JMAP
REGENTS BY PERFORMANCE INDICATOR: TOPIC

NY Geometry Regents Exam Questions from Fall 2008 to January 2014 Sorted by PI: Topic

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LINEAR EQUATIONS
G.G.62: PARALLEL AND PERPENDICULAR LINES

1. What is the slope of a line perpendicular to the line whose equation is $5x + 3y = 8$?
   1. $\frac{3}{5}$
   2. $\frac{5}{3}$
   3. $\frac{3}{5}$
   4. $\frac{5}{3}$

2. 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. $\frac{3}{2}$

3. 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. $-\frac{4}{3}$

4. 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. $-3$

5. 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. $-6$

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

7. 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. $\frac{5}{3}$

8. 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. $\frac{1}{2}$
9 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. $\frac{1}{10}$

10 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. $3x + y = 0$

11 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. $\frac{1}{2}$

G.G.63: PARALLEL AND PERPENDICULAR LINES

12 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

13 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. $3y = -2x + 12$

14 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. $y - 2x = 3$

15 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. $2y + 10x = 8$

16 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. $12$

17 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

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

$x + 6y = 12$

$3(x - 2) = -y - 4$

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

2
19 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

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

21 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.

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

23 Points \( A(5,3) \) and \( B(7,6) \) lie on \( AB \). Points \( C(6,4) \) and \( D(9,0) \) lie on \( CD \). Which statement is true?
1 \( AB \parallel CD \)
2 \( AB \perp CD \)
3 \( AB \) and \( CD \) are the same line.
4 \( AB \) and \( CD \) intersect, but are not perpendicular.

24 A student wrote the following equations:
\[
\begin{align*}
3y + 6 &= 2x \\
2y - 3x &= 6
\end{align*}
\]
The lines represented by these equations are
1 parallel
2 the same line
3 perpendicular
4 intersecting, but not perpendicular

25 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.

G.G.64: PARALLEL AND PERPENDICULAR LINES

26 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 \( y = -2x - 9 \)

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

28 Find an equation of the line passing through the point \((6,5)\) and perpendicular to the line whose equation is \( 2y + 3x = 6 \).
29. 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. \( y = \frac{5}{3}x + 1 \)

30. 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. \( y = -\frac{1}{3}x + 3 \)

31. 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. \( y = -2x - 5 \)

32. 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. \( y = -\frac{3}{2}x + 8 \)

G.G.65: PARALLEL AND PERPENDICULAR LINES

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

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

35. Write an equation of the line that passes through the point (6, −5) and is parallel to the line whose equation is \( 2x - 3y = 11 \).
36. 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. $y = -2x + 17$

37. 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. $y = \frac{3}{2}x + 6$

38. 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. $3x + 4y = 14$

39. 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. $y = \frac{1}{2}x + 1$

40. What is the equation of a line passing through $(2, -1)$ and parallel to the line represented by the equation $y = 2x + 1$?

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

41. 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. $y = \frac{-3}{2}x + 2$

42. 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. $y = \frac{-2}{3}x + \frac{8}{3}$
43 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. \(y = \frac{3}{2}x - 5\)

44 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. \(y = -5x - 28\)

45 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]

46 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. \(y = 2x - 12\)

47 The coordinates of the endpoints of \(AB\) are \(A(0, 0)\) and \(B(0, 6)\). The equation of the perpendicular bisector of \(AB\) is

1. \(x = 0\)
2. \(x = 3\)
3. \(y = 0\)
4. \(y = 3\)
48 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]

49 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. \( y = -\frac{1}{2}x + \frac{19}{2} \)

SYSTEMS
G.G.70: QUADRATIC-LINEAR SYSTEMS

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

\[
\begin{align*}
y &= -x + 2 \\
y &= x^2
\end{align*}
\]
51 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

52 Given the equations: 
\[ y = x^2 - 6x + 10 \]
\[ y + x = 4 \]
What is the solution to the given system of equations?
1 (2, 3)
2 (3, 2)
3 (2, 2) and (1, 3)
4 (2, 2) and (3, 1)

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

54 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

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

56 Solve the following system of equations graphically.
\[ 2x^2 - 4x = y + 1 \]
\[ x + y = 1 \]
57 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)

58 On the set of axes below, solve the system of equations graphically and state the coordinates of all points in the solution.
\[ y = (x - 2)^2 - 3 \]
\[ 2y + 16 = 4x \]

59 On the set of axes below, solve the following system of equations graphically and state the coordinates of all points in the solution.
\[ (x + 3)^2 + (y - 2)^2 = 25 \]
\[ 2y + 4 = -x \]

60 The equations \( x^2 + y^2 = 25 \) and \( y = 5 \) are graphed on a set of axes. What is the solution of this system?
1. (0, 0)
2. (5, 0)
3. (0, 5)
4. (5, 5)
61 Which graph could be used to find the solution to the following system of equations?

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

\[
x + y = 2
\]

62 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 \((6, 6)\)

63 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 \((-1, -1)\)

**TOOLS OF GEOMETRY**

G.G.66: MIDPOINT

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

1. \((-2, 3)\)
2. \(\left(-1, 1 \frac{1}{2}\right)\)
3. \((-1, 3)\)
4. \(\left(3, 4 \frac{1}{2}\right)\)
65 Square $LMNO$ is shown in the diagram below.

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

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

66 The endpoints of $\overline{CD}$ are $C(-2, -4)$ and $D(6, 2)$. What are the coordinates of the midpoint of $\overline{CD}$?

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

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

68 If a line segment has endpoints $A(3x + 5, 3y)$ and $B(x - 1, -y)$, what are the coordinates of the midpoint of $\overline{AB}$?

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

69 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. $(5, -2)$

70 In circle $O$, diameter $\overline{RS}$ 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.
71 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. $(-5,2)$

72 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. $(-7,-2)$

73 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. $(10,10)$

74 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. $(5.5, 3)$

75 The midpoint of $AB$ is $M(4,2)$. If the coordinates of $A$ are $(6, -4)$, what are the coordinates of $B$?
1. $(1, -3)$
2. $(2,8)$
3. $(5, -1)$
4. $(14,0)$

G.G.67: DISTANCE

76 The endpoints of $PQ$ are $P(-3,1)$ and $Q(4,25)$. Find the length of $PQ$.

77 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. $8$

78 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. $2\sqrt{5}$

79 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

80 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. $\sqrt{145}$


81 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. $2\sqrt{41}$

82 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. $\sqrt{233}$

83 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. $2\sqrt{26}$

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

85 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. $\sqrt{50}$

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

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

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

G.G.1: PLANES

89 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 $k_2$. 
90. 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 $k$.

91. In plane $P$, 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 $P$
2. parallel to plane $P$
3. perpendicular to plane $P$
4. skew to plane $P$

92. 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 $n$.

93. 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.

94. 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 $BAT$.

G.G.2: PLANES

95. 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

96. Point $P$ lies on line $m$. Point $P$ is also included in distinct planes $Q$, $R$, $S$, and $T$. At most, how many of these planes could be perpendicular to line $m$?
1. 1
2. 2
3. 3
4. 4
97. 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

98. 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

99. 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

100. 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

102. If $AB$ is contained in plane $P$, and $AB$ is perpendicular to plane $R$, which statement is true?
1. $AB$ is parallel to plane $R$.
2. Plane $P$ is parallel to plane $R$.
3. $AB$ is perpendicular to plane $P$.
4. Plane $P$ is perpendicular to plane $R$.

103. As shown in the diagram below, $FJ$ is contained in plane $R$, $BC$ and $DE$ are contained in plane $S$, and $FJ$, $BC$, and $DE$ intersect at $A$.

Which fact is sufficient to show that planes $R$ and $S$ are perpendicular?
1. $FA \perp DE$
2. $AD \perp AF$
3. $BC \perp FJ$
4. $DE \perp BC$
G.G.7: PLANES

104 In the diagram below, line $k$ is perpendicular to plane $P$ at point $T$.

[Diagram of a plane $P$ with line $k$ perpendicular to it at point $T$.]

