” and determine the truth value of the negation.
546 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) $288\pi$

547 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) $\overline{JK} \cong \overline{ON}$

548 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) $3x + y = 0$

549 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

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

551 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) $y = 3$

552 In the diagram below of $\triangle ABC$, $D$ is the midpoint of $\overline{AB}$, and $E$ is the midpoint of $\overline{BC}$.

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

553 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
554 If the vertex angles of two isosceles triangles are congruent, then the triangles must be
1) acute
2) congruent
3) right
4) similar

555 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.

556 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)

557 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.

558 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

559 Point M is the midpoint of AB. If the coordinates
of A are (–3, 6) and the coordinates of M are (–5, 2),
what are the coordinates of B?
1) (1, 2)
2) (7, 10)
3) (–4, 4)
4) (–7, –2)
560 Triangle $ABC$ has coordinates $A(2,-2)$, $B(2,1)$, and $C(4,-2)$. Triangle $A'B'C'$ is the image of $\triangle ABC$ under $T_{5,-2}$. On the set of axes below, graph and label $\triangle ABC$ and its image, $\triangle A'B'C'$. Determine the relationship between the area of $\triangle ABC$ and the area of $\triangle A'B'C'$. Justify your response.

562 In the diagram below, $\overline{DE}$ 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 $\triangle CAB$

563 The volume, in cubic centimeters, of a sphere whose diameter is 6 centimeters is
1) $12\pi$
2) $36\pi$
3) $48\pi$
4) $288\pi$

564 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) $y = 2x - 12$
565 Find, in degrees, the measures of both an interior angle and an exterior angle of a regular pentagon.

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

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

568 In $\triangle ABC$ shown below, $P$ is the centroid and $BF = 18$.

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

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

Which statement must be true?
1) $\angle ADB \cong \angle CBD$  
2) $\angle ABC \cong \angle ADC$  
3) $AB \cong CD$  
4) $AD \cong CD$
570 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) $2\sqrt{41}$

571 In the diagram below, line $p$ intersects line $m$ and line $n$.

If $m \angle 1 = 7x$ and $m \angle 2 = 5x + 30$, lines $m$ and $n$ are parallel when $x$ equals

1) 12.5
2) 15
3) 87.5
4) 105

572 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) $\frac{1}{10}$

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

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

574 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) $y = -\frac{3}{2}x + 2$

575 As shown in the diagram below, $\overline{AC}$ bisects $\angle BAD$ and $\angle B \cong \angle D$.

Which method could be used to prove $\triangle ABC \cong \triangle ADC$?

1) SSS
2) AAA
3) SAS
4) AAS
576 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

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

---

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.

579 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) $\angle BAC \cong \angle EDF$
580 In the diagram below of rhombus $ABCD$, $m\angle C = 100$.

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

581 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

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

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

584 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) $\{15,36,39\}$
585 Using a compass and straightedge, on the diagram below of $\overrightarrow{RS}$, construct an equilateral triangle with $RS$ as one side. [Leave all construction marks.]

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

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

588 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

589 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
590 Determine whether the two lines represented by the equations \( y = 2x + 3 \) and \( 2y + x = 6 \) are parallel, perpendicular, or neither. Justify your response.

591 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

592 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

593 On the set of axes below, solve the following system of equations graphically and state the coordinates of all points in the solution.
\[
\begin{align*}
(x + 3)^2 + (y - 2)^2 &= 25 \\
2y + 4 &= -x
\end{align*}
\]

594 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.
595 Which diagram represents a correct construction of equilateral \( \triangle ABC \), given side \( AB \)?

1) 

![Diagram 1](image1)

2) 

![Diagram 2](image2)

3) 

![Diagram 3](image3)

4) 

![Diagram 4](image4)

596 Line \( n \) intersects lines \( l \) and \( m \), forming the angles shown in the diagram below.

![Diagram](image5)

Which value of \( x \) would prove \( l \parallel m \)?

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

597 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 \( A \).

![Diagram](image6)

Which fact is sufficient to show that planes \( R \) and \( S \) are perpendicular?

1) \( FA \perp DE \) 
2) \( AD \perp AF \) 
3) \( BC \perp FJ \) 
4) \( DE \perp BC \)
598 Which graph represents a circle with the equation 
\[(x - 3)^2 + (y + 1)^2 = 4?\]

1) 

2) 

3) 

4) 

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

600 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

601 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

602 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) \(AB + CD = AD\)
603  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) \((-15, -8)\)

604  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

605  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.

606  In the diagram of \(\triangle ABC\) shown below, \(DE \parallel BC\).

\[ \triangle ABC \]

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

607  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 \(AC\).

\[ \triangle ABC \]

If \(AB = 20\), \(BC = 12\), and \(AC = 16\), what is the perimeter of trapezoid \(ABEF\)?
1) 24
2) 36
3) 40
4) 44
608 The length of $\overline{AB}$ is 3 inches. On the diagram below, sketch the points that are equidistant from $A$ and $B$ and sketch the points that are 2 inches from $A$. Label with an $X$ all points that satisfy both conditions.
Geometry Regents at Random
Answer Section

1  ANS: 3
\[ m = \frac{-A}{B} = \frac{-3}{-2} = \frac{3}{2} \]

PTS: 2  REF: 011324ge  STA: G.G.63  TOP: Parallel and Perpendicular Lines

2  ANS: 1  PTS: 2  REF: 011303ge  STA: G.G.24
TOP: Statements

3  ANS: 3
midpoint: \( \left( \frac{6 + 8}{2}, \frac{8 + 4}{2} \right) = (7, 6) \).
slope: \( \frac{8 - 4}{6 - 2} = \frac{4}{2} = -2; \ m_\perp = \frac{1}{2} \).
\[ \frac{12}{2} = \frac{7}{2} + b \]
\[ \frac{5}{12} = b \]

PTS: 2  REF: 081327ge  STA: G.G.68  TOP: Perpendicular Bisector

4  ANS: 3  PTS: 2  REF: 081320ge  STA: G.G.42
TOP: Midsegments

5  ANS: 1  PTS: 2  REF: 081303ge  STA: G.G.24
TOP: Negations

6  ANS: 4
\((x, y) \rightarrow (-x, -y)\)

PTS: 2  REF: 061304ge  STA: G.G.54  TOP: Rotations

7  ANS: 2  PTS: 2  REF: 011418ge  STA: G.G.14  TOP: Volume and Lateral Area
\[ 18\pi \cdot 42 = 2375 \]

8  ANS: 2
Isosceles or not, \( \Delta RSV \) and \( \Delta RST \) have a common base, and since \( \overline{RS} \) and \( \overline{VT} \) are bases, congruent altitudes.

PTS: 2  REF: 061301ge  STA: G.G.40  TOP: Trapezoids

9  ANS:
\[ M = \left( \frac{3 + 3}{2}, \frac{-1 + 5}{2} \right) = (3, 2) \text{.} \ y = 2. \]

PTS: 2  REF: 011334ge  STA: G.G.68  TOP: Perpendicular Bisector

10 ANS: 1  PTS: 2  REF: 011404ge  STA: G.G.9
TOP: Planes
11 ANS: 3 PTS: 2 REF: 011427ge STA: G.G.56
TOP: Identifying Transformations

12 ANS: 3 PTS: 2 REF: 061320ge STA: G.G.35
TOP: Parallel Lines and Transversals

13 ANS:

PTS: 2 REF: 081334ge STA: G.G.22 TOP: Locus

14 ANS:
\[ \triangle MAH, \overline{MH} \cong \overline{AH} \] and medians \( \overline{AB} \) and \( \overline{MT} \) are given. \( \overline{MA} \cong \overline{AM} \) (reflexive property). \( \triangle MAH \) is an isosceles triangle (definition of isosceles triangle). \( \angle AMB \cong \angle MAT \) (isosceles triangle theorem). \( B \) is the midpoint of \( \overline{MH} \) and \( T \) is the midpoint of \( \overline{AH} \) (definition of midpoint). \( MB \cong AT \) (multiplication postulate). \( \triangle MBA \cong \triangle ATM \) (SAS). \( \triangle MBA \cong \triangle ATM \) (CPCTC).

15 ANS:
\[ Bh = V \]
\[ 12h = 84 \]
\[ h = 7 \]

PTS: 2 REF: 061338ge STA: G.G.27 TOP: Triangle Proofs

16 ANS:
Distance is preserved after the reflection. \( 2x + 13 = 9x - 8 \)
\[ 21 = 7x \]
\[ 3 = x \]

PTS: 2 REF: 011432ge STA: G.G.12 TOP: Volume

17 ANS:
\[ \sqrt{(3-7)^2 + (-4-2)^2} = \sqrt{16 + 36} = \sqrt{52} = \sqrt{4 \cdot 13} = 2\sqrt{13}. \]

PTS: 2 REF: 011431ge STA: G.G.67 TOP: Distance

18 ANS: 4 PTS: 2 REF: 081318ge STA: G.G.26
TOP: Converse and Biconditional

19 ANS: 4 PTS: 2 REF: 011421ge STA: G.G.54
TOP: Rotations
20 ANS: 

PTS: 2  REF: 011330ge  STA: G.G.50  TOP: Tangents
KEY: common tangency

21 ANS: 2

Parallel chords intercept congruent arcs. \( \frac{360 - (104 + 168)}{2} = 44 \)

PTS: 2  REF: 011302ge  STA: G.G.52  TOP: Chords

22 ANS: 3  PTS: 2  REF: 081312ge  STA: G.G.72
TOP: Equations of Circles

23 ANS:
\[ A = 2B - 15 \quad 2B - 15 + B + 2B - 15 + B = 180 \]
\[ C = A + B \quad 6B - 30 = 180 \]
\[ C = 2B - 15 + B \quad 6B = 210 \]
\[ B = 35 \]

PTS: 2  REF: 081332ge  STA: G.G.30  TOP: Interior and Exterior Angles of Triangles

24 ANS: 3
\[ x^2 + 5^2 = 25 \]
\[ x = 0 \]

PTS: 2  REF: 011312ge  STA: G.G.70  TOP: Quadratic-Linear Systems

25 ANS:
\[ \sqrt{(-1 - 3)^2 + (4 - (-2))^2} = \sqrt{16 + 36} = \sqrt{52} = \sqrt{4 \cdot 13} = 2\sqrt{13} \]

PTS: 2  REF: 081331ge  STA: G.G.67  TOP: Distance

26 ANS: 2  PTS: 2  REF: 011317ge  STA: G.G.22
TOP: Locus

27 ANS:
\[ A'(2, 2), B'(3, 0), C(1, -1) \]

PTS: 2  REF: 081329ge  STA: G.G.58  TOP: Dilations

28 ANS: 1  PTS: 2  REF: 081323ge  STA: G.G.9
TOP: Planes

29 ANS: 4  PTS: 2  REF: 061319ge  STA: G.G.73
TOP: Equations of Circles
30  ANS:
\[2(y + 10) = 4y - 20. \quad DF = y + 10 = 20 + 10 = 30. \quad OA = OD = \sqrt{16^2 + 30^2} = 34\]
\[2y + 20 = 4y - 20\]
\[40 = 2y\]
\[20 = y\]

PTS: 4       REF: 061336ge  STA: G.G.49  TOP: Chords

31  ANS:

PTS: 2       REF: 061333ge  STA: G.G.23  TOP: Locus

32  ANS:

PTS: 4       REF: 081336ge  STA: G.G.58  TOP: Compositions of Transformations

KEY: grids

33  ANS:
\[\triangle ABC, \ BD \ bisects \ \angle ABC, \ BD \perp AC \ (Given). \quad \angle CBD \cong \angle ADB \ (Definition \ of \ angle \ bisector). \quad BD \cong BD \ \ (Reflexive \ property). \quad \angle CDB \ and \ \angle ADB \ are \ right \ angles \ (Definition \ of \ perpendicular). \quad \angle CDB \cong \angle ADB \ (All \ right \ angles \ are \ congruent). \quad \triangle CDB \cong \triangle ADB \ (SAS). \quad AB \cong CB \ (CPCTC).\]

PTS: 4       REF: 081335ge  STA: G.G.27  TOP: Triangle Proofs

34  ANS: 1

PTS: 2       REF: 011413ge  STA: G.G.42  TOP: Midsegments
35 ANS:

\[ L = 2\pi rh = 2\pi \cdot 3 \cdot 7 = 42\pi \]