Which statement is true?

1. Any point in plane $P$ also will be on line $k$.
2. Only one line in plane $P$ will intersect line $k$.
3. All planes that intersect plane $P$ will pass through $T$.
4. Any plane containing line $k$ is perpendicular to plane $P$.

G.G.8: PLANES

105 In the diagram below, $AB$ is perpendicular to plane $AEFG$.

[Diagram of a cube with lines $AB$ and $AEFG$ shown.]

Which plane must be perpendicular to plane $AEFG$?

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

106 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

107 Plane $A$ is parallel to plane $B$. Plane $C$ intersects plane $A$ in line $m$ and intersects plane $B$ in line $n$. Lines $m$ and $n$ are

1. intersecting
2. parallel
3. perpendicular
4. skew
G.G.9: PLANES

108 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 \( R \).

109 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\(^\circ\)

110 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 \( \mathcal{D} \).

111 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 \( c \).

112 As shown in the diagram below, \( \overrightarrow{EF} \) intersects planes \( \mathcal{P} \), \( \mathcal{Q} \), and \( \mathcal{R} \).

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

113 Plane \( \mathcal{A} \) and plane \( \mathcal{B} \) are two distinct planes that are both perpendicular to line \( \ell \). Which statement about planes \( \mathcal{A} \) and \( \mathcal{B} \) is true?
1 Planes \( \mathcal{A} \) and \( \mathcal{B} \) have a common edge, which forms a line.
2 Planes \( \mathcal{A} \) and \( \mathcal{B} \) are perpendicular to each other.
3 Planes \( \mathcal{A} \) and \( \mathcal{B} \) intersect each other at exactly one point.
4 Planes \( \mathcal{A} \) and \( \mathcal{B} \) are parallel to each other.

114 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
115 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 \( \ell \).

G.G.10: SOLIDS

116 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. \( DE \parallel BC \)

117 The diagram below shows a right pentagonal prism.

Which statement is always true?

1. \( BC \parallel ED \)
2. \( FG \parallel CD \)
3. \( FJ \parallel IH \)
4. \( GB \parallel HC \)

118 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 \( EF \)
119  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

120  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

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

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

G.G.13: SOLIDS

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

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

Which statement is not true?
1  \( EA \cong EC \)
2  \( EB \cong EF \)
3  \( \triangle AEB \cong \triangle BEC \)
4  \( \triangle CED \) is isosceles
G.G.17: CONSTRUCTIONS

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

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

126 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 $m\angle DBF = m\angle EBF$

127 Using a compass and straightedge, construct the angle bisector of $\angle ABC$ shown below. [Leave all construction marks.]
128 Based on the construction below, which statement must be true?

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

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

130 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. \( 2(m\angle ABC) = m\angle CBD \)

131 On the diagram below, use a compass and straightedge to construct the bisector of \( \angle XYZ \). [Leave all construction marks.]
132 Using a compass and straightedge, construct the bisector of \( \angle CBA \). [Leave all construction marks.]

133 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.

134 Using a compass and straightedge, construct the bisector of \( \angle MJH \). [Leave all construction marks.]

Which statement must be true?

1. \( \overrightarrow{AF} \) bisects side \( BC \)
2. \( \overrightarrow{AF} \) bisects \( \angle BAC \)
3. \( \overrightarrow{AF} \perp BC \)
4. \( \triangle ABG \sim \triangle ACG \)
135 Which diagram shows the construction of a \(45^\circ\) angle?

1  
2  
3  
4

G.G.18: CONSTRUCTIONS

136 The diagram below shows the construction of the perpendicular bisector of \(AB\).

![Diagram of perpendicular bisector]

Which statement is \textit{not} true?

1 \(AC = CB\)
2 \(CB = \frac{1}{2} AB\)
3 \(AC = 2AB\)
4 \(AC + CB = AB\)

137 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
138 Which diagram shows the construction of the perpendicular bisector of $AB$?

1. Diagram 1
2. Diagram 2
3. Diagram 3
4. Diagram 4

139 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

140 On the diagram of $\triangle ABC$ shown below, use a compass and straightedge to construct the perpendicular bisector of $AC$. [Leave all construction marks.]
141 Based on the construction below, which conclusion is not always true?

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

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

G.G.19: CONSTRUCTIONS

143 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. $PS \cong RQ$

144 Using a compass and straightedge, construct a line that passes through point $P$ and is perpendicular to line $m$. [Leave all construction marks.]
145 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.

146 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.
147 The diagram below shows the construction of $\overrightarrow{AB}$ through point $P$ parallel to $CD$.

Which theorem justifies this method of construction?

1. If two lines in a plane are perpendicular to a transversal at different points, then the lines are parallel.
2. If two lines in a plane are cut by a transversal to form congruent corresponding angles, then the lines are parallel.
3. If two lines in a plane are cut by a transversal to form congruent alternate interior angles, then the lines are parallel.
4. If two lines in a plane are cut by a transversal to form congruent alternate exterior angles, then the lines are parallel.

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

G.G.20: CONSTRUCTIONS

Using a compass and straightedge, and $\overline{AB}$ below, construct an equilateral triangle with all sides congruent to $\overline{AB}$. [Leave all construction marks.]
153 On the line segment below, use a compass and straightedge to construct equilateral triangle $ABC$. [Leave all construction marks.]

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

155 Which diagram represents a correct construction of equilateral $\triangle ABC$, given side $AB$?
156 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. $AB + BC > AC$

157 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 $ABCD$. 

1. $\angle A + \angle B + \angle C = 180$
2. $m\angle A = m\angle B = m\angle C$
3. $AB = AC = BC$
4. $AB + BC > AC$
The length of \( AB \) is 3 inches. On the diagram below, sketch the points that are equidistant from \( A \) and \( B \) and sketch the points that are 2 inches from \( A \). Label with an \( X \) all points that satisfy both conditions.

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

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.
161 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 $\times$ all points that satisfy both conditions.

![Diagram of cars A and B with distances 7 miles and 4 miles marked]

162 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.

![Diagram of fence, bird bath, and light pole]

How many locations are possible for the bird bath?

1 1
2 2
3 3
4 0

163 In the diagram below, point $M$ is located on $AB$. Sketch the locus of points that are 1 unit from $AB$ and the locus of points 2 units from point $M$. Label with an $\times$ all points that satisfy both conditions.

![Diagram of line AB and point M with loci marked]

164 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

165 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
166 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.

167 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.
G.G.23: LOCUS

168 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.

169 In a coordinate plane, how many points are both 5 units from the origin and 2 units from the \(x\)-axis?

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170 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 \(X\) all points that satisfy both conditions.

171 On the grid below, graph the points that are equidistant from both the \(x\) and \(y\) axes and the points that are 5 units from the origin. Label with an \(X\) all points that satisfy both conditions.
172 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.

173 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.

174 How many points are both 4 units from the origin and also 2 units from the line $y = 4$?

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175 On the set of axes below, graph the locus of points that are 4 units from the line $x = 3$ and the locus of points that are 5 units from the point $(0, 2)$. Label with an $X$ all points that satisfy both conditions.

176 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.
177 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.

178 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 X all points that satisfy both conditions.

179 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

180 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
ANGLES
G.G.35: PARALLEL LINES & TRANSVERSALS

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

1. \(a \parallel b\)
2. \(a \parallel c\)
3. \(b \parallel c\)
4. \(d \parallel e\)

182 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.

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

184 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
185 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

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

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

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

187 In the diagram below, \( \ell \parallel m \) and \( QR \perp ST \) at \( R \).

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

188 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
189 Transversal $EF$ intersects $AB$ and $CD$, as shown in the diagram below.

Which statement could always be used to prove $AB \parallel CD$?