36 ANS:

\[ L = 2\pi rh = 2\pi \cdot 3 \cdot 7 = 42\pi \]

37 ANS: 3

\[
\begin{align*}
6 &= \frac{4 + x}{2}, & 8 &= \frac{2 + y}{2}. \\
4 + x &= 12 & 2 + y &= 16 \\
x &= 8 & y &= 14
\end{align*}
\]

38 ANS:

\[ A''(11, 1), B''(3, 7), C''(3, 1) \]

39 ANS:

\[
\sqrt{(7 - 3)^2 + (-8 - 0)^2} = \sqrt{16 + 64} = \sqrt{80} = 4\sqrt{5}
\]

40 ANS: 2

\[
\sqrt{15^2 - 12^2} = 9
\]

41 ANS: 3

42 ANS: 1
43 ANS: 1  PTS: 2  REF: 081324ge  STA: G.G.74  
TOP: Graphing Circles

44 ANS: 2  PTS: 2  REF: 081306ge  STA: G.G.34  
TOP: Angle Side Relationship

45 ANS: 1  PTS: 2  REF: 061307ge  STA: G.G.55  
TOP: Properties of Transformations

46 ANS: 4  
$6x = x + 40 + 3x + 10$.  $m\angle CAB = 25 + 40 = 65$  
$6x = 4x + 50$  
$2x = 50$  
$x = 25$

PTS: 2  REF: 081310ge  STA: G.G.32  TOP: Exterior Angle Theorem

47 ANS: 4  
$3y + 6 = 2x$  
$2y - 3x = 6$  
$3y = 2x - 6$  
$2y = 3x + 6$  
$y = \frac{2}{3}x - 2$  
$y = \frac{3}{2}x + 3$  
$m = \frac{2}{3}$  
$m = \frac{3}{2}$

PTS: 2  REF: 081315ge  STA: G.G.63  TOP: Parallel and Perpendicular Lines

48 ANS: 2  
Perimeter of $\triangle DEF$ is $5 + 8 + 11 = 24$.  $\frac{5}{24} = \frac{x}{60}$  
$24x = 300$  
$x = 12.5$

PTS: 2  REF: 011307ge  STA: G.G.45  TOP: Similarity  
KEY: perimeter and area

49 ANS: 2  PTS: 2  REF: 061305ge  STA: G.G.18  
TOP: Constructions

50 ANS: 3  PTS: 2  REF: 011402ge  STA: G.G.17  
TOP: Constructions

51 ANS:  
$x^2 - 8x = 5x + 30$.  $m\angle C = 4(15) - 5 = 55$  
$x^2 - 13x - 30 = 0$  
$(x - 15)(x + 2) = 0$  
$x = 15$

PTS: 4  REF: 061337ge  STA: G.G.45  TOP: Similarity  
KEY: basic
52 ANS: 1
7x - 36 + 5x + 12 = 180

12x - 24 = 180
12x = 204
x = 17

PTS: 2 REF: 011422ge STA: G.G.35 TOP: Parallel Lines and Transversals

53 ANS: 1
2x + x = 12. \( 
\overline{BD} = 2(4) = 8 
\)
3x = 12
x = 4

PTS: 2 REF: 011408ge STA: G.G.43 TOP: Centroid

54 ANS:

PTS: 2 REF: 061332ge STA: G.G.20 TOP: Constructions

55 ANS:
Neither. The slope of \( y = \frac{1}{2} x - 1 \) is \( \frac{1}{2} \). The slope of \( y + 4 = \frac{-1}{2} (x - 2) \) is \( -\frac{1}{2} \). The slopes are neither the same nor opposite reciprocals.

PTS: 2 REF: 011433ge STA: G.G.63 TOP: Parallel and Perpendicular Lines

56 ANS: 4 PTS: 2 REF: 011318ge STA: G.G.73 TOP: Equations of Circles

57 ANS: 3

120\pi = \pi(12)(l)

10 = l

PTS: 2 REF: 081314ge STA: G.G.15 TOP: Volume and Lateral Area
58 ANS:

\[ S''(5, -3), W''(3, -4), A''(2, 1), \text{ and } N''(4, 2) \]

PTS: 4 REF: 061335ge STA: G.G.58 TOP: Compositions of Transformations
KEY: grids

59 ANS: 2 PTS: 2 REF: 081316ge STA: G.G.23 TOP: Locus

60 ANS: 1

\[ \frac{70 - 20}{2} = 25 \]

PTS: 2 REF: 011325ge STA: G.G.51 TOP: Arcs Determined by Angles
KEY: outside circle

61 ANS: 2

\[ \sqrt{(-2 - 4)^2 + (-3 - (-1))^2} = \sqrt{40} = \sqrt{4} \cdot \sqrt{10} = 2 \sqrt{10} \]

PTS: 2 REF: 011313ge STA: G.G.69 TOP: Quadrilaterals in the Coordinate Plane

62 ANS: 3

\[ AB = 8 - 4 = 4, BC = \sqrt{(-2 - (-5))^2 + (8 - 6)^2} = \sqrt{13}, AC = \sqrt{(-2 - (-5))^2 + (4 - 6)^2} = \sqrt{13} \]

PTS: 2 REF: 011328ge STA: G.G.69 TOP: Triangles in the Coordinate Plane

63 ANS: 3 PTS: 2 REF: 061306ge STA: G.G.71 TOP: Equations of Circles

64 ANS: 3

The regular polygon with the smallest interior angle is an equilateral triangle, with 60°. \[ 180° - 60° = 120° \]

PTS: 2 REF: 061314ge STA: G.G.26 TOP: Converse and Biconditional
68 ANS: 2
\[
x^2 - 2 = x \\
x^2 - x - 2 = 0 \\
(x - 2)(x + 1) = 0 \\
x = 2, -1
\]
PTS: 2 REF: 011409ge STA: G.G.70 TOP: Quadratic-Linear Systems

69 ANS:
\[
(n - 2)180 = (8 - 2)180 = 1080. \quad \frac{1080}{8} = 135.
\]
PTS: 2 REF: 061330ge STA: G.G.37 TOP: Interior and Exterior Angles of Polygons


71 ANS: 2
\[
(x - 4)^2 - 2 = -2x + 6. \quad y = -2(4) + 6 = -2 \\
x^2 - 8x + 16 - 2 = -2x + 6 \quad y = -2(2) + 6 = 2 \\
x^2 - 6x + 8 = 0 \\
(x - 4)(x - 2) = 0 \\
x = 4, 2
\]
PTS: 2 REF: 081319ge STA: G.G.70 TOP: Quadratic-Linear Systems

72 ANS: 2 PTS: 2 REF: 081301ge STA: G.G.24 TOP: Statements

73 ANS:

PTS: 2 REF: 011333ge STA: G.G.19 TOP: Constructions

74 ANS:
Rectangle \(ABCD\) with points \(E\) and \(F\) on side \(\overline{AB}\), segments \(CE\) and \(DF\) intersect at \(G\), and \(\angle ADG \cong \angle BCE\) are given. \(\overline{AD} \cong \overline{BC}\) because opposite sides of a rectangle are congruent. \(\angle A\) and \(\angle B\) are right angles and congruent because all angles of a rectangle are right and congruent. \(\triangle ADF \cong \triangle BCE\) by ASA. \(\overline{AF} \cong \overline{BE}\) per CPCTC. \(\overline{EF} \cong \overline{FE}\) under the Reflexive Property. \(\overline{AF} - \overline{EF} \cong \overline{BE} - \overline{FE}\) using the Subtraction Property of Segments. \(\overline{AE} \cong \overline{BF}\) because of the Definition of Segments.
75 ANS: 2  PTS: 2  REF: 061315ge  STA: G.G.13
TOP: Solids

76 ANS: 1

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

\[ 44.6022 = \frac{4}{3} \pi r^3 \]

\[ 10.648 \approx r^3 \]

\[ 2.2 \approx r \]

77 ANS: 4  PTS: 2  REF: 081313ge  STA: G.G.19
TOP: Volume and Surface Area

78 ANS:

\[ L = 2\pi r h = 2\pi \cdot 3 \cdot 5 \approx 94.25, \quad V = \pi r^2 h = \pi (3)^2 (5) \approx 141.37 \]

79 ANS: 3  PTS: 2  REF: 081309ge  STA: G.G.29
TOP: Triangle Congruency

80 ANS: 1

If two prisms have equal heights and volume, the area of their bases is equal.

81 ANS: 3  PTS: 2  REF: 011322ge  STA: G.G.49
TOP: Chords
82 ANS:

\[ M\left(\frac{-7+3}{2}, \frac{4+6}{2}\right) = M(-5, 5) \]

\[ m_{MN} = \frac{5 - 3}{-5 - 0} = \frac{2}{-5} \]

Since both opposite sides have equal slopes and are parallel, \(MNPQ\) is a parallelogram.

\[ \overrightarrow{MN} = \sqrt{(-5 - 0)^2 + (5 - 3)^2} = \sqrt{29} \]

\[ \overrightarrow{NA} = \sqrt{(0 - 2)^2 + (3 - 4)^2} = \sqrt{53} \]

\[ m_{PQ} = m_{NA} = \frac{-2 - 5}{-3 - 3} = -\frac{7}{2} \]

\[ m_{QM} = m_{NA} = \frac{-4 - (-2)}{-2 - (-3)} = -\frac{2}{5} \]

\[ \overrightarrow{MN} = \sqrt{29} \]

\[ \overrightarrow{NA} = \sqrt{53} \]

\[ \overrightarrow{MN} \text{ is not congruent to } \overrightarrow{NP} \]

\[ \overrightarrow{MNPQ} \text{ is not a rhombus since not all sides are congruent.} \]

PTS: 6 REF: 081338ge STA: G.G.69 TOP: Quadrilaterals in the Coordinate Plane


84 ANS: 2

\[ \frac{(n - 2)180}{n} = 120 \]

\[ 180n - 360 = 120n \]

\[ 60n = 360 \]

\[ n = 6 \]

PTS: 2 REF: 011326ge STA: G.G.37 TOP: Interior and Exterior Angles of Polygons


86 ANS: 3

\[ 3x - 15 = 2(6) \]

\[ 3x = 27 \]

\[ x = 9 \]

PTS: 2 REF: 001311ge STA: G.G.42 TOP: Midsegments
\[(n - 2)180 - n \left(\frac{(n - 2)180}{n}\right) = 180n - 360 - 180n + 180n - 360 = 180n - 720.\]

\[180(5) - 720 = 180\]

**PTS:** 2  **REF:** 081322ge  **STA:** G.G.37  **TOP:** Interior and Exterior Angles of Polygons

88  **ANS:** 2  
\[m = \frac{-A}{B} = \frac{-5}{1} = -5 \quad y = mx + b\]
\[3 = -5(5) + b \quad 28 = b\]

**PTS:** 2  **REF:** 011410ge  **STA:** G.G.65  **TOP:** Parallel and Perpendicular Lines

89  **ANS:** 2  
\[\sqrt{17^2 - 15^2} = \sqrt{289 - 225} = \sqrt{64} = 8\]

**PTS:** 2  **REF:** 011424ge  **STA:** G.G.49  **TOP:** Chords

90  **ANS:**  
\[12x - 4 + 180 - 6x + 6x + 7x + 13 = 360. \quad 16y + 1 = \frac{12y + 1 + 18y + 6}{2} \]
\[19x + 189 = 360 \quad 32y + 2 = 30y + 7 \]
\[19x = 171 \quad 2y = 5 \]
\[x = 9 \quad y = \frac{5}{2}\]

**PTS:** 4  **REF:** 081337ge  **STA:** G.G.40  **TOP:** Trapezoids

**TOP:** Equations of Circles

91  **ANS:** 3  **PTS:** 2  **REF:** 061309ge  **STA:** G.G.72

**TOP:** Angle Side Relationship

92  **ANS:** 4  
Distance is preserved after a rotation.