1. $\angle 2 \cong \angle 4$
2. $\angle 7 \cong \angle 8$
3. $\angle 3$ and $\angle 6$ are supplementary
4. $\angle 1$ and $\angle 5$ are supplementary

190 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

191 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. $\sqrt{110}$

192 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
193 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}

194 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

195 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 $\{8, 15, 17\}$

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

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

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

199 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

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

201 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 $m\angle D = m\angle F$
202 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

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

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

205 The diagram below shows $\triangle ABD$, with $ABC$, $BE \perp AD$, and $\angle EBD \cong \angle CBD$.

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

206 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

207 In $\triangle ABC$, the measure of angle $A$ is fifteen less than twice the measure of angle $B$. The measure of angle $C$ equals the sum of the measures of angle $A$ and angle $B$. Determine the measure of angle $B$. 

What is $m\angle JSM$?
1. $163$
2. $121$
3. $42$
4. $17$
G.G.31: ISOSCELES TRIANGLE THEOREM

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

What is the measure of \( \angle A \)?
1 40°
2 50°
3 70°
4 100°

209 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 \( AD \cong DC \)

210 In \( \triangle RST \), \( m\angle RST = 46 \) and \( RS \cong ST \). Find \( m\angle STR \).

211 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 \( m\angle C < m\angle B \)

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

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

214 In the diagram below of \( \triangle GJK \), \( H \) is a point on \( GJ \), \( HJ \cong JK \), \( m\angle G = 28 \), and \( m\angle GJK = 70 \). Determine whether \( \triangle GHK \) is an isosceles triangle and justify your answer.
215 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

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

What is the value of $x$?

1 10  
2 28  
3 32  
4 40

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

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 $DC$.

G.G.32: EXTERIOR ANGLE THEOREM

218 Side $\overline{PQ}$ of $\triangle PQR$ is extended through $Q$ to point $T$. Which statement is not always true?

1 $m\angle RQT > m\angle R$  
2 $m\angle RQT > m\angle P$  
3 $m\angle RQT = m\angle P + m\angle R$  
4 $m\angle RQT > m\angle PQR$
219 In the diagram below, \( \triangle ABC \) is shown with \( \overline{AC} \) extended through point \( D \).

If \( m\angle BCD = 6x + 2 \), \( m\angle BAC = 3x + 15 \), and \( m\angle ABC = 2x - 1 \), what is the value of \( x \)?

1 12
2 14 \( \frac{10}{11} \)
3 16
4 18 \( \frac{1}{9} \)

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

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

What is \( m\angle B \)?

1 5
2 20
3 25
4 55

222 In the diagram of \( \triangle KLM \) below, \( m\angle L = 70 \), \( m\angle M = 50 \), and \( \overline{MK} \) is extended through \( N \).

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

1 60°
2 120°
3 180°
4 300°
223 In the diagram below of \( \triangle BCD \), side \( \overline{DB} \) is extended to point \( A \).

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

224 In \( \triangle FGH \), \( \angle F = 42 \) and an exterior angle at vertex \( H \) has a measure of 104. What is \( \angle G \)?
1. 34
2. 62
3. 76
4. 146

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

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

226 In the diagram of \( \triangle ABC \) below, \( \overline{AB} \) is extended to point \( D \).

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

227 In the diagram below, \( \overrightarrow{RCBT} \) and \( \triangle ABC \) are shown with \( \angle A = 60 \) and \( \angle A = 125 \).

What is \( \angle ACR \)?
1. 125
2. 115
3. 65
4. 55
228 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

229 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. \( \{26, 8, 15\} \)

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

231 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. \( BC < AC < AB \)

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

233 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. \( m\angle P > m\angle R > m\angle Q \)

234 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. \( \angle C, \angle A, \angle B \)
235 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. $BC, AB, AC$

236 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. $RS < TS < RT$

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

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

1. $AB$
2. $DC$
3. $AD$
4. $BD$

238 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 $\triangle ABC$.

239 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. $BC < BA$

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

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

241 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. $AB = 18$, $BC = 14$, $AC = 5$

G.G.46: SIDE SPLITTER THEOREM

242 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
243 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 \( EB \).

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

246 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 \( EB \).
247 In the diagram below of $\triangle ABC$, $TV \parallel BC$, $AT = 5$, $TB = 7$, and $AV = 10$. What is the length of $VC$?

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248 In the diagram of $\triangle ABC$ shown below, $DE \parallel BC$.

If $AB = 10$, $AD = 8$, and $AE = 12$, what is the length of $EC$?

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G.G.42: MIDSEGMENTS

249 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 $GH \parallel DE$.

250 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 $\triangle ABC$. 
251 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

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

What is the length, in centimeters, of $EF$?
1. 6
2. 12
3. 18
4. 4

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

254 In the diagram below of $\triangle ABC$, $D$ is the midpoint of $AB$, and $E$ is the midpoint of $BC$.

If $AC = 4x + 10$, which expression represents $DE$?
1. $x + 2.5$
2. $2x + 5$
3. $2x + 10$
4. $8x + 20$
255 Triangle $HKL$ has vertices $H(-7, 2), K(3, -4), \text{ and } L(5, 4)$. 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.]

256 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 $AC$.

257 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 $\triangle CAB$

258 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. $DE = \frac{1}{2} CB$
2. $\overline{DE} \parallel \overline{CB}$
3. $\frac{AD}{DC} = \frac{DE}{CB}$
4. $\triangle ABC \sim \triangle AED$

If $AB = 20$, $BC = 12$, and $AC = 16$, what is the perimeter of trapezoid $ABEF$?
1. 24
2. 36
3. 40
4. 44
259 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 $x$?

$$\begin{array}{c}
1 \quad 6 \\
2 \quad 7 \\
3 \quad 9 \\
4 \quad 12
\end{array}$$

260 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 $VC$?

$$\begin{array}{c}
1 \quad 5 \\
2 \quad 13 \\
3 \quad 16 \\
4 \quad 32
\end{array}$$

261 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

$$\begin{array}{c}
1 \quad 35 \\
2 \quad 31 \\
3 \quad 28 \\
4 \quad 26
\end{array}$$

G.G.21: CENTROID, ORTHOCENTER, INCENTER AND CIRCUMCENTER

262 In which triangle do the three altitudes intersect outside the triangle?

$$\begin{array}{c}
1 \quad \text{a right triangle} \\
2 \quad \text{an acute triangle} \\
3 \quad \text{an obtuse triangle} \\
4 \quad \text{an equilateral triangle}
\end{array}$$
263 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 \( \triangle ABC \)

264 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. \( \angle DBG \cong \angle EBG \)

265 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.

266 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. \( (9, 6) \)
267 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.]

268 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

269 In the diagram below of $\triangle ABC$, $AE \cong BE$, $AF \cong CF$, and $CD \cong BD$.

Point $P$ must be the
1. centroid
2. circumcenter
3. incenter
4. orthocenter

270 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

G.G.43: CENTROID

271 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. $x + \frac{2}{3}x = 6$
272 In the diagram below of $\triangle TEM$, medians $\overline{TB}$, $\overline{EC}$, and $\overline{MA}$ intersect at $D$, and $TB = 9$. Find the length of $TD$.

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

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

274 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

275 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
276 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

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

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

278 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

G.G.69: TRIANGLES IN THE COORDINATE PLANE

279 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. $m\angle ABC = 60$
280 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.]

281 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

282 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

283 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

284 Triangle $ABC$ has vertices at $A(3, 0)$, $B(9, -5)$, and $C(7, -8)$. Find the length of $\overline{AC}$ in simplest radical form.

285 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

286 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

287 The number of degrees in the sum of the interior angles of a pentagon is
1. 72
2. 360
3. 540
4. 720
288 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. \( \frac{(n - 2) \cdot 180}{n} \)

289 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

G.G.37: INTERIOR AND EXTERIOR ANGLES OF POLYGONS

290 What is the measure of an interior angle of a regular octagon?
1. 45°
2. 60°
3. 120°
4. 135°

291 In the diagram below of regular pentagon \( ABCDE \), \( EB \) is drawn.

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

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

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

294 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

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

296 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

297 What is the measure of the largest exterior angle that any regular polygon can have?
1. 60°
2. 90°
3. 120°
4. 360°
G.G.38: PARALLELOGRAMS

298 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°

299 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

300 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.