**PTS:** 2  **REF:** 081304ge  **STA:** G.G.55  **TOP:** Properties of Transformations

93  **ANS:** 1  **PTS:** 2  **REF:** 011416ge  **STA:** G.G.34

**TOP:** Midpoint

94  **ANS:** 2  
\[\frac{6 + x}{2} = 4. \quad \frac{-4 + y}{2} = 2\]
\[x = 2 \quad y = 8\]

**PTS:** 2  **REF:** 011401ge  **STA:** G.G.66  **TOP:** Midpoint

95  **ANS:** 1  **PTS:** 2  **REF:** 011423ge  **STA:** G.G.71

**TOP:** Equations of Circles
96 ANS: 1
12(8) = x(6)
96 = 6x
16 = x

PTS: 2 REF: 061328ge STA: G.G.53 TOP: Segments Intercepted by Circle
KEY: two secants

97 ANS: 3
15 \div 5 = 3
18 \div 6 = 3

PTS: 2 REF: 081317ge STA: G.G.45 TOP: Similarity
KEY: perimeter and area

98 ANS: 1
x^2 = 3 \times 12
x = 6

PTS: 2 REF: 011308ge STA: G.G.47 TOP: Similarity
KEY: altitude

99 ANS: 2
PTS: 2 REF: 061321ge STA: G.G.34
TOP: Angle Side Relationship

100 ANS: 1
PTS: 2 REF: 011320ge STA: G.G.26
TOP: Conditional Statements

101 ANS: 4
PTS: 2 REF: 011406ge STA: G.G.10
TOP: Solids

102 ANS: 2
PTS: 2 REF: 011411ge STA: G.G.27
TOP: Quadrilateral Proofs

103 ANS: 2
m \angle ABC = 55, so m \angle ACR = 60 + 55 = 115

PTS: 2 REF: 011414ge STA: G.G.32 TOP: Exterior Angle Theorem

104 ANS: 1
8 \times 12 = 16x
6 = x

PTS: 2 REF: 081328ge STA: G.G.53 TOP: Segments Intercepted by Circle
KEY: two chords

105 ANS:

PTS: 2 REF: 011331ge STA: G.G.23 TOP: Locus
106 ANS: 2 PTS: 2 REF: 081311ge STA: G.G.10
TOP: Solids

107 ANS: 2 PTS: 2 REF: 061313ge STA: G.G.70
TOP: Quadratic-Linear Systems

108 ANS: 4  PTS: 2 REF: 061303ge STA: G.G.22
TOP: Locus

109 ANS: 4  PTS: 2 REF: 011306ge STA: G.G.9
TOP: Planes

110 ANS: 1
\[ \frac{180 - 52}{2} = 64, \quad 180 - (90 + 64) = 26 \]

PTS: 2 REF: 011314ge STA: G.G.30 TOP: Interior and Exterior Angles of Triangles

111 ANS: 1  PTS: 2 REF: 061310ge STA: G.G.2
TOP: Planes

112 ANS: 4  PTS: 2 REF: 011407ge STA: G.G.23
TOP: Locus

113 ANS: 4  PTS: 2 REF: 011315ge STA: G.G.1
TOP: Planes

114 ANS: 3
\[ 25 \times 9 \times 12 = 15^2 h \]
\[ 2700 = 15^2 h \]
\[ 12 = h \]

PTS: 2 REF: 061323ge STA: G.G.11 TOP: Volume

115 ANS: 4
\[ m = \frac{2}{3}, \quad 2 = -\frac{3}{2} (4) + b \]
\[ m_\perp = -\frac{3}{2}, \quad 2 = -6 + b \]
\[ 8 = b \]

PTS: 2 REF: 011319ge STA: G.G.64 TOP: Parallel and Perpendicular Lines

116 ANS: 3
\[ x^2 = 2(2 + 10) \]
\[ x^2 = 24 \]
\[ x = \sqrt{24} = \sqrt{4 \times 6} = 2\sqrt{6} \]

PTS: 2 REF: 081326ge STA: G.G.47 TOP: Similarity
KEY: leg

117 ANS: 1  PTS: 2 REF: 061325ge STA: G.G.74
TOP: Graphing Circles
118 ANS:
If \( r = 5 \), then \( r^2 = 25 \). \((x + 3)^2 + (y - 2)^2 = 25\)

PTS: 2  REF: 011332ge  STA: G.G.71  TOP: Equations of Circles

119 ANS: 4
\[
m_{AB} = \frac{6 - 3}{7 - 5} = \frac{3}{2}, \quad m_{CD} = \frac{4 - 0}{6 - 9} = \frac{4}{-3}
\]

PTS: 2  REF: 061318ge  STA: G.G.63  TOP: Parallel and Perpendicular Lines

120 ANS: 4  PTS: 2  REF: 011403ge  STA: G.G.73  TOP: Equations of Circles

121 ANS:
\[
\begin{align*}
x + 3x - 60 + 5x - 30 &= 180 \quad 5(30) - 30 = 120 \quad 6y - 8 &= 4y - 2 \quad \overline{DC} = 10 + 10 = 20 \\
9x - 90 &= 180 \quad m \angle BAC = 180 - 120 = 60 \quad 2y &= 6 \\
x &= 30 = m \angle D \quad y &= 3 \\
5(3) - 2 &= 10 = \overline{BC}
\end{align*}
\]

PTS: 3  REF: 011435ge  STA: G.G.31  TOP: Isosceles Triangle Theorem

122 ANS: 2
\[
s^2 + s^2 = (3\sqrt{2})^2
\]
\[
2s^2 = 18
\]
\[
s^2 = 9
\]
\[
s = 3
\]

PTS: 2  REF: 011420ge  STA: G.G.39  TOP: Special Parallelograms

123 ANS: 3
\[
3x + 1 + 4x - 17 + 5x - 20 = 180 \quad 3(18) + 1 = 55
\]
\[
12x - 36 = 180 \quad 4(18) - 17 = 55
\]
\[
12x = 216 \quad 5(18) - 20 = 70
\]
\[
x = 18
\]

PTS: 2  REF: 061308ge  STA: G.G.30  TOP: Interior and Exterior Angles of Triangles

124 ANS: 2  PTS: 2  REF: 061324ge  STA: G.G.44  TOP: Similarity Proofs
125. ANS:

\[
\begin{align*}
\angle D &= 3(25) - 15 = 60
\end{align*}
\]

PTS: 2  REF: 081330ge  STA: G.G.17  TOP: Constructions

126. ANS:

\[
\begin{align*}
2(4x + 20) + 2(3x - 15) &= 360. \\
8x + 40 + 6x - 30 &= 360 \\
14x &= 350 \\
x &= 25
\end{align*}
\]

PTS: 3  REF: 011436ge  STA: G.G.58  TOP: Compositions of Transformations

KEY: grids

127. ANS:

\[
\begin{align*}
2 + 3^2 + 22 + 32 &\neq 4^2
\end{align*}
\]

PTS: 2  REF: 011331ge  STA: G.G.48  TOP: Pythagorean Theorem


129. ANS: 3  PTS: 2  REF: 011304ge  STA: G.G.56  TOP: Identifying Transformations

130. ANS: 3  PTS: 2  REF: 011425ge  STA: G.G.39  TOP: Special Parallelograms

131. ANS: 2  PTS: 2  REF: 011316ge  STA: G.G.48  TOP: Pythagorean Theorem
132 ANS:

\[
\begin{align*}
&\text{PTS: 2} \quad \text{REF: 011434ge} \quad \text{STA: G.G.22} \quad \text{TOP: Locus} \\
&\text{SA} = 4\pi r^2 = 4\pi \cdot 2.5^2 = 25\pi \approx 78.54
\end{align*}
\]

133 ANS:

\[
\begin{align*}
&\text{PTS: 2} \quad \text{REF: 011429ge} \quad \text{STA: G.G.16} \quad \text{TOP: Volume and Surface Area} \\
&2x - 8 = x + 2. \ A E = 10 + 2 = 12. \ A C = 2(AE) = 2(12) = 24 \\
&x = 10
\end{align*}
\]

134 ANS:

\[
\begin{align*}
&\text{PTS: 2} \quad \text{REF: 011327ge} \quad \text{STA: G.G.39} \quad \text{TOP: Special Parallelograms} \\
&M_x = \frac{8 + (-3)}{2} = 2.5. \ M_y = \frac{-4 + 2}{2} = -1.
\end{align*}
\]

135 ANS:

\[
\begin{align*}
&\text{PTS: 2} \quad \text{REF: 061312ge} \quad \text{STA: G.G.66} \quad \text{TOP: Midpoint} \\
&\text{TOP: Equations of Circles} \\
&\text{PTS: 2} \quad \text{REF: 081305ge} \quad \text{STA: G.G.71}
\end{align*}
\]

136 ANS:

\[
\begin{align*}
&\text{TOP: Angle Side Relationship} \\
&x^2 + 12 + 11x + 5 + 13x - 17 = 180. \ m\angle A = 6^2 + 12 = 48. \ m\angle B \text{ is the largest angle, so } AC \text{ in the longest side.} \\
&x^2 + 24x - 180 = 0 \quad m\angle B = 11(6) + 5 = 71 \\
&(x + 30)(x - 6) = 0 \quad m\angle C = 13(6) - 7 = 61 \\
&x = 6
\end{align*}
\]

137 ANS:

\[
\begin{align*}
&\sqrt{8^2 + 15^2} = 17 \\
&\text{PTS: 2} \quad \text{REF: 061326ge} \quad \text{STA: G.G.39} \quad \text{TOP: Special Parallelograms} \\
&\text{ANS: 1} \\
&\text{Parallel chords intercept congruent arcs. } m\overparen{AC} = m\overparen{BD}. \ \frac{180 - 110}{2} = 35.
\end{align*}
\]

138 ANS:

\[
\begin{align*}
&\text{PTS: 2} \quad \text{REF: 081302ge} \quad \text{STA: G.G.52} \quad \text{TOP: Chords}
\end{align*}
\]

17
140 ANS:

\[ 4x \cdot x = 6^2 \]
\[ 4x^2 = 36 \]
\[ x^2 = 9 \]
\[ x = 3 \]
\[ \frac{BD}{x} = 4(3) = 12 \]

PTS: 4 REF: 011437ge STA: G.G.47 TOP: Similarity
KEY: leg

141 ANS: 3

\[ x^2 = 3 \times 12. \quad \sqrt{6^2 + 3^2} = \sqrt{45} = \sqrt{9 \times 5} = 3 \times \sqrt{5} \]
\[ x = 6 \]

PTS: 2 REF: 061327ge STA: G.G.47 TOP: Similarity
KEY: altitude

142 ANS: 3

\[ 180 - 38 = 142 \]

PTS: 2 REF: 011419ge STA: G.G.50 TOP: Tangents
KEY: two tangents

143 ANS: 3 PTS: 2 REF: 011311ge STA: G.G.42
TOP: Midsegments

144 ANS: 3

\[ 2y = 3x - 4. \quad 1 = \frac{3}{2} (6) + b \]
\[ y = \frac{3}{2} x - 2 \quad 1 = 9 + b \]
\[ -8 = b \]

PTS: 2 REF: 061316ge STA: G.G.65 TOP: Parallel and Perpendicular Lines

145 ANS: 2

The slope of \( 2x + 4y = 12 \) is \( m = \frac{-A}{B} = \frac{-2}{4} = -\frac{1}{2} \).
\[ m \perp = 2. \]


146 ANS: 4 PTS: 2 REF: 011428ge STA: G.G.50
TOP: Tangents KEY: common tangency

147 ANS: 4

center: \((3, -4)\); radius: \(\sqrt{10}\)

PTS: 2 REF: 081333ge STA: G.G.73 TOP: Equations of Circles

148 ANS: 2 PTS: 2 REF: 061322ge STA: G.G.51
TOP: Arcs Determined by Angles KEY: inscribed
149 ANS:
\[ m_{AB} = \frac{4 - 1}{4 - 2} = \frac{3}{2}, \quad m_{BC} = \frac{2}{3} \]

PTS: 4 REF: 061334ge STA: G.G.69 TOP: Quadrilaterals in the Coordinate Plane

150 ANS: 1 PTS: 2 REF: 011412ge STA: G.G.28
TOP: Triangle Congruency

151 ANS: 4 PTS: 2 REF: 081308ge STA: G.G.49
TOP: Chords

152 ANS: 3
The centroid divides each median into segments whose lengths are in the ratio 2 : 1.

PTS: 2 REF: 081307ge STA: G.G.43 TOP: Centroid

153 ANS: 2
\[ 7 + 18 > 6 + 12 \]

PTS: 2 REF: fall0819ge STA: G.G.33 TOP: Triangle Inequality Theorem
Geometry Regents at Random

Answer Section

154 ANS: 1

\((x,y) \to (x + 3,y + 1)\)

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

155 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

156 ANS: 4

\(\Delta ABC \sim \Delta DBE\).

\[
\frac{AB}{DB} = \frac{AC}{DE}
\]

\[
\frac{9}{2} = \frac{x}{3}
\]

\[
x = 13.5
\]

PTS: 2  REF: 060927ge  STA: G.G.46  TOP: Side Splitter Theorem

157 ANS: 1

\(A'(2,4)\)

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

KEY: basic
\[3x + 15 + 2x - 1 = 6x + 2\]
\[5x + 14 = 6x + 2\]
\[x = 12\]

159 ANS: 2
PTS: 2
REF: 081015ge
STA: G.G.56
TOP: Identifying Transformations

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

161 ANS: 2
PTS: 2
REF: 011017ge
STA: G.G.67
TOP: Distance
KEY: general

162 ANS: 3
PTS: 2
REF: 080902ge
STA: G.G.17
TOP: Constructions

163 ANS: 2
\[x^2 = 3(x + 18)\]
\[x^2 - 3x - 54 = 0\]
\[(x - 9)(x + 6) = 0\]
\[x = 9\]

164 ANS: 2
Parallel chords intercept congruent arcs. \(\overline{AC} = \overline{BD} = 30\).
\[180 - 30 - 30 = 120\]

PTS: 2
REF: 080904ge
STA: G.G.52
TOP: Chords
165 ANS:

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

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

\[x = 7 \quad 14y = 84\]

\[y = 6\]


166 ANS:

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

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

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

168 ANS:

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

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

\[b = 14\]

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

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

170 ANS: 3

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

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

171 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

172 ANS:

\[5. \quad \frac{3}{x} = \frac{6 + 3}{15}\]

\[9x = 45\]

\[x = 5\]

PTS: 2 REF: 011033ge STA: G.G.46 TOP: Side Splitter Theorem
173 ANS: 3
\[ V = \pi r^2 h = \pi \cdot 6^2 \cdot 27 = 972\pi \]

PTS: 2 REF: 011027ge STA: G.G.14 TOP: Volume and Lateral Area

174 ANS:
\[
\begin{align*}
\text{PTS: 2} & \quad \text{REF: fall0832ge} \quad \text{STA: G.G.17} \quad \text{TOP: Constructions} \\
\text{175 ANS: 2} & \\
\text{The slope of a line in standard form is } & -\frac{A}{B} \text{ so the slope of this line is } -\frac{5}{3} \text{ Perpendicular lines have slope that are the opposite and reciprocal of each other.} \\
\text{PTS: 2} & \quad \text{REF: fall0828ge} \quad \text{STA: G.G.62} \quad \text{TOP: Parallel and Perpendicular Lines} \\
\text{176 ANS: 4} & \\
\text{ } & \\
\text{d} & = \sqrt{(146 - (-4))^2 + (52 - 2)^2} = \sqrt{25000} \approx 158.1 \\
\text{PTS: 2} & \quad \text{REF: 061021ge} \quad \text{STA: G.G.67} \quad \text{TOP: Distance} \\
\text{KEY: general} & \\
\text{177 ANS: 1} & \quad \text{PTS: 2} \quad \text{REF: 061010ge} \quad \text{STA: G.G.34} \quad \text{TOP: Angle Side Relationship} \\
\text{178 ANS: 4} & \quad \text{PTS: 2} \quad \text{REF: 060912ge} \quad \text{STA: G.G.23} \quad \text{TOP: Locus} \\
\text{179 ANS: 4} & \quad \text{PTS: 2} \quad \text{REF: 011012ge} \quad \text{STA: G.G.1} \quad \text{TOP: Planes} \\
\text{180 ANS: 2} & \quad \text{PTS: 2} \quad \text{REF: 011006ge} \quad \text{STA: G.G.56} \quad \text{TOP: Identifying Transformations}
181 ANS:

PTS: 2  REF: 061032ge  STA: G.G.54  TOP: Reflections
KEY: grids

182 ANS: 3

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

183 ANS: 1  PTS: 2  REF: 060918ge  STA: G.G.2  TOP: Planes

184 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.

PTS: 2  REF: 060933ge  STA: G.G.25  TOP: Compound Statements
KEY: disjunction

185 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

186 ANS: 3  PTS: 2  REF: 080928ge  STA: G.G.50  TOP: Tangents  KEY: common tangency
\[ \angle D, \angle G \text{ and } 24^\circ \text{ or } \angle E, \angle F \text{ and } 84^\circ. \ \text{m} \overarc{FE} = \frac{2}{15} \times 360 = 48. \] Since the chords forming \( \angle D \) and \( \angle G \) are intercepted by \( \overarc{FE} \), their measure is \( 24^\circ \). \[ \text{m} \overarc{GD} = \frac{7}{15} \times 360 = 168. \] Since the chords forming \( \angle E \) and \( \angle F \) are intercepted by \( \overarc{GD} \), their measure is \( 84^\circ \).

**PTS: 4**  
**REF:** fall0836ge  
**STA:** G.G.51  
**TOP:** Arcs Determined by Angles  
**KEY:** inscribed

**ANS:**

\[ \angle C \]

**PTS: 2**  
**REF:** 080932ge  
**STA:** G.G.17  
**TOP:** Constructions

**ANS: 3**

\[ \overarc{DE} \]

**PTS: 2**  
**REF:** 080920ge  
**STA:** G.G.42  
**TOP:** Midsegments

**ANS: 4**

Median \( BF \) bisects \( AC \) so that \( CF \cong FA \).

**PTS: 2**  
**REF:** fall0810ge  
**STA:** G.G.24  
**TOP:** Statements
\[ y = \frac{4}{3} x - 6 \].  
\[ M_x = \frac{-1 + 7}{2} = 3 \]  
\[ M_y = \frac{1 + (-5)}{2} = -2 \]  
\[ m = \frac{1 - (-5)}{-1 - 7} = \frac{3}{4} \]  

The perpendicular bisector goes through \((3, -2)\) and has a slope of \(\frac{4}{3}\).

\[ y - y_M = m(x - x_M). \]  
\[ y - 1 = \frac{4}{3}(x - 2) \]  

**PTS:** 4  
**REF:** 080935ge  
**STA:** G.G.68  
**TOP:** Perpendicular Bisector

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

**PTS:** 2  
**REF:** 081032ge  
**STA:** G.G.20  
**TOP:** Constructions

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

**PTS:** 2  
**REF:** fall0827ge  
**STA:** G.G.37  
**TOP:** Interior and Exterior Angles of Polygons
Perpendicular lines have slope the opposite and reciprocal of each other.

\[ 2y = -6x + 8 \]

\[ y = -3x + 4 \]

\[ m = -3 \]

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

Because the triangles are similar, \( \frac{m_{\angle A}}{m_{\angle D}} = 1 \)

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

\[ r = 5 \]

\[ r^2 = 25 \]

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

Opposite sides of a parallelogram are congruent. \( 4x - 3 = x + 3 \). \( SV = (2) + 3 = 5 \).

\[ 3x = 6 \]

\[ x = 2 \]
203 ANS: 
\[ JK \cong LM \] because opposite sides of a parallelogram are congruent. \[ LM \cong LN \] because of the Isosceles Triangle Theorem. \[ LM \cong JM \] because of the transitive property. \( JKLM \) is a rhombus because all sides are congruent.

PTS: 4
REF: 011036ge
STA: G.G.27
TOP: Quadrilateral Proofs

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

PTS: 6
REF: 080938ge
STA: G.G.27
TOP: Quadrilateral Proofs

205 ANS: 3
PTS: 2
REF: 061004ge
STA: G.G.31
TOP: Isosceles Triangle Theorem

206 ANS:
2.4. 5a = 4²  5b = 3²  h² = 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

207 ANS:
(6, -4).  \[ C_x = \frac{Q_x + R_x}{2}, \quad C_y = \frac{Q_y + R_y}{2}. \]
\[ 3.5 = \frac{1 + R_x}{2} \quad 2 = \frac{8 + R_y}{2} \]
\[ 7 = 1 + R_x \quad 4 = 8 + R_y \]
\[ 6 = R_x \quad -4 = R_y \]

PTS: 2
REF: 011031ge
STA: G.G.66
TOP: Midpoint
KEY: graph

208 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
209 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

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

211 ANS:

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

212 ANS:
6. The centroid divides each median into segments whose lengths are in the ratio 2 : 1. \(TD = 6\) and \(DB = 3\)
PTS: 2 REF: 011034ge STA: G.G.43 TOP: Centroid

213 ANS:

\[15 + 5\sqrt{5}\]
PTS: 4 REF: 060936ge STA: G.G.69 TOP: Triangles in the Coordinate Plane
214 ANS: 1

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

216 ANS: 1
TOP: Equations of Circles
TOP: Midsegments

217 ANS: 4
\( BG \) is also an angle bisector since it intersects the concurrence of \( CD \) and \( AE \)

218 ANS: 2
TOP: Constructions
TOP: Exterior Angle Theorem

219 ANS: 2
A dilation affects distance, not angle measure.

220 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°)).

221 ANS: 4
180 - (40 + 40) = 100

TOP: Isosceles Triangle Theorem
\[ \frac{140 - RS}{2} = 40 \]
\[ 140 - RS = 80 \]
\[ RS = 60 \]

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

223  ANS: 2

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

PTS: 2  REF: 060923ge  STA: G.G.70  TOP: Quadratic-Linear Systems
230 ANS:

\[ V = \frac{1}{3} Bh = \frac{1}{3} s^2 h = \frac{1}{3} \cdot 12^2 \cdot 42 = 2016 \]

PTS: 2 REF: 080930ge STA: G.G.13 TOP: Volume

231 ANS: 3 PTS: 2 REF: 081026ge STA: G.G.26

TOP: Contrapositive

232 ANS: 4

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

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

233 ANS: 1 PTS: 2 REF: 081009ge STA: G.G.73

TOP: Equations of Circles

234 ANS: 4 PTS: 2 REF: 061015ge STA: G.G.56

TOP: Identifying Transformations

235 ANS: 4

Corresponding angles of similar triangles are congruent.

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

KEY: perimeter and area

236 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

237 ANS: 4 PTS: 2 REF: fall0818ge STA: G.G.61

TOP: Analytical Representations of Transformations

238 ANS: 4 PTS: 2 REF: fall0824ge STA: G.G.50

TOP: Tangents KEY: common tangency

239 ANS: 2

\[(d + 4)^2 = 12(6)\]

\[ 4d + 16 = 72 \]

\[ d = 14 \]

\[ r = 7 \]

PTS: 2 REF: 061023ge STA: G.G.53 TOP: Segments Intercepted by Circle

KEY: two secants
240 ANS: 

\[
\begin{array}{c}
\text{Translation}
\end{array}
\]

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

241 ANS: 3

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

\[
m = -\frac{A}{B} = \frac{5}{2} \quad m = -\frac{A}{B} = \frac{10}{4} = \frac{5}{2}
\]

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

243 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

244 ANS: 2 
PTS: 2 
REF: 011003ge 
STA: G.G.55 
TOP: Properties of Transformations

245 ANS: 4

\[
l_1w_1h_1 = l_2w_2h_2 \\
10 \times 2 \times h = 5 \times w_2 \times h \\
20 = 5w_2 \\
w_2 = \frac{20}{5} = 4
\]

PTS: 2 
REF: 011030ge 
STA: G.G.11 
TOP: Volume

246 ANS: 2 
PTS: 2 
REF: 011020ge 
STA: G.G.74 
TOP: Graphing Circles
247 ANS:
20. \(5x + 10 = 4x + 30\)

\[ x = 20 \]

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

KEY: basic

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

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

250 ANS: 1 PTS: 2 REF: 060920ge STA: G.G.74
TOP: Graphing Circles

251 ANS: 3 PTS: 2 REF: fall0816ge STA: G.G.1
TOP: Planes

252 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

253 ANS:

\[ 375\pi \quad L = \pi rl = \pi(15)(25) = 375\pi \]

PTS: 2 REF: 081030ge STA: G.G.15 TOP: Lateral Area

254 ANS: 1

\[
a^2 + (5\sqrt{2})^2 = (2\sqrt{15})^2
\]

\[
a^2 + (25 \times 2) = 4 \times 15
\]

\[
a^2 + 50 = 60
\]

\[
a^2 = 10
\]

\[
a = \sqrt{10}
\]

PTS: 2 REF: 011016ge STA: G.G.48 TOP: Pythagorean Theorem

255 ANS: 2

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

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

\[
b = 1
\]

PTS: 2 REF: 060907ge STA: G.G.64 TOP: Parallel and Perpendicular Lines

256 ANS: 2 PTS: 2 REF: 061007ge STA: G.G.35
TOP: Parallel Lines and Transversals
ANS: 3
\[
\frac{36 + 20}{2} = 28
\]

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

ANS: 4
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:
\[
y = mx + b
\]
\[
3 = -2(7) + b
\]
\[17 = b\]

PTS: 2  REF: 081010ge  STA: G.G.65  TOP: Parallel and Perpendicular Lines

ANS: 2
\[
M_x = \frac{3x + 5 + x - 1}{2} = \frac{4x + 4}{2} = 2x + 2. \quad M_y = \frac{3y + (-y)}{2} = \frac{2y}{2} = y.
\]

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

ANS: 2
Parallel chords intercept congruent arcs. \(m\overline{AD} = m\overline{BC} = 60\). \(m\angle CDB = \frac{1}{2} m\overline{BC} = 30\).