301 In the diagram below, parallelogram $ABCD$ has diagonals $AC$ and $BD$ that intersect at point $E$.

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

302 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.
G.G.39: PARALLELOGRAMS

303 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\( \angle TAS. \)

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

305 In rhombus \( ABCD, \) the diagonals \( AC \) and \( BD \) intersect at \( E. \) If \( AE = 5 \) and \( BE = 12, \) what is the length of \( AB? \)
1 7 2 10 3 13 4 17

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

307 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

308 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

What is m\( \angle DBC? \)
1 40 2 45 3 50 4 80
309 In the diagram below, \( \text{MATH} \) is a rhombus with diagonals \( AH \) and \( MT \).

If \( m\angle HAM = 12 \), what is \( m\angle AMT \)?

1. 12
2. 78
3. 84
4. 156

310 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.

311 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

312 What is the perimeter of a rhombus whose diagonals are 16 and 30?

1. 92
2. 68
3. 60
4. 17

313 What is the perimeter of a square whose diagonal is \( 3\sqrt{2} \)?

1. 18
2. 12
3. 9
4. 6

314 Which quadrilateral does not always have congruent diagonals?

1. isosceles trapezoid
2. rectangle
3. rhombus
4. square

G.G.40: TRAPEZOIDS

315 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. \( \frac{1}{2} \)
316 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 $x$.

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

If $RS = 30$ and $XV = 44$, what is the length of $TU$?

1 37  
2 58  
3 74  
4 118

318 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

319 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

320 The diagram below shows isosceles trapezoid $ABCD$ with $\overline{AB} \parallel \overline{DC}$ and $\overline{AD} \cong \overline{BC}$. If $m\angle BAD = 2x$ and $m\angle BCD = 3x + 5$, find $m\angle BAD$.

321 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
322 In the diagram below, $LATE$ is an isosceles trapezoid with $LE \cong AT$, $LA = 24$, $ET = 40$, and $AT = 10$. Altitudes $LF$ and $AG$ are drawn.

What is the length of $LF$?
1. 6
2. 8
3. 3
4. 4

323 In the diagram below, $EF$ is the median of trapezoid $ABCD$.

If $AB = 5x - 9$, $DC = x + 3$, and $EF = 2x + 2$, what is the value of $x$?
1. 5
2. 2
3. 7
4. 8

324 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

325 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. $\triangle SVT$
326 Trapezoid TRAP, with median $\overline{MQ}$, is shown in the diagram below. Solve algebraically for $x$ and $y$.

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

328 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 $\overline{BD}$

329 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.]

330 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.]
331 Given: \( \triangle ABC \) with vertices \( A(-6,-2), B(2,8), \) and \( C(6,-2) \). \( \overline{AB} \) has midpoint \( D \), \( \overline{BC} \) has midpoint \( E \), and \( \overline{AC} \) has midpoint \( F \).

Prove: \( ADEF \) is a parallelogram

\( ADEF \) is not a rhombus

[The use of the grid is optional.]

332 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 \( \overline{AC} \) and \( \overline{BD} \)?

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

333 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. \( 10\sqrt{2} \)

334 The coordinates of two vertices of square \( ABCD \) are \( A(2,1) \) and \( B(4,4) \). Determine the slope of side \( \overline{BC} \).
336 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

337 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 $AB > BC$

338 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
339 In the diagram below of circle $O$, diameter $AOB$ is perpendicular to chord $CD$ at point $E$, $OA = 6$, and $OE = 2$.

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

340 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 $CE$.

341 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

342 In circle $R$ shown below, diameter $DE$ is perpendicular to chord $ST$ at point $L$.

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

344 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

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

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

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

If $\angle ADB = 60$, what is $\angle CDB$?
1. 20
2. 30
3. 60
4. 120

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

What is $\angle CD$?
1. 150
2. 120
3. 100
4. 60
348 In the diagram below of circle $O$, chord $AB \parallel$ chord $CD$, and chord $CD \parallel$ chord $EF$.

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

349 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. $ABD \cong CDB$

350 In the diagram below, trapezoid $ABCD$, with bases $AB$ and $DC$, is inscribed in circle $O$, with diameter $DC$. If $mAB=80$, find $mBC$.

351 In the diagram below, two parallel lines intersect circle $O$ at points $A$, $B$, $C$, and $D$, with $mAB = x + 20$ and $mDC = 2x - 20$. Find $mAB$. 
352 In the diagram below of circle $O$, diameter $AB$ is parallel to chord $CD$.

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

353 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 $\overline{AG} \cong \overline{BH}$

354 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 $96$

355 In the diagram of circle $O$ below, chord $\overline{CD}$ is parallel to diameter $\overline{AOB}$ and $m\overline{CD} = 110$.

What is $m\overline{DB}$?
1 $35$
2 $55$
3 $70$
4 $110$
G.G.50: TANGENTS

356 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

357 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 \( SE \).

358 How many common tangent lines can be drawn to the two externally tangent circles shown below?

1. 1
2. 2
3. 3
4. 4

359 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

360 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°
2. 100°
3. 70°
4. 50°
361 In the diagram below of $\triangle PAO$, $AP$ is tangent to circle $O$ at point $A$, $OB = 7$, and $BP = 18$.

![Diagram](image1.jpg)

What is the length of $AP$?

1. 10
2. 12
3. 17
4. 24

362 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. $180^\circ$

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

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

363 In the diagram below, circles $A$ and $B$ are tangent at point $C$ and $AB$ is drawn. Sketch all common tangent lines.

![Diagram](image2.jpg)

364 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.

![Diagram](image3.jpg)

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

1. 71
2. 104
3. 142
4. 161
366 How many common tangent lines can be drawn to the circles shown below?

1 1
2 2
3 3
4 4

G.G.51: ARCS DETERMINED BY ANGLES

367 In the diagram below of circle O, chords \( \overline{DF}, \overline{DE}, \overline{FG}, \) and \( \overline{EG} \) are drawn such that \( m\angle DF : m\angle FE : m\angle EG : m\angle GD = 5:2:1:7 \). Identify one pair of inscribed angles that are congruent to each other and give their measure.

368 In the diagram below of circle O, chords \( \overline{AD} \) and \( \overline{BC} \) intersect at E, \( m\angle AC = 87 \), and \( m\angle BD = 35 \).

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

369 In the diagram below of circle O, chords \( \overline{AE} \) and \( \overline{DC} \) 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
370 In the diagram below of circle $O$, chords $AD$ and $BC$ intersect at $E$.

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

371 In the diagram below of circle $C$, $m\overarc{T} = 140$, and $m\angle P = 40$.

What is $m\overarc{RS}$?
1. 50
2. 60
3. 90
4. 110

372 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

373 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 $m\angle LMK$.
374 In the diagram below of circle $O$, chords $AB$ and $CD$ intersect at $E$.

If $m\angle AEC = 34$ and $m\overarc{AC} = 50$, what is $m\overarc{DB}$?

1. 16  
2. 18  
3. 68  
4. 118

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

Determine $m\angle CEB$. Determine $m\angle F$. Determine $m\angle DAC$.

376 In the diagram below of circle $O$, $PAC$ and $PBD$ are secants.

If $m\overarc{CD} = 70$ and $m\overarc{AB} = 20$, what is the degree measure of $\angle P$?

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

377 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
G.G.53: SEGMENTS INTERCEPTED BY CIRCLE

378 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

379 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

380 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
381 In the diagram below, tangent \( \overline{PA} \) and secant \( \overline{PBC} \) 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

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

What is the length of \( \overline{OC} \)?

1 4.5
2 7
3 9
4 14

383 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 \( \overline{EB} \)?

1 15
2 12
3 6.7
4 2.4

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

What is the perimeter of \( \triangle ABC \)?

1 15
2 25
3 30
4 60
385 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.