PTS: 2  REF: 060906ge  STA: G.G.52  TOP: Chords

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

PTS: 4  REF: 081038ge  STA: G.G.69  TOP: Quadrilaterals in the Coordinate Plane

ANS: 4
\[
M_x = \frac{-6 + 1}{2} = -\frac{5}{2}. \quad M_y = \frac{1 + 8}{2} = \frac{9}{2}.
\]

PTS: 2  REF: 060919ge  STA: G.G.66  TOP: Midpoint
KEY: graph

ANS: 2  PTS: 2  REF: 061022ge  STA: G.G.62
TOP: Parallel and Perpendicular Lines
ANS: 4  PTS: 2  REF: 061008ge  STA: G.G.40  TOP: Trapezoids


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

ANS: 1  PTS: 2  REF: 061009ge  STA: G.G.26  TOP: Converse and Biconditional

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

PTS: 2  REF: 060916ge  STA: G.G.53  TOP: Segments Intercepted by Circle  KEY: tangent and secant

ANS: 2

\[\angle ACB \text{ and } \angle ECD \text{ are congruent vertical angles and } \angle CAB \cong \angle CED.\]

PTS: 2  REF: 060917ge  STA: G.G.44  TOP: Similarity Proofs

ANS:

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

ANS: 1
Since \(\overline{AC} \cong \overline{BC}\), \(m\angle A = m\angle B\) under the Isosceles Triangle Theorem.

PTS: 2  REF: fall0809ge  STA: G.G.69  TOP: Triangles in the Coordinate Plane
272 ANS: 3

273 ANS: 1

\[ 4x = 6 \cdot 10 \]
\[ x = 15 \]

274 ANS:
Yes, \( m \angle ABD = m \angle BDC = 44 \) 180 – (93 + 43) = 44  
\[ x + 19 + 2x + 6 + 3x + 5 = 180 \]
\[ 6x + 30 = 180 \]
\[ 6x = 150 \]
\[ x = 25 \]
\[ x + 19 = 44 \]

angles \( \angle ABD \) and \( \angle CDB \) are congruent, \( \overline{AB} \) is parallel to \( \overline{DC} \).

275 ANS: 1
The closer a chord is to the center of a circle, the longer the chord.

276 ANS: 1

\[ PT: 2 \]
\[ REF: 061013ge \]
\[ STA: G.G.50 \]
\[ TOP: Tangents \]
\[ KEY: point of tangency \]

277 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
The slope of a line in standard form is $-\frac{A}{B}$, so the slope of this line is $\frac{-2}{-1} = 2$. A parallel line would also have a slope of 2. Since the answers are in slope intercept form, find the $y$-intercept:

$$y = mx + b$$

$$-11 = 2(-3) + b$$

$$-5 = b$$
The centroid divides each median into segments whose lengths are in the ratio 2 : 1.

\[ \overline{GC} = 2\overline{FG} \]
\[ \overline{GC} + \overline{FG} = 24 \]
\[ 2\overline{FG} + \overline{FG} = 24 \]
\[ 3\overline{FG} = 24 \]
\[ \overline{FG} = 8 \]

285 ANS: 1

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

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

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

286 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

287 ANS: 4

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

PTS: 2 REF: fall0831ge STA: G.G.67 TOP: Distance

KEY: general

288 ANS: 4

The slope of \[ y = -3x + 2 \] is \(-3\). The perpendicular slope is \(\frac{1}{3}\). \(-1 = \frac{1}{3} (3) + b \)
\[ -1 = 1 + b \]
\[ b = -2 \]

PTS: 2 REF: 011018ge STA: G.G.64 TOP: Parallel and Perpendicular Lines
289 ANS:

\[ M_x = \frac{-2 + 6}{2} = 2. \quad M_y = \frac{3 + 3}{2} = 3. \]
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 \( r^2 = 16. \)

290 ANS: 1

\[ 3x^2 + 18x + 24 \]
\[ 3(x^2 + 6x + 8) \]
\[ 3(x + 4)(x + 2) \]

291 ANS: 1

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

292 ANS:

293 ANS: 3

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

294 ANS: 4

\[ y = \frac{1}{2} x - 5 \]

295 ANS: 2

PTS: 2 REF: fall0822ge STA: G.G.63 TOP: Parallel and Perpendicular Lines
295 ANS: 4 PTS: 2 REF: 060922ge STA: G.G.73
TOP: Equations of Circles

296 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

297 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

298 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 and Lateral Area

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

300 ANS: 4
$$180 - (50 + 30) = 100$$

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

301 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

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

303 ANS: 3
The diagonals of an isosceles trapezoid are congruent. $5x + 3 = 11x - 5$.
$$6x = 18$$
$$x = 3$$

PTS: 2 REF: fall0801ge STA: G.G.40 TOP: Trapezoids

304 ANS: 4 PTS: 2 REF: 011019ge STA: G.G.44
TOP: Similarity Proofs
305 ANS: 2
Longest side of a triangle is opposite the largest angle. Shortest side is opposite the smallest angle.

PTS: 2   REF: 060911ge   STA: G.G.34   TOP: Angle Side Relationship

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

307 ANS: 2

PTS: 2   REF: 081007ge   STA: G.G.28   TOP: Triangle Congruency

308 ANS: 3
Because \( OC \) is a radius, its length is 5. Since \( CE = 2 \ OE = 3 \). \( \triangle EDO \) is a 3-4-5 triangle. If \( ED = 4 \), \( BD = 8 \).

PTS: 2   REF: fall0811ge   STA: G.G.49   TOP: Chords

309 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

310 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

311 ANS: 2
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 \( y = \frac{3}{2} x + 3 \).

PTS: 2   REF: 060926ge   STA: G.G.63   TOP: Parallel and Perpendicular Lines
312 ANS:
3. The non-parallel sides of an isosceles trapezoid are congruent. \(2x + 5 = 3x + 2\)

\[x = 3\]

PTS: 2 REF: 080929ge STA: G.G.40 TOP: Trapezoids

313 ANS: 1 
TOP: Centroid, Orthocenter, Incenter and Circumcenter

314 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

315 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

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

PTS: 2 REF: 060914ge STA: G.G.43 TOP: Centroid

317 ANS: 3

. The sum of the interior angles of a pentagon is \((5 - 2)180 = 540\).

PTS: 2 REF: 011023ge STA: G.G.36 TOP: Interior and Exterior Angles of Polygons

318 ANS: 4 
TOP: Identifying Transformations

319 ANS: 3 
TOP: Equations of Circles

320 ANS: 3 
TOP: Identifying Transformations

321 ANS: 4 
TOP: Conditional Statements

322 ANS: 2 
TOP: Negations
323  ANS:
\[2\sqrt{3}. \quad x^2 = 3 \cdot 4\]
\[x = \sqrt{12} = 2\sqrt{3}\]

PTS: 2  REF:  fall0829ge  STA:  G.G.47  TOP:  Similarity

KEY: altitude

324  ANS: 4  PTS: 2  REF:  080914ge  STA:  G.G.7
TOP:  Planes

325  ANS: 3  PTS: 2  REF:  060928ge  STA:  G.G.8
TOP:  Planes

326  ANS: 2  PTS: 2  REF:  080921ge  STA:  G.G.72
TOP:  Equations of Circles

327  ANS:
\[y = \frac{2}{3} x + 1. \quad 2y + 3x = 6 \quad . \quad y = mx + b\]
\[2y = -3x + 6 \quad 5 = \frac{2}{3} (6) + b\]
\[y = -\frac{3}{2} x + 3 \quad 5 = 4 + b\]
\[m = -\frac{3}{2} \quad 1 = b\]
\[m_{\perp} = \frac{2}{3}\]

PTS: 4  REF:  061036ge  STA:  G.G.64  TOP:  Parallel and Perpendicular Lines

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

329  ANS: 3  PTS: 2  REF:  080924ge  STA:  G.G.24
TOP:  Negations

330  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

331  ANS: 1
\[AB = 10 \quad \text{since} \quad \triangle ABC \quad \text{is a 6-8-10 triangle.} \quad 6^2 = 10x\]
\[3.6 = x\]

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

KEY: leg

332  ANS: 1
Parallel lines intercept congruent arcs.

PTS: 2  REF:  061001ge  STA:  G.G.52  TOP:  Chords
y = \frac{2}{3}x - 9. The slope of 2x - 3y = 11 is \frac{-A}{B} = \frac{-2}{3} = \frac{2}{3} \cdot \frac{2}{3} = \left(\frac{2}{3}\right)(6) + b

-5 = 4 + b
b = -9

V = \pi r^2 h
1000 = \pi r^2 \cdot 8
r^2 = \frac{1000}{8\pi}
r \approx 6.3

452. \text{SA} = 4\pi r^2 = 4\pi \cdot 6^2 = 144\pi \approx 452

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
339 ANS:
\[ V = \pi r^2 h \]
\[ 1256.4 = \pi r^2 \cdot 8 \]
\[ r^2 = \frac{1256.4}{8\pi} \]
\[ r \approx 22.4 \]

PTS: 2 REF: fall0833ge STA: G.G.14 TOP: Volume and Lateral Area

340 ANS: 2
The length of the midsegment of a trapezoid is the average of the lengths of its bases. \( \frac{x + 30}{2} = 44. \)
\[ x + 30 = 88 \]
\[ x = 58 \]

PTS: 2 REF: 011001ge STA: G.G.40 TOP: Trapezoids

341 ANS:
\[ AC \cong EC \text{ and } DC \cong BC \text{ because of the definition of midpoint. } \angle ACB \cong \angle ECD \text{ because of vertical angles. } \]
\[ \triangle ABC \cong \triangle EDC \text{ because of SAS. } \angle CDE \cong \angle CBA \text{ because of CPCTC. } BD \text{ is a transversal intersecting } AB \text{ and } ED. \]
Therefore \( AB \parallel DE \) because \( \angle CDE \) and \( \angle CBA \) are congruent alternate interior angles.


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

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


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

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

345 ANS: 1 PTS: 2 REF: 080918ge STA: G.G.41 TOP: Special Quadrilaterals
\[ \Delta_{PRT} \text{ and } \Delta_{SRQ} \text{ share } \angle R \text{ and it is given that } \angle RPT \cong \angle RSQ. \]

346 ANS: 1

347 ANS: 2

348 ANS: 2

349 ANS: 1

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

\[ y = -12x - 20 \]

350 ANS:

\[ \frac{3}{7} = \frac{6}{x} \]

\[ 3x = 42 \]

\[ x = 14 \]

351 ANS: 1

352 ANS: 2

\[ \frac{3}{7} = \frac{6}{x} \]

\[ 3x = 42 \]

\[ x = 14 \]

353 ANS: 2

\[ \frac{3}{7} = \frac{6}{x} \]

\[ 3x = 42 \]

\[ x = 14 \]
353 ANS:

![Diagram of a prism with lateral edges labeled](image)

The lateral edges of a prism are parallel.