386 In the diagram below of circle $O$, $\overline{PA}$ is tangent to circle $O$ at $A$, and $\overline{PBC}$ is a secant with points $B$ and $C$ on the circle. If $PA = 8$ and $PB = 4$, what is the length of $\overline{BC}$?

1 20
2 16
3 15
4 12

387 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 $\overline{AC}$?

1 8
2 15
3 23
4 27

388 In the diagram below of circle $O$, chords $\overline{RT}$ and $\overline{QS}$ intersect at $M$. Secant $\overline{PTR}$ and tangent $\overline{PS}$ are drawn to circle $O$. The length of $\overline{RM}$ is two more than the length of $\overline{TM}$, $QM = 2$, $SM = 12$, and $PT = 8$.

Find the length of $\overline{RT}$. Find the length of $\overline{PS}$. 

79
389 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

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

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

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

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

394 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.]

395 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 $(x + 7)^2 + (y - 3)^2 = 16$

396 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 $(x - 1)^2 + (y + 4)^2 = 25$
397 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. \((x - 2)^2 + (y + 8)^2 = 81\)

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

399 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. \((x - 3)^2 + (y + 5)^2 = 16\)

400 Write an equation of a circle whose center is \((-3, 2)\) and whose diameter is 10.

401 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. \((x - 5)^2 + (y + 3)^2 = 16\)

402 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. \((x + 5)^2 + (y - 4)^2 = 49\)

403 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. \((x - 1)^2 + (y + 2)^2 = 2\)

G.G.72: EQUATIONS OF CIRCLES

404 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. \((x - 5)^2 + (y + 1)^2 = 9\)
405 What is an equation for the circle shown in the graph below?

1. $x^2 + y^2 = 2$
2. $x^2 + y^2 = 4$
3. $x^2 + y^2 = 8$
4. $x^2 + y^2 = 16$

406 Write an equation for circle $O$ shown on 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. $(x + 5)^2 + (y - 6)^2 = 25$

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

408 Write an equation of the circle graphed in the diagram below.
409. 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. $(x - 2)^2 + (y + 2)^2 = 3$

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

411. 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. $(x + 4)^2 + (y + 1)^2 = 9$

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

1. $(x - 3)^2 + (y + 1)^2 = 6$
2. $(x + 3)^2 + (y - 1)^2 = 6$
3. $(x - 3)^2 + (y + 1)^2 = 9$
4. $(x + 3)^2 + (y - 1)^2 = 9$
413 What is the equation of circle $O$ shown in the diagram below?

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

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

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

415 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 $=\sqrt{C}$

416 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 $\sqrt{13}$

417 What are the center and the radius of the circle whose equation is $(x - 3)^2 + (y + 3)^2 = 36$?
1. $(3,-3)$; radius $=6$
2. $(3,-3)$; radius $=18$
3. $(5,-3)$; radius $=18$
4. $(5,-3)$; radius $=16$

418 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 $=16$

419 What are the center and the radius of the circle whose equation is $(x - 5)^2 + (y + 3)^2 = 16$?
1. $(-5,3)$ and $16$
2. $(5,-3)$ and $16$
3. $(-5,3)$ and $4$
4. $(5,-3)$ and $4$
420 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

421 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. \((x - 5)^2 + (y - 4)^2 = 25\)

422 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 \(4\sqrt{2}\)

423 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 \((x - 2)^2 + (y - 5)^2 = 25\)

424 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.

425 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

426 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
G.G.74: GRAPHING CIRCLES

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

1 2 3 4

428 The equation of a circle is $(x - 2)^2 + (y + 4)^2 = 4$. Which diagram is the graph of the circle?
429 Which graph represents a circle with the equation 

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

430 Which graph represents a circle whose equation is 

$(x + 2)^2 + y^2 = 16$?
431 Which graph represents a circle whose equation is 
\[ x^2 + (y - 1)^2 = 9? \]

432 Which graph represents a circle whose equation is 
\[ x^2 + (y - 2)^2 = 4? \]
MEASURING IN THE
PLANE AND SPACE
G.G.11: VOLUME

433  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.

434  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

435  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

G.G.12: VOLUME

436  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  $x^2 + 6x + 8$

437  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.

438  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

439  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

440  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.
G.G.13: VOLUME

441 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?

442 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$^3$.

G.G.14: VOLUME AND LATERAL AREA

443 The volume of a cylinder is 12,566.4 cm$^3$. The height of the cylinder is 8 cm. Find the radius of the cylinder to the nearest tenth of a centimeter.

444 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

445 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 $3,888\pi$

446 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

447 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 $2,160\pi$
448 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.

449 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?

450 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 $\pi$.

451 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.

452 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 $\pi$.

453 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

G.G.15: VOLUME AND LATERAL AREA

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

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

1. 201
2. 481
3. 603
4. 804
455 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.

456 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

G.G.16: VOLUME AND SURFACE AREA

457 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.

458 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. \( 288\pi \)

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

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

460 A sphere has a diameter of 18 meters. Find the volume of the sphere, in cubic meters, in terms of \( \pi \).

461 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

462 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. \( 288\pi \)

463 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

464 The diameter of a sphere is 5 inches. Determine and state the surface area of the sphere, to the nearest hundredth of a square inch.

G.G.45: SIMILARITY

465 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.
466 In the diagram below, $\triangle ABC \sim \triangle EFG$, $m \angle C = 4x + 30$, and $m \angle G = 5x + 10$. Determine the value of $x$.

467 Given $\triangle ABC \sim \triangle DEF$ such that $\frac{AB}{DE} = \frac{3}{2}$. Which statement is not true?

1. $\frac{BC}{EF} = \frac{3}{2}$
2. $\frac{m \angle A}{m \angle D} = \frac{3}{2}$
3. $\frac{\text{area of } \triangle ABC}{\text{area of } \triangle DEF} = \frac{9}{4}$
4. $\frac{\text{perimeter of } \triangle ABC}{\text{perimeter of } \triangle DEF} = \frac{3}{2}$

468 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

469 $\triangle ABC$ 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. $\frac{\text{perimeter of } \triangle ABC}{\text{perimeter of } \triangle DEF}$

470 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
471 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.]

472 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. \( \frac{AB + BC + AC}{RS + ST + RT} = \frac{AB}{RS} \)

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

474 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

475 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.]

476 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

G.G.47: SIMILITUDE

477 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.
478. In the diagram below, the length of the legs \( AC \) and \( BC \) of right triangle \( ABC \) are 6 cm and 8 cm, respectively. Altitude \( CD \) is drawn to the hypotenuse of \( \triangle ABC \).

What is the length of \( AD \) to the nearest tenth of a centimeter?
1. 3.6
2. 6.0
3. 6.4
4. 4.0

479. 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

480. 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 \( h \).

481. In the diagram below of right triangle \( ABC \), \( CD \) is the altitude to hypotenuse \( AB \), \( CB = 6 \), and \( AD = 5 \).

What is the length of \( BD \)?
1. 5
2. 9
3. 3
4. 4
482. 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

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

1. 9
2. 12
3. 3
4. 15

484. In the diagram below of right triangle $ABC$, altitude $CD$ is drawn to hypotenuse $AB$.

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

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

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

What is the length of $AB$?

1. $5\sqrt{3}$
2. 6
3. $3\sqrt{5}$
4. 9
486 Triangle $ABC$ shown below is a right triangle with altitude $AD$ drawn to the hypotenuse $BC$.

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

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

487 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.]

TRANSFORMATIONS

G.G.54: ROTATIONS

488 The coordinates of the vertices of $\triangle RST$ are $R(-2, 3)$, $S(4, 4)$, and $T(2, -2)$. Triangle $R'S'T'$ is the image of $\triangle RST$ after a rotation of $90^\circ$ about the origin. State the coordinates of the vertices of $\triangle R'S'T'$. [The use of the set of axes below is optional.]
489 The coordinates of the vertices of $\triangle ABC$ are $A(1, 2), B(-4, 3),$ and $C(-3, -5)$. State the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$ after a rotation of $90^\circ$ about the origin. [The use of the set of axes below is optional.]