354 ANS: 4

PTS: 2

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

TOP: Solids

355 ANS: 3

The lateral edges of a prism are parallel.

356 ANS: 2

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

PTS: 2

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

357 ANS: 3

PTS: 2

REF: fall0825ge STA: G.G.21 TOP: Arcs Determined by Angles

KEY: inside circle

358 ANS: 2

PTS: 2

REF: 060910ge STA: G.G.71 TOP: Equations of Circles

359 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

360 ANS: 4

The slope of \( y = -\frac{2}{3}x - 5 \) is \(-\frac{2}{3}\). Perpendicular lines have slope that are opposite reciprocals.

361 ANS: AC

\[
m\angle BCA = 63 \text{ and } m\angle ABC = 80. \quad AC \text{ is the longest side as it is opposite the largest angle.}
\]

PTS: 2

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

362 ANS:

\[
x + 3x + 5x - 54 = 180
\]

\[
9x = 234
\]

\[
x = 26
\]

PTS: 2

REF: 080933ge STA: G.G.30 TOP: Interior and Exterior Angles of Triangles
The marked $60^\circ$ angle and the angle above it are on the same straight line and supplementary. This unmarked supplementary angle is $120^\circ$. Because the unmarked $120^\circ$ angle and the marked $120^\circ$ angle are alternate exterior angles and congruent, $d \parallel e$.

364 ANS: 2
PTS: 2
REF: fall0806ge
STA: G.G.9
TOP: Planes

365 ANS:
37. Since $DE$ is a midsegment, $AC = 14$. $10 + 13 + 14 = 37$

366 ANS: 3

367 ANS:
34. $2x - 12 + x + 90 = 180$
   
   $3x + 78 = 90$
   
   $3x = 102$
   
   $x = 34$

368 ANS:

PTS: 2
REF: 061033ge
STA: G.G.22
TOP: Locus
369 ANS: 4

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

370 ANS:

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

Let $AD = x$. $36x = 12^2$

$x = 4$

371 ANS: 4

PTS: 2 REF: 080922ge STA: G.G.47 TOP: Similarity

KEY: leg

372 ANS:

$67 \cdot \frac{180 - 46}{2} = 67$

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

373 ANS: 3

PTS: 2 REF: 061017ge STA: G.G.1 TOP: Planes

374 ANS: 3

PTS: 2 REF: 060925ge STA: G.G.17 TOP: Constructions
375 ANS:  
\[ \overline{BD} \cong \overline{DB} \text{ (Reflexive Property)}; \triangle ABD \cong \triangle CDB \text{ (SSS); } \angle BDC \cong \angle ABD \text{ (CPCTC).} \]

\[
\begin{align*}
\text{PTS: 4} & \quad \text{REF: 061035ge} & \quad \text{STA: G.G.27} & \quad \text{TOP: Quadrilateral Proofs} \\
376 \text{ ANS: 4} & \quad \text{sum of interior } \angle s = \text{ sum of exterior } \angle s \\
& = (n-2)180 = n \left( 180 - \frac{(n-2)180}{n} \right) \\
& = 180n - 360 = 180n - 180n + 360 \\
& = 180n = 720 \\
& \therefore n = 4
\end{align*}
\]

\[
\begin{align*}
\text{PTS: 2} & \quad \text{REF: 081016ge} & \quad \text{STA: G.G.36} & \quad \text{TOP: Interior and Exterior Angles of Polygons} \\
377 \text{ ANS: 4} & \quad \text{ } \\
\end{align*}
\]

\[
\begin{align*}
y + x &= 4 \quad x^2 - 6x + 10 = -x + 4 \quad y + x = 4 \quad y + 2 = 4 \\
y &= -x + 4 \quad x^2 - 5x + 6 = 0 \quad y + 3 = 4 \quad y = 2 \\
y &= 1 \quad (x - 3)(x - 2) = 0 \quad y = 1 \\
x &= 3 \text{ or } 2
\end{align*}
\]

\[
\begin{align*}
\text{PTS: 2} & \quad \text{REF: 080912ge} & \quad \text{STA: G.G.70} & \quad \text{TOP: Quadratic-Linear Systems} \\
378 \text{ ANS: } \\
& \text{Because } \overline{AB} \parallel \overline{DC}, \overline{AD} \cong \overline{BC} \text{ since parallel chords intersect congruent arcs. } \angle BDC \cong \angle ACD \text{ because inscribed angles that intersect congruent arcs are congruent. } \overline{AD} \cong \overline{BC} \text{ since congruent chords intersect congruent arcs, } \angle DAC \cong \angle DBC \text{ because inscribed angles that intersect the same arc are congruent. Therefore, } \triangle ACD \cong \triangle BDC \text{ because of AAS.}
\end{align*}
\]

\[
\begin{align*}
\text{PTS: 6} & \quad \text{REF: fall0838ge} & \quad \text{STA: G.G.27} & \quad \text{TOP: Circle Proofs}
\end{align*}
\]
Geometry Regents at Random

Answer Section

379 ANS: 1

\[
\frac{40 - 24}{2} = 8. \sqrt{10^2 - 8^2} = 6.
\]

PTS: 2 REF: 061204ge STA: G.G.40 TOP: Trapezoids

380 ANS:

\(\angle B\) and \(\angle C\) are right angles because perpendicular lines form right angles. \(\angle B \cong \angle C\) because all right angles are congruent. \(\triangle AEB \cong \triangle DEC\) because vertical angles are congruent. \(\triangle ABE \cong \triangle DCE\) because of ASA. \(AB \cong DC\) because CPCTC.


381 ANS:

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

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

382 ANS:

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

PTS: 4 REF: 081136ge STA: G.G.58 TOP: Compositions of Transformations
\[
\frac{x + 2}{x} = \frac{x + 6}{4}
\]
\[x^2 + 6x = 4x + 8\]
\[x^2 + 2x - 8 = 0\]
\[(x + 4)(x - 2) = 0\]
\[x = 2\]

\[\text{PTS: 4} \quad \text{REF: 081137ge} \quad \text{STA: G.G.45} \quad \text{TOP: Similarity}\]

\[\text{KEY: basic}\]

Opposite sides of a parallelogram are congruent and the diagonals of a parallelogram bisect each other.

\[\text{PTS: 2} \quad \text{REF: 061222ge} \quad \text{STA: G.G.28} \quad \text{TOP: Triangle Congruency}\]

The slope of \(x + 2y = 4\) is \(m = \frac{-A}{B} = \frac{-1}{2}\). The slope of \(4y - 2x = 12\) is \(m = \frac{-A}{B} = \frac{2}{4} = \frac{1}{2}\). Since the slopes are neither equal nor opposite reciprocals, the lines are neither parallel nor perpendicular.

\[\text{PTS: 2} \quad \text{REF: 061231ge} \quad \text{STA: G.G.63} \quad \text{TOP: Parallel and Perpendicular Lines}\]

\[\text{KEY: basic}\]

\[\text{ANS: 4} \quad \text{PTS: 2} \quad \text{REF: 061215ge} \quad \text{STA: G.G.64} \quad \text{TOP: Parallel and Perpendicular Lines}\]

\[\text{TOP: Planes}\]
390 ANS:

\[ y = mx + b \]
\[-1 = 2(2) + b \]
\[-5 = b \]

391 ANS: 3

\[ y = mx + b \]
\[-1 = 2(2) + b \]
\[-5 = b \]

392 ANS: 4

PTS: 2

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

TOP: Interior and Exterior Angles of Triangles

393 ANS:

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.

394 ANS:

\[ L = 2\pi rh = 2\pi \cdot 12 \cdot 22 \approx 1659. \quad \frac{1659}{600} \approx 2.8. \quad 3 \text{ cans are needed.} \]

395 ANS: 3

PTS: 2

REF: 061233ge STA: G.G.14 TOP: Volume and Lateral Area

KEY: Centroid, Orthocenter, Incenter and Circumcenter
396 \text{ ANS: } 4 \\
y = mx + b \\
3 = \frac{3}{2}(-2) + b \\
3 = -3 + b \\
6 = b \\
\text{PTS: } 2 \quad \text{REF: } 011114ge \quad \text{STA: } G.G.65 \quad \text{TOP: Parallel and Perpendicular Lines}

397 \text{ ANS: } 1 \quad \text{PTS: } 2 \quad \text{REF: } 061104ge \quad \text{STA: } G.G.43 \\
\text{TOP: Centroid}

398 \text{ 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. \\
\begin{align*}
y - 2 &= \frac{-4}{3}(x + 5) \\
3y - 6 &= -4x - 20 \\
4x + 3y &= -14
\end{align*}

\text{PTS: } 2 \quad \text{REF: } 061123ge \quad \text{STA: } G.G.65 \quad \text{TOP: Parallel and Perpendicular Lines}

399 \text{ ANS: } 2 \\
m = \frac{-A}{B} = \frac{-4}{2} = -2 \quad y = mx + b \\
2 = -2(2) + b \\
6 = b \\
\text{PTS: } 2 \quad \text{REF: } 081112ge \quad \text{STA: } G.G.65 \quad \text{TOP: Parallel and Perpendicular Lines}

400 \text{ ANS: } 1 \quad \text{PTS: } 2 \quad \text{REF: } 011220ge \quad \text{STA: } G.G.72 \\
\text{TOP: Equations of Circles}

401 \text{ ANS: } 4 \quad \text{PTS: } 2 \quad \text{REF: } 081106ge \quad \text{STA: } G.G.17 \\
\text{TOP: Constructions}

402 \text{ ANS: } 3 \\
x + 2x + 15 = 5x + 15 \\
2(5) + 15 = 25 \\
3x + 15 = 5x + 5 \\
10 = 2x \\
5 = x \\
\text{PTS: } 2 \quad \text{REF: } 011127ge \quad \text{STA: } G.G.32 \quad \text{TOP: Exterior Angle Theorem}

403 \text{ ANS: } 3 \quad \text{PTS: } 2 \quad \text{REF: } 061224ge \quad \text{STA: } G.G.45 \\
\text{TOP: Similarity} \quad \text{KEY: basic}
404 ANS:

![Diagram]

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

405 ANS: 3  PTS: 2  REF: 061210ge  STA: G.G.71
TOP: Equations of Circles

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

407 ANS:

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

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

408 ANS: 2  PTS: 2  REF: 011109ge  STA: G.G.9
TOP: Planes

409 ANS: 1  PTS: 2  REF: 011221ge  STA: G.G.10
TOP: Solids

410 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

411 ANS: 2  PTS: 2  REF: 011211ge  STA: G.G.55
TOP: Properties of Transformations

412 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
413 ANS:

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

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

414 ANS:

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

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

415 ANS: 2  PTS: 2  REF: 061107ge  STA: G.G.32

TOP: Exterior Angle Theorem

416 ANS: 3

\[ 4x + 14 + 8x + 10 = 180 \]
\[ 12x = 156 \]
\[ x = 13 \]

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

417 ANS: 1

PTS: 2  REF: 081219ge  STA: G.G.34  TOP: Angle Side Relationship

418 ANS: 3  PTS: 2  REF: 011105ge  STA: G.G.10

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

**419 ANS:**

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

**PTS:** 2  **REF:** 081134ge  **STA:** G.G.21  
**TOP:** Centroid, Orthocenter, Incenter and Circumcenter

**420 ANS:** 1

\[7x + 4 = 2(2x + 5) \quad PM = 2(2) + 5 = 9\]

\[7x + 4 = 4x + 10\]

\[3x = 6\]

\[x = 2\]

**PTS:** 2  **REF:** 011226ge  **STA:** G.G.43  **TOP:** Centroid

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

\[5 \frac{x}{7} = \frac{10}{x}\]

\[5x = 70\]

\[x = 14\]

**PTS:** 2  **REF:** 081103ge  **STA:** G.G.46  **TOP:** Side Splitter Theorem

**423 ANS:** 3  **PTS:** 2  **REF:** 081209ge  **STA:** G.G.71  
**TOP:** Equations of Circles

**424 ANS:** 1  **PTS:** 2  **REF:** 011102ge  **STA:** G.G.55  
**TOP:** Properties of Transformations

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

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

**426 ANS:**  
\[\angle A\text{CB} \equiv \angle A\text{ED} \text{ is given. } \angle A \equiv \angle A \text{ because of the reflexive property. Therefore } \triangle ABC \sim \triangle ADE \text{ because of AA.}\]