490 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. $(3, -4)$

491 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. $(-1, 7)$

492 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. $(7, -4)$

493 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 $\triangle XYZ$. 

G.G.54: REFLECTIONS
494 Triangle $ABC$ has vertices $A(-2, 2)$, $B(-1, -3)$, and $C(4, 0)$. Find the coordinates of the vertices of $\Delta A'B'C'$, the image of $\Delta ABC$ after the transformation $r_{y-axis}$. [The use of the grid is optional.]

495 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. $(-3, 2)$

496 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. $(-4b, -3a)$

497 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. $(1, -1)$

498 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. $(-15, -8)$

499 Triangle $TAP$ has coordinates $T(-1, 4)$, $A(2, 4)$, and $P(2, 0)$. On the set of axes below, graph and label $\Delta T'A'P'$, the image of $\Delta TAP$ after the translation $(x, y) \rightarrow (x - 5, y - 1)$.
G.G.58: DILATIONS

500 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 \( D_{\frac{1}{2}} \).

G.G.54: COMPOSITIONS OF TRANSFORMATIONS

501 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.]

502 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. \((2, -4)\)

G.G.58: COMPOSITIONS OF TRANSFORMATIONS

503 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. \((-8, -12)\)

504 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. \((-2, 10)\) and \((6, 8)\)
2. \((-1, 5)\) and \((3, 4)\)
3. \((2, 7)\) and \((10, 5)\)
4. \((14, -2)\) and \((22, -4)\)

505 The coordinates of the vertices of \( \Delta ABC \) \( A(1, 3), B(-2, 2) \) and \( C(0, -2) \). On the grid below, graph and label \( \Delta A''B''C'' \), the result of the composite transformation \( D_2 \circ T_{3,-2} \). State the coordinates of \( A'' \), \( B'' \), and \( C'' \).
506  As shown on the set of axes below, \( \Delta GHS \) has vertices \( G(3, 1), H(5, 3), \) and \( S(1, 4) \). Graph and state the coordinates of \( \Delta G''H''S'' \), the image of \( \Delta GHS \) after the transformation \( T_{-3,1} \circ D_2 \).

507  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 \( r_y \circ r_{x-axis} \) is performed on trapezoid \( ABCD \). State the coordinates of trapezoid \( A''B''C''D'' \). [The use of the set of axes below is optional.]
508 The vertices of $\triangle RST$ are $R(-6, 5), S(-7, -2)$, and $T(1, 4)$. The image of $\triangle RST$ after the composition $T_{-2,1} \circ r_{y=x}$ is $\triangle R'S'T'$. State the coordinates of $\triangle R'S'T'$. [The use of the set of axes below is optional.]

509 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.]
510 The coordinates of the vertices of parallelogram SWAN are S(2, −2), W(−2, −4), A(−4, 6), and N(0, 8). State and label the coordinates of parallelogram S″W″A″N″, the image of SWAN after the transformation $T_{4,-2} \circ D_{\frac{1}{2}}$. [The use of the set of axes below is optional.]

511 Quadrilateral $MATH$ has coordinates $M(−6,−3)$, $A(−1,−3)$, $T(−2,−1)$, and $H(−4,−1)$. The image of quadrilateral $MATH$ after the composition $r_{y-axis} \circ T_{7,5}$ is quadrilateral $M″A″T″H″$. State and label the coordinates of $M″A″T″H″$. [The use of the set of axes below is optional.]
512 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.]

513 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 $\overline{AB} \parallel \overline{A'B'}$. 

G.G.55: PROPERTIES OF TRANSFORMATIONS
514 Triangle $DEG$ has the coordinates $D(1,1)$, $E(5,1)$, and $G(5,4)$. 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.

515 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
516 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 $\angle A$

517 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 $N'O'$

518 A pentagon is drawn on the set of axes below. If the pentagon is reflected over the $y$-axis, determine if this transformation is an isometry. Justify your answer. [The use of the set of axes is optional.]

519 Pentagon $PQRST$ has $PQ$ parallel to $TS$. After a translation of $T_2,-5$, which line segment is parallel to $P'Q'$?
1. $R'Q'$
2. $R'S'$
3. $T'S'$
4. $T'P'$

520 When a quadrilateral is reflected over the line $y = x$, which geometric relationship is not preserved?
1. congruence
2. orientation
3. parallelism
4. perpendicularly
521 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.

522 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

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

524 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.

525 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

G.G.57: PROPERTIES OF TRANSFORMATIONS

526 Which transformation of the line $x = 3$ results in an image that is perpendicular to the given line?

1. $r_{x = 3}$
2. $r_{y = x}$
3. $r_{x = 1}$
4. $r_{x = 1}$
G.G.59: PROPERTIES OF TRANSFORMATIONS

527 In $\triangle KLM$, $m\angle K = 36$ and $KM = 5$. The transformation $D_2$ is performed on $\triangle KLM$ to form $\triangle K'L'M'$. Find $m\angle K'$. Justify your answer. Find the length of $K'M'$. Justify your answer.

528 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 $\triangle ABC = \text{perimeter of } \triangle A'B'C'$
4. $2(\text{area of } \triangle ABC) = \text{area of } \triangle A'B'C'$

530 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

531 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. $T_{(-2,3)}$

G.G.56: IDENTIFYING TRANSFORMATIONS

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

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. $R_{90^\circ}$

1. rotation
2. dilation
3. translation
4. glide reflection
533 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

534 Which transformation is not always an isometry?

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

535 Which transformation can map the letter $S$ onto itself?

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

536 The diagram below shows $AB$ and $DE$.

Which transformation will move $\overline{AB}$ onto $\overline{DE}$ such that point $D$ is the image of point $A$ and point $E$ is the image of point $B$?

1. $T_{3,-3}$  
2. $D_{\frac{1}{2}}$  
3. $R_{90^\circ}$  
4. $r_{y=x}$

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

1. dilation  
2. translation  
3. line reflection  
4. glide reflection
538 As shown on the graph below, ΔR'S'T' is the image of ΔRST under a single transformation.

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

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

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

540 In the diagram below, under which transformation is ΔA'B'C' the image of ΔABC?

1. D_2
2. r_x-axis
3. r_y-axis
4. (x, y) → (x - 2, y)

541 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
G.G.60: IDENTIFYING TRANSFORMATIONS

542 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. $D_{\frac{1}{2}} \circ R_{90°}$

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

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

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

G.G.61: ANALYTICAL REPRESENTATIONS OF TRANSFORMATIONS

545 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
546 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.

LOGIC
G.G.24: STATEMENTS AND NEGATIONS

547 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.

548 Given \(\triangle ABC\) with base \(AFEDC\), median \(BF\), altitude \(BD\), and \(BE\) bisects \(\angle ABC\), which conclusion is valid?
1. \(\angle FAB \cong \angle ABF\)
2. \(\angle ABF \cong \angle CBD\)
3. \(CE \cong EA\)
4. \(CF \cong FA\)

549 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.

550 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.

551 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.
552 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

553 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

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

555 As shown in the diagram below, \(CD\) is a median of \(\triangle ABC\).

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

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

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 \(\triangle ABC \cong \triangle DBC\)

557 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

G.G.25: COMPOUND STATEMENTS

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

559 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.
560 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

561 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.

562 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.

563 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.

564 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.

565 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.

566 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

567 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.

568 Lines $m$ and $n$ are in plane $A$. What is the converse of the statement “If lines $m$ and $n$ are parallel, then lines $m$ and $n$ do not intersect”? 
1 If lines $m$ and $n$ are not parallel, then lines $m$ and $n$ intersect.
2 If lines $m$ and $n$ are not parallel, then lines $m$ and $n$ do not intersect
3 If lines $m$ and $n$ intersect, then lines $m$ and $n$ are not parallel.
4 If lines $m$ and $n$ do not intersect, then lines $m$ and $n$ are parallel.
G.G.28: TRIANGLE CONGRUENCY

569 In the diagram of $\triangle ABC$ and $\triangle DEF$ below, $AB \cong DE$, $\angle A \cong \angle D$, and $\angle B \cong \angle E$.