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

**427 ANS:** 4  **PTS:** 2  **REF:** 011121ge  **STA:** G.G.71  
**TOP:** Equations of Circles
3x + 5 + 4x - 15 + 2x + 10 = 180. \( m\angle D = 3(20) + 5 = 65. \ m\angle E = 4(20) - 15 = 65. \)

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

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

429 ANS: 2  PTS: 2  REF: 011215ge  STA: G.G.12  TOP: Volume

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

431 ANS:
Yes. A reflection is an isometry.


432 ANS: 4
\[ \sqrt{25^2 - 7^2} = 24 \]

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

433 ANS:

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

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

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

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

436 ANS: 4 PTS: 2 REF: 081224ge STA: G.G.21

TOP: Centroid, Orthocenter, Incenter and Circumcenter

437 ANS:
The medians of a triangle are not concurrent. False.

PTS: 2 REF: 061129ge STA: G.G.24 TOP: Negations

438 ANS: 2 PTS: 2 REF: 011206ge STA: G.G.32

TOP: Exterior Angle Theorem

439 ANS:

30. \[ 3x + 4x + 5x = 360. \ \text{mLN: mNK: mKL = 90:120:150.} \ \frac{150 - 90}{2} = 30 \]

\[ x = 20 \]

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

KEY: outside circle

440 ANS: 3

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

PTS: 2 REF: 011223ge STA: G.G.36 TOP: Interior and Exterior Angles of Polygons

441 ANS: 3

\[ x^2 + 7^2 = (x + 1)^2 \quad x + 1 = 25 \]

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

\[ 48 = 2x \]

\[ 24 = x \]

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

442 ANS: 3 PTS: 2 REF: 081128ge STA: G.G.39

TOP: Special Parallelograms

443 ANS:

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

444 ANS: 4 PTS: 2 REF: 011222ge STA: G.G.34
TOP: Angle Side Relationship

445 ANS: 4
\[ x^2 - 6x + 2x - 3 = 9x + 27 \]
\[ x^2 - 4x - 3 = 9x + 27 \]
\[ x^2 - 13x - 30 = 0 \]
\[ (x - 15)(x + 2) = 0 \]
\[ x = 15, -2 \]

PTS: 2 REF: 061225ge STA: G.G.32 TOP: Exterior Angle Theorem
446 ANS: 4 PTS: 2 REF: 081216ge STA: G.G.45
TOP: Similarity KEY: basic

447 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

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

449 ANS: 2
\[ \sqrt{17^2 - 15^2} = 8, \quad 17 - 8 = 9 \]

PTS: 2 REF: 061221ge STA: G.G.49 TOP: Chords

450 ANS: 4 PTS: 2 REF: 011124ge STA: G.G.51
TOP: Arcs Determined by Angles KEY: inscribed
451 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 and Lateral Area

452 ANS: 3

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

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

KEY: basic

453 ANS: 4

Parallel lines intercept congruent arcs.

PTS: 2 REF: 081201ge STA: G.G.52 TOP: Chords

454 ANS: 2

\[ d = \sqrt{(-1 - 7)^2 + (9 - 4)^2} = \sqrt{64 + 25} = \sqrt{89} \]

PTS: 2 REF: 061109ge STA: G.G.67 TOP: Distance

KEY: general

455 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

456 ANS: 4

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

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

457 ANS: 4

The slope of \(3x + 5y = 4\) is \(m = \frac{-A}{B} = \frac{-3}{5}\). \(m_\perp = \frac{5}{3}\).


458 ANS:

\[ (x - 5)^2 + (y + 4)^2 = 36 \]

PTS: 2 REF: 081132ge STA: G.G.72 TOP: Equations of Circles
\[ \angle B \text{ and } \angle E \text{ are right angles because of the definition of perpendicular lines. } \angle B \cong \angle E \text{ because all right angles are congruent. } \angle BFD \text{ and } \angle DFE \text{ are supplementary and } \angle ECA \text{ and } \angle ACB \text{ are supplementary because of the definition of supplementary angles. } \angle DFE \cong \angle ACB \text{ because angles supplementary to congruent angles are congruent. } \triangle ABC \sim \triangle DEF \text{ because of AA.} \]

\[
6^2 = x(x + 5) \\
36 = x^2 + 5x \\
0 = x^2 + 5x - 36 \\
0 = (x + 9)(x - 4) \\
x = 4
\]

\[
1 = \frac{-4 + x}{2}, \quad 5 = \frac{3 + y}{2}. \\
-4 + x = 2, \quad 3 + y = 10 \\
x = 6, \quad y = 7
\]

\[
m_{AB} = \left( \frac{-6 + 2}{2}, \frac{-2 + 8}{2} \right) = D(2, 3) \quad m_{BC} = \left( \frac{2 + 6}{2}, \frac{8 + 2}{2} \right) = E(4, 3) \quad F(0, -2). \text{ To prove that } ADEF \text{ is a parallelogram, show that both pairs of opposite sides of the parallelogram are parallel by showing the opposite sides have the same slope: } m_{AD} = \frac{3 - (-2)}{2 - (-6)} = \frac{5}{4} \quad \overline{AF} \parallel \overline{DE} \text{ because all horizontal lines have the same slope. } ADEF \text{ is not a rhombus because not all sides are congruent. } \overline{AD} = \sqrt{5^2 + 4^2} = \sqrt{41} \quad AF = 6
\]

\[
\text{PTS: } 4 \quad \text{REF: } 011136\text{ge} \quad \text{STA: } G.G.44 \quad \text{TOP: Similarity Proofs} \\
\text{ANS: } 4
\]

\[
\text{PTS: } 2 \quad \text{REF: } 011123\text{ge} \quad \text{STA: } G.G.47 \quad \text{TOP: Similarity} \\
\text{KEY: } \text{leg} \\
\text{ANS: } 4 \quad \text{PTS: } 2 \quad \text{REF: } 061103\text{ge} \quad \text{STA: } G.G.60 \\
\text{TOP: Identifying Transformations}
\]

\[
\text{ANS: } 1 \\
1 = \frac{-4 + x}{2}, \quad 5 = \frac{3 + y}{2}. \\
-4 + x = 2, \quad 3 + y = 10 \\
x = 6, \quad y = 7
\]

\[
\text{PTS: } 2 \quad \text{REF: } 081115\text{ge} \quad \text{STA: } G.G.66 \quad \text{TOP: Midpoint} \\
\text{ANS: } 2
\]

\[
\text{PTS: } 6 \quad \text{REF: } 081138\text{ge} \quad \text{STA: } G.G.69 \quad \text{TOP: Quadrilaterals in the Coordinate Plane} \\
\text{ANS: } 2 \quad \text{PTS: } 2 \quad \text{REF: } 081117\text{ge} \quad \text{STA: } G.G.23 \\
\text{TOP: Locus}
\]
465 ANS: 

\[ \begin{align*} 
\text{D} & \quad \text{E} \\
\angle D & = 60 \degree \\
\angle E & = 30 \degree \\
\angle F & = 20 \degree \\
\angle C & = 30 \degree \\
\angle A & = 6 \times 6 = 36 \\
\angle B & = 6 \times 3 = 18 \\
\angle C & = 6 \times 3 = 18 \\
\end{align*} \]

PTS: 2 REF: 011129ge STA: G.G.31 TOP: Isosceles Triangle Theorem

466 ANS: 4

\[ x \cdot 4x = 6^2. \quad PQ = 4x + x = 5x = 5(3) = 15 \]
\[ 4x^2 = 36 \]
\[ x = 3 \]

PTS: 2 REF: 011227ge STA: G.G.47 TOP: Similarity

KEY: leg

467 ANS: 2 PTS: 2 REF: 081214ge STA: G.G.50 TOP: Tangents KEY: point of tangency

468 ANS: 3 PTS: 2 REF: 081204ge STA: G.G.59 TOP: Properties of Transformations

469 ANS: 

\[ \begin{align*} 
\text{A} & \quad \text{B} \\
\angle A & = \angle B \\
\angle C & = \angle D \\
\angle E & = \angle F \\
\end{align*} \]

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

KEY: grids

470 ANS: 1

\[ \begin{align*} 
AB & = CD \\
AB + BC & = CD + BC \\
AC & = BD \\
\end{align*} \]

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

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

TOP: Planes

472 ANS:

\[ 2x - 20 = x + 20. \quad m\overline{AB} = x + 20 = 40 + 20 = 60 \]
\[ x = 40 \]

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


473 ANS: 2  PTS: 2  REF: 061115ge  STA: G.G.69
TOP: Triangles in the Coordinate Plane

474 ANS: 2

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

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

475 ANS: 2  PTS: 2  REF: 081205ge  STA: G.G.17
TOP: Constructions

476 ANS: 4  PTS: 2  REF: 061213ge  STA: G.G.5
TOP: Planes

477 ANS: 2

\[ \frac{50 + x}{2} = 34 \]
\[ 50 + x = 68 \]
\[ x = 18 \]

PTS: 2  REF: 011214ge  STA: G.G.51  TOP: Arcs Determined by Angles
KEY: inside circle

478 ANS: 3  PTS: 2  REF: 061111ge  STA: G.G.38
TOP: Parallelograms

479 ANS:

9.1. \((11)(8)h = 800\)
\[ h = 9.1 \]

PTS: 2  REF: 061131ge  STA: G.G.12  TOP: Volume

480 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

481 ANS:

32. \[ \frac{16}{20} = \frac{x - 3}{x + 5}. \quad AC = x - 3 = 35 - 3 = 32 \]
\[ 16x + 80 = 20x - 60 \]
\[ 140 = 4x \]
\[ 35 = x \]

PTS: 4  REF: 011137ge  STA: G.G.46  TOP: Side Splitter Theorem
482 ANS: 4
\( m \angle A = 80 \)

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

483 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

484 ANS: 4
\[
\begin{align*}
x + 6y &= 12 \\
3(x - 2) &= -y - 4 \\
6y &= -x + 12 \\
-3(x - 2) &= y + 4 \\
y &= -\frac{1}{6}x + 2 \\
m &= -3 \\
m &= -\frac{1}{6}
\end{align*}
\]

PTS: 2 
REF: 011119ge 
STA: G.G.63 
TOP: Parallel and Perpendicular Lines

485 ANS: 2
\[
\begin{align*}
x + 3(\frac{3 + 5x - 9}{2}) &= 2x + 2 \\
6x - 6 &= 4x + 4 \\
2x &= 10 \\
x &= 5
\end{align*}
\]

TOP: Equations of Circles

486 ANS: 2
\[
\begin{align*}
x + 6y &= 12 \\
3(x - 2) &= -y - 4 \\
6y &= -x + 12 \\
-3(x - 2) &= y + 4 \\
y &= -\frac{1}{6}x + 2 \\
m &= -3 \\
m &= -\frac{1}{6}
\end{align*}
\]

PTS: 2 
REF: 011119ge 
STA: G.G.63 
TOP: Parallel and Perpendicular Lines

487 ANS: 2
\[
\begin{align*}
x + 3(\frac{3 + 5x - 9}{2}) &= 2x + 2 \\
6x - 6 &= 4x + 4 \\
2x &= 10 \\
x &= 5
\end{align*}
\]

TOP: Trapezoids

488 ANS: 2
\[
\begin{align*}
x + 6y &= 12 \\
3(x - 2) &= -y - 4 \\
6y &= -x + 12 \\
-3(x - 2) &= y + 4 \\
y &= -\frac{1}{6}x + 2 \\
m &= -3 \\
m &= -\frac{1}{6}
\end{align*}
\]

TOP: Constructions

489 ANS: 2
\[
\begin{align*}
V &= \pi r^2 h = \pi \cdot 6^2 \cdot 15 = 540\pi
\end{align*}
\]

PTS: 2 
REF: 011117ge 
STA: G.G.14 
TOP: Volume and Lateral Area

490 ANS: 1
PTS: 2 
REF: 011128ge 
STA: G.G.2 
TOP: Planes

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

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

PTS: 4  
REF: 011237ge  
STA: G.G.42  
TOP: Midsegments

ANS:
\[
\frac{180 - 80}{2} = 50
\]

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

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

ANS: 2  
PTS: 2  
REF: 081120ge  
STA: G.G.8  
TOP: Planes

ANS: 1

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

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

KEY: general
The diagonals of a parallelogram intersect at their midpoints. \( M_{AC} \left( \frac{1+3}{2}, \frac{5+(-1)}{2} \right) = (2, 2) \)
517 ANS: 1 PTS: 2 REF: 081116ge STA: G.G.7 TOP: Planes

518 ANS: 4
\[
\frac{5}{2+3+5} \times 180 = 90
\]

519 ANS: 3

PTS: 2 REF: 081119ge STA: G.G.30 TOP: Interior and Exterior Angles of Triangles

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

521 ANS:

PTS: 2 REF: 081228ge STA: G.G.64 TOP: Parallel and Perpendicular Lines

522 ANS:

PTS: 2 REF: 011230ge STA: G.G.22 TOP: Locus
No, $\angle KGH$ is not congruent to $\angle GKH$.

**524**

No, $\angle KGH$ is not congruent to $\angle GKH$.

PTS: 2  
REF: 081135ge  
STA: G.G.31  
TOP: Isosceles Triangle Theorem

**525**

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

PTS: 2  
REF: 011204ge  
STA: G.G.39  
TOP: Special Parallelograms

**526**

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

PTS: 2  
REF: 081236ge  
STA: G.G.58  
TOP: Compositions of Transformations

**527**

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

PTS: 4  
REF: 061138ge  
STA: G.G.27  
TOP: Circle Proofs

**528**

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

PTS: 6  
REF: 061138ge  
STA: G.G.27  
TOP: Circle Proofs

**529**

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

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

**530**

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

PTS: 2  
REF: 061121ge  
STA: G.G.22  
TOP: Locus
531 ANS: 3  PTS: 2  REF: 011104ge  STA: G.G.38
TOP: Parallelograms
532 ANS: 2
\[(n - 2)180 = (6 - 2)180 = 720. \frac{720}{6} = 120.\]

PTS: 2  REF: 081125ge  STA: G.G.37  TOP: Interior and Exterior Angles of Polygons
533 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
534 ANS: 1  PTS: 2  REF: 061214ge  STA: G.G.21
TOP: Centroid, Orthocenter, Incenter and Circumcenter
535 ANS:
\[52, 40, 80. 360 - (56 + 112) = 192. \frac{192 - 112}{2} = 40. \frac{112 + 48}{2} = 80\]
\[\frac{1}{4} \times 192 = 48\]
\[\frac{56 + 48}{2} = 52\]

PTS: 6  REF: 081238ge  STA: G.G.51  TOP: Arcs Determined by Angles
KEY: mixed
536 ANS:
\[\sqrt{(-4 - 2)^2 + (3 - 5)^2} = \sqrt{36 + 4} = \sqrt{40} = \sqrt{4 \times 10} = 2\sqrt{10}.\]

PTS: 2  REF: 081232ge  STA: G.G.67  TOP: Distance
537 ANS: 1

PTS: 2  REF: 061211ge  STA: G.G.31  TOP: Isosceles Triangle Theorem
538 ANS: 4  PTS: 2  REF: 061118ge  STA: G.G.1
TOP: Planes
539 ANS: 1  PTS: 2  REF: 011122ge  STA: G.G.28
TOP: Triangle Congruency
540 ANS: 4 PTS: 2  REF: 061114ge  STA: G.G.73
TOP: Equations of Circles

541 ANS: 3  PTS: 2  REF: 081111ge  STA: G.G.32
TOP: Exterior Angle Theorem

542 ANS:
$R'(−3,−2), S'(−4,4), \text{and } T'(2,2)$.

543 ANS: 2  REF: 011232ge  STA: G.G.54  TOP: Rotations
TOP: Identifying Transformations

544 ANS: 1
\[
m = \frac{3}{2} \quad y = mx + b
\]
\[
2 = \frac{3}{2} (1) + b
\]
\[
\frac{1}{2} = b
\]

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

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

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

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

549 ANS: 2  PTS: 2  REF: 081202ge  STA: G.G.55
TOP: Properties of Transformations

550 ANS:
\[
V = \frac{4}{3} \pi \cdot 9^3 = 972\pi
\]

551 ANS: 4
$AB$ is a vertical line, so its perpendicular bisector is a horizontal line through the midpoint of $AB$, which is $(0,3)$.

PTS: 2  REF: 011225ge  STA: G.G.68  TOP: Perpendicular Bisector
\[
\frac{4x + 10}{2} = 2x + 5
\]

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

555 ANS: 2

PTS: 2  
REF: 081226ge  
STA: G.G.69  
TOP: Triangles in the Coordinate Plane

554 ANS: 4

PTS: 2  
REF: 061124ge  
STA: G.G.31  
TOP: Isosceles Triangle Theorem

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

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

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

\[\overline{RT} = 6 + 4 = 10. \quad \overline{y} \cdot \overline{y} = 18 \times 8\]

\[x = 4\]

PTS: 4  
REF: 061237ge  
STA: G.G.53  
TOP: Segments Intercepted by Circle

KEY: tangent and secant

556 ANS: 2

PTS: 2  
REF: 081108ge  
STA: G.G.54  
TOP: Reflections

KEY: basic

557 ANS: 3

PTS: 2  
REF: 081218ge  
STA: G.G.1  
TOP: Planes

558 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
559 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

560 ANS:

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


561 ANS: 2
\[3x + x + 20 + x + 20 = 180\]
\[5x = 40\]
\[x = 28\]

PTS: 2 REF: 081222ge STA: G.G.31 TOP: Isosceles Triangle Theorem

562 ANS: 3 PTS: 2 REF: 081227ge STA: G.G.42 TOP: Midsegments

563 ANS: 2
\[V = \frac{4}{3} \pi r^3 = \frac{4}{3} \pi \cdot 3^3 = 36\pi\]

PTS: 2 REF: 061112ge STA: G.G.16 TOP: Volume and Surface Area

564 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

565 ANS:
\[(5 - 2)180 = 540. \quad \frac{540}{5} = 108 \text{ interior. } 180 - 108 = 72 \text{ exterior}\]

PTS: 2 REF: 011131ge STA: G.G.37 TOP: Interior and Exterior Angles of Polygons
566 ANS:  

![Diagram of Constructions](image1)

PTS: 2  REF: 081233ge  STA: G.G.19  TOP: Constructions

567 ANS:  

![Diagram of Constructions](image2)

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

568 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

569 ANS: 4  

PTS: 2  REF: 011216ge  STA: G.G.29  TOP: Triangle Congruency

570 ANS: 4  

\[ d = \sqrt{(-5 - 3)^2 + (4 - (-6))^2} = \sqrt{64 + 100} = \sqrt{164} = 2\sqrt{41} \]

PTS: 2  REF: 011121ge  STA: G.G.67  TOP: Distance

571 ANS: 2  

7x = 5x + 30
2x = 30
x = 15

PTS: 2  REF: 061106ge  STA: G.G.35  TOP: Parallel Lines and Transversals

572 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

573 ANS: 3  

\[ \sqrt{5^2 + 12^2} = 13 \]

PTS: 2  REF: 061116ge  STA: G.G.39  TOP: Special Parallelograms
\[ m = \frac{-A}{B} = \frac{-3}{2} \]
\[ y = mx + b \]
\[-1 = \left(\frac{-3}{2}\right)(2) + b \]
\[-1 = -3 + b \]
\[2 = b \]

PTS: 2  REF: 061226ge  STA: G.G.65  TOP: Parallel and Perpendicular Lines

\[
\begin{align*}
\text{ANS: } & 4 \\
\end{align*}
\]

\[
\begin{align*}
m &= \frac{-A}{B} \quad \text{where } m = -\frac{3}{2} \\
y &= mx + b \\
-1 &= \left(-\frac{3}{2}\right)(2) + b \\
-1 &= -3 + b \\
2 &= b \\
\end{align*}
\]

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

\[
\begin{align*}
\text{ANS: } & 1 \\
\end{align*}
\]

\[
\begin{align*}
d &= \sqrt{(4 - 1)^2 + (7 - 11)^2} = \sqrt{9 + 16} = \sqrt{25} = 5 \\
\end{align*}
\]

PTS: 2  REF: 011205ge  STA: G.G.67  TOP: Distance

KEY: general

\[
\begin{align*}
\text{ANS: } & 3 \\
\text{PTS: } & 2 \\
\text{REF: } & 081208ge  \\
\text{STA: } & G.G.27  \\
\text{TOP: } & \text{Quadrilateral Proofs} \\
\end{align*}
\]

\[
\begin{align*}
\text{ANS: } & 2 \\
\text{PTS: } & 2 \\
\text{REF: } & 061208ge  \\
\text{STA: } & G.G.19  \\
\text{TOP: } & \text{Constructions} \\
\end{align*}
\]

\[
\begin{align*}
\text{ANS: } & 3 \\
\text{PTS: } & 2 \\
\text{REF: } & 011209ge  \\
\text{STA: } & G.G.44  \\
\text{TOP: } & \text{Similarity Proofs} \\
\end{align*}
\]

\[
\begin{align*}
\text{ANS: } & 1 \\
\text{PTS: } & 2 \\
\text{REF: } & 011112ge  \\
\text{STA: } & G.G.39  \\
\text{TOP: } & \text{Special Parallelograms} \\
\end{align*}
\]

\[
\begin{align*}
\frac{7x}{4} &= \frac{7}{x} \\
7(2) &= 14 \\
7x^2 &= 28 \\
x &= 2 \\
\end{align*}
\]

PTS: 2  REF: 061120ge  STA: G.G.45  TOP: Similarity

KEY: basic

\[
\begin{align*}
\text{ANS: } & 1 \\
\text{PTS: } & 2 \\
\text{REF: } & 061125ge  \\
\text{STA: } & G.G.39  \\
\text{TOP: } & \text{Special Parallelograms} \\
\end{align*}
\]
583 ANS:

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

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

584 ANS: 3

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

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

585 ANS:

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

586 ANS:

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

587 ANS: 3  
PTS: 2  
REF: 061218ge  
STA: G.G.36  
TOP: Interior and Exterior Angles of Polygons
588 ANS: 2 PTS: 2 REF: 011203ge STA: G.G.73
TOP: Equations of Circles

589 ANS: 3
7x = 5x + 30
2x = 30
x = 15

PTS: 2 REF: 081109ge STA: G.G.35 TOP: Parallel Lines and Transversals

590 ANS:
The slope of y = 2x + 3 is 2. The slope of 2y + x = 6 is \(-\frac{A}{B} = \frac{-1}{2}\). Since the slopes are opposite reciprocals, the lines are perpendicular.

PTS: 2 REF: 011231ge STA: G.G.63 TOP: Parallel and Perpendicular Lines

591 ANS: 4 PTS: 2 REF: 011208ge STA: G.G.53
TOP: Segments Intercepted by Circle KEY: two tangents

592 ANS: 2 PTS: 2 REF: 061202ge STA: G.G.24
TOP: Negations

593 ANS:

594 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

595 ANS: 1 PTS: 2 REF: 011207ge STA: G.G.20
TOP: Constructions

596 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
As originally administered, this question read, “Which fact is not sufficient to show that planes \( R \) and \( S \) are perpendicular?” The State Education Department stated that since a correct solution was not provided for Question 11, all students shall be awarded credit for this question.

\[ AC = BD \]
\[ AC - BC = BD - BC \]
\[ AB = CD \]

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

\[ PTS: 2 \quad REF: 061206ge \quad STA: G.G.27 \quad TOP: \text{Line Proofs} \]

\[ ANS: 3 \]

\[ PTS: 2 \quad REF: 011107ge \quad STA: G.G.54 \quad TOP: \text{Translations} \]

\[ ANS: 4 \]

\[ PTS: 2 \quad REF: 011108ge \quad STA: G.G.27 \quad TOP: \text{Angle Proofs} \]

\[ PTS: 4 \quad REF: 061135ge \quad STA: G.G.23 \quad TOP: \text{Locus} \]
\[ \frac{8}{2} = \frac{12}{x}. \]

\[ 8x = 24 \]

\[ x = 3 \]

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

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

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

PTS: 2  REF: 060932ge  STA: G.G.22  TOP: Locus