Which method can be used to prove $\triangle ABC \cong \triangle DEF$?

1. SSS
2. SAS
3. ASA
4. HL

570 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

571 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. $\angle AEG \cong \angle ODL$

572 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
573. 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

574. In parallelogram $ABCD$ shown below, diagonals $\overline{AC}$ and $\overline{BD}$ intersect at $E$.

Which statement must be true?
1. $\overline{AC} \cong \overline{DB}$
2. $\angle ABD \cong \angle CBD$
3. $\triangle AED \cong \triangle CEB$
4. $\triangle DCE \cong \triangle BCE$

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

Triangle $DAE$ can be proved congruent to triangle $BCE$ by
1. ASA
2. SAS
3. SSS
4. HL
576 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

578 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 \( \angle A \cong \angle X \)

579 If \( \triangle JKL \cong \triangle MNO \), which statement is always true?

1. \( \angle KJL \cong \angle NMO \)
2. \( \angle KJL \cong \angle MON \)
3. \( JL \cong MO \)
4. \( JK \cong ON \)

580 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. \( CB \cong XZ \)
581 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. \( AD \cong CD \)

582 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. \( NP \)

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

Which statement can \textit{not} be proven?
1. \( \angle XYV \cong \angle TVS \)
2. \( \angle YXV \cong \angle VUT \)
3. \( XY \cong TS \)
4. \( YV \cong SV \)

584 If \( \triangle ABC \cong \triangle JKL \cong \triangle RST \), then \( BC \) must be congruent to
1. \( JL \)
2. \( JK \)
3. \( ST \)
4. \( RS \)

G.G.27: LINE PROOFS

585 In the diagram below of \( \triangle ABC, \; \overline{AC} \cong \overline{BD} \).

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

G.G.27: ANGLE PROOFS

586 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

G.G.27: TRIANGLE PROOFS

587 Given: \( \triangle ABC \) and \( \triangle EDC \), \( C \) is the midpoint of \( \overline{BD} \) and \( \overline{AE} \)

Prove: \( AB \parallel DE \)
588 Given: \( AD \) bisects \( BC \) at \( E \).
\[
\begin{align*}
AB \perp BC \\
DC \perp BC
\end{align*}
\]
Prove: \( AB \cong DC \)

589 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. \( EC \cong EA \)

590 In the diagram of \( \triangle MAH \) below, \( MH \cong AH \) and medians \( AB \) and \( MT \) are drawn.
Prove: \( \angle MBA \cong \angle ATM \)

591 Given: \( \triangle ABC, \ BD \) bisects \( \angle ABC, \ BD \perp AC \)
Prove: \( AB \cong CB \)

G.G.27: QUADRILATERAL PROOFS

592 Given: Quadrilateral \( ABCD \), diagonal \( AFEC \),
\[
\begin{align*}
AE \cong FC, BF \perp AC, DE \perp AC, \angle 1 \cong \angle 2
\end{align*}
\]
Prove: \( ABCD \) is a parallelogram.
593 Given: $JKLM$ is a parallelogram.
\[ JM \cong LN \]
\[ \angle LMN \cong \angle LNM \]
Prove: $JKLM$ is a rhombus.

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

595 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: $\triangle AEF \cong \triangle CEG$

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

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

What is the reason justifying that $\angle B \cong \angle D$?
1. Opposite angles in a quadrilateral are congruent.
2. Parallel lines have congruent corresponding angles.
3. Corresponding parts of congruent triangles are congruent.
4. Alternate interior angles in congruent triangles are congruent.

597 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: $AE \cong BF$
598 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. $\angle AED \cong \angle CFB$

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

600 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: $\angle AOP \cong \angle BOP$

601 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. 1. lines form right angles</td>
</tr>
<tr>
<td>4. $\angle RAS$ is a right angle</td>
<td>4.</td>
</tr>
<tr>
<td>5. $\angle BST \cong \angle RAS$</td>
<td>5.</td>
</tr>
<tr>
<td>6. $ER \cong RT$</td>
<td>6. 6. Reflexive property</td>
</tr>
<tr>
<td>7. $\triangle RST \cong \triangle RAS$</td>
<td>7.</td>
</tr>
<tr>
<td>8. $\frac{RS}{RA} = \frac{RT}{RS}$</td>
<td>8.</td>
</tr>
<tr>
<td>9. $(RS)^2 = RA \cdot RT$</td>
<td>9.</td>
</tr>
</tbody>
</table>
G.G.44: SIMILARITY PROOFS

602 In the diagram below of \( \triangle PRT \), \( Q \) is a point on \( PR \), \( S \) is a point on \( TR \), \( QS \) is drawn, and \( \angle RPT \cong \angle RSQ \).

Which reason justifies the conclusion that \( \triangle PRT \sim \triangle SRQ \)?
1. AA
2. ASA
3. SAS
4. SSS

603 In the diagram of \( \triangle ABC \) and \( \triangle EDC \) below, \( AE \) and \( BD \) intersect at \( C \), and \( \angle CAB \cong \angle CED \).

What technique can be used to prove that \( \triangle PST \sim \triangle RQT \)?
1. SAS
2. SSS
3. ASA
4. AA

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

605 In the diagram below, \( BFCE \), \( AB \perp BE \), \( DE \perp BE \), and \( \angle BFD \cong \angle ECA \). Prove that \( \triangle ABC \sim \triangle DEF \).
606  The diagram below shows $\triangle ABC$, with $\overline{AEB}$, $\overline{ADC}$, and $\angle ACB \cong \angle AED$. Prove that $\triangle ABC$ is similar to $\triangle ADE$.

![Diagram](image)

607  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. $\angle BAC \cong \angle EDF$

608  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
Geometry Regents Exam Questions by Performance Indicator: Topic
Answer Section

1 ANS: 2
The slope of a line in standard form is \(-\frac{A}{B}\) so the slope of this line is \(-\frac{5}{3}\). Perpendicular lines have slope that are the opposite and reciprocal of each other.

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

2 ANS: 4
The slope of \(y = \frac{-2}{3}x - 5\) is \(-\frac{2}{3}\). Perpendicular lines have slope that are opposite reciprocals.

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

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

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

4 ANS: 2
The slope of \(x + 2y = 3\) is \(m = -\frac{A}{B} = -\frac{1}{2}\). \(m_\perp = 2\).


5 ANS: 3
\(2y = -6x + 8\) Perpendicular lines have slope the opposite and reciprocal of each other.
\[ y = -3x + 4 \]
\[ m = -3 \]
\[ m_\perp = \frac{1}{3} \]


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


7 ANS: 4
The slope of \(3x + 5y = 4\) is \(m = -\frac{A}{B} = -\frac{3}{5}\). \(m_\perp = \frac{5}{3}\).


8 ANS: 2
The slope of \(x + 2y = 3\) is \(m = -\frac{A}{B} = -\frac{1}{2}\). \(m_\perp = 2\).

9 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

10 ANS: 3

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


11 ANS: 2

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


12 ANS: 4

\[ \begin{align*} 
3y + 1 &= 6x + 4. \\
2y + 1 &= x - 9 \\
3y &= 6x + 3. \\
2y &= x - 10 \\
y &= 2x + 1. \\
y &= \frac{1}{2}x - 5 
\end{align*} \]

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

13 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

14 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

15 ANS: 3

\[ \begin{align*} 
m &= \frac{-A}{B} = \frac{5}{2}. \\
m &= \frac{-A}{B} = \frac{10}{4} = \frac{5}{2} 
\end{align*} \]

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

16 ANS: 1

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

\[ y = -12x - 20 \]

PTS: 2    REF: 061027ge    STA: G.G.63    TOP: Parallel and Perpendicular Lines
17 ANS: 2
\[ y + \frac{1}{2}x = 4 \quad 3x + 6y = 12 \]
\[ y = -\frac{1}{2}x + 4 \quad 6y = -3x + 12 \]
\[ m = -\frac{1}{2} \quad y = -\frac{3}{6}x + 2 \]
\[ y = -\frac{1}{2}x + 2 \]

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

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

PTS: 2  REF: 011119ge  STA: G.G.63  TOP: Parallel and Perpendicular Lines

19 ANS: 1  PTS: 2  REF: 061113ge  STA: G.G.63
TOP: Parallel and Perpendicular Lines

20 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

21 ANS:
The slope of \( x + 2y = 4 \) is \( m = \frac{-A}{B} = \frac{-1}{2} \). The slope of \( 4y - 2x = 12 \) is \( \frac{-A}{B} = \frac{2}{4} = \frac{1}{2} \). Since the slopes are neither equal nor opposite reciprocals, the lines are neither parallel nor perpendicular.

PTS: 2  REF: 061231ge  STA: G.G.63  TOP: Parallel and Perpendicular Lines

22 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

23 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
24 ANS: 4

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

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

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

\[m = \frac{2}{3}\quad m = \frac{3}{2}\]

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

25 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

26 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

27 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

28 ANS:

\[y = \frac{2}{3}x + 1,\ 2y + 3x = 6\]

\[y = mx + b\]

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

\[y = \frac{3}{2}x + 3\quad 5 = 4 + b\]

\[m = \frac{-3}{2}\quad 1 = b\]

\[m_\perp = \frac{2}{3}\quad y = \frac{2}{3}x + 1\]

PTS: 4 REF: 061036ge STA: G.G.64 TOP: Parallel and Perpendicular Lines

29 ANS: 3 PTS: 2 REF: 011217ge STA: G.G.64
30 ANS: 4
\[ m_\perp = -\frac{1}{3}. \quad y = mx + b \]
\[ 6 = -\frac{1}{3}(-9) + b \]
\[ 6 = 3 + b \]
\[ 3 = b \]

PTS: 2  REF: 061215ge  STA: G.G.64  TOP: Parallel and Perpendicular Lines

31 ANS: 3

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

PTS: 2  REF: 081228ge  STA: G.G.64  TOP: Parallel and Perpendicular Lines

32 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

33 ANS: 2

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: \[ y = mx + b \]
\[ -11 = 2(-3) + b \]
\[ -5 = b \]

PTS: 2  REF: fall0812ge  STA: G.G.65  TOP: Parallel and Perpendicular Lines

34 ANS:
\[ y = -2x + 14. \]

The slope of \( 2x + y = 3 \) is \( \frac{-A}{B} = \frac{-2}{1} = -2 \). \[ y = mx + b \]
\[ 4 = (-2)(5) + b \]
\[ b = 14 \]

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

35 ANS:
\[ y = \frac{2}{3}x - 9. \]

The slope of \( 2x - 3y = 11 \) is \( \frac{-A}{B} = \frac{-2}{3} = \frac{2}{3} \). \[ y = mx + b \]
\[ -5 = \left(\frac{2}{3}\right)(6) + b \]
\[ -5 = 4 + b \]
\[ b = -9 \]

PTS: 2  REF: 080931ge  STA: G.G.65  TOP: Parallel and Perpendicular Lines
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:

\[ y = mx + b \]
\[ 3 = -2(7) + b \]
\[ 17 = b \]
41 ANS: 4
\[
m = \frac{-A}{B} = \frac{-3}{2} \quad y = mx + b
\]
\[
-1 = \left( \frac{-3}{2} \right)(2) + b
\]
\[
-1 = -3 + b
\]
\[
2 = b
\]

PTS: 2  REF: 061226ge  STA: G.G.65  TOP: Parallel and Perpendicular Lines

42 ANS: 1
\[
m = \frac{3}{2} \quad y = mx + b
\]
\[
2 = \frac{3}{2} (1) + b
\]
\[
\frac{1}{2} = b
\]

PTS: 2  REF: 081217ge  STA: G.G.65  TOP: Parallel and Perpendicular Lines

43 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

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

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

\[ y = \frac{4}{3}x - 6 \]

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

\[ m = \frac{1 - (-5)}{-1 - 7} = -\frac{3}{4} \]

\[ y - y_M = m(x - x_M) \]

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

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

46 ANS:

\[ m = \left( \frac{8 + 0}{2}, \frac{2 + 6}{2} \right) = (4, 4) \]

\[ m = \frac{6 - 2}{0 - 8} = -\frac{1}{2} \]

\[ m_{\perp} = \frac{-1}{-\frac{1}{2}} = 2 \]

\[ y = mx + b \]

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

\[ -4 = b \]

PTS: 2 REF: 081126ge STA: G.G.68 TOP: Perpendicular Bisector

47 ANS:

\(AB\) 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

48 ANS:

\[ M = \left( \frac{3 + 3}{2}, \frac{-1 + 5}{2} \right) = (3, 2) \]

\[ y = 2 \]

PTS: 2 REF: 011334ge STA: G.G.68 TOP: Perpendicular Bisector
49 ANS: 3
midpoint: \( \left( \frac{6 + 8}{2}, \frac{8 + 4}{2} \right) = (7, 6) \). slope: \( \frac{8 - 4}{6 - 8} = \frac{4}{-2} = -2; m_1 = \frac{1}{2} \). \( 6 = \frac{1}{2} (7) + b \)
\[
\frac{12}{2} = \frac{7}{2} + b
\]
\[
\frac{5}{12} = b
\]

50 ANS: 3

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

51 ANS: 1

\( y = x^2 - 4x = (4)^2 - 4(4) = 0 \). (4, 0) is the only intersection.

52 ANS: 4

\( y = x + 4 \). \( x^2 - 6x + 10 = -x + 4 \). \( y = x + 4 \). \( y + 2 = 4 \)
\( y = -x + 4 \)
\( x^2 - 5x + 6 = 0 \)
\( y = 3 \)
\( y = 2 \)
\( (x - 3)(x - 2) = 0 \)
\( y = 1 \)
\( x = 3 \) or 2

PTS: 2 REF: 080912ge STA: G.G.70 TOP: Quadratic-Linear Systems
53 ANS:

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

PTS: 6  REF: 011038ge  STA: G.G.70  TOP: Quadratic-Linear Systems

54 ANS: 3

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

55 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
56 ANS: 

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

57 ANS: 3

PTS: 2  REF: 081118ge  STA: G.G.70  TOP: Quadratic-Linear Systems

58 ANS:

PTS: 6  REF: 061238ge  STA: G.G.70  TOP: Quadratic-Linear Systems

59 ANS:

PTS: 4  REF: 081237ge  STA: G.G.70  TOP: Quadratic-Linear Systems
12

x^2 + 5^2 = 25
x = 0

60 ANS: 3

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

61 ANS: 2

PTS: 2 REF: 061313ge STA: G.G.70

62 ANS: 2

(x - 4)^2 - 2 = -2x + 6. y = -2(4) + 6 = -2

x^2 - 8x + 16 - 2 = -2x + 6 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

63 ANS: 2

PTS: 2 REF: 011409ge STA: G.G.70 TOP: Quadratic-Linear Systems

64 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

65 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

66 ANS: 2

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

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

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

\( 3.5 = \frac{1 + R_x}{2} \), \( 2 = \frac{8 + R_y}{2} \).

\( 7 = 1 + R_x \), \( 4 = 8 + R_y \).

\( 6 = R_x \), \( -4 = R_y \).

PTS: 2 REF: 011031ge STA: G.G.66 TOP: Midpoint
KEY: graph

68 ANS: 2

\( M_x = \frac{3x + 5 + x - 1}{2} = \frac{4x + 4}{2} = 2x + 2 \), \( M_y = \frac{3y + (-y)}{2} = \frac{2y}{2} = y \).

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

69 ANS: 2

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

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

70 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

71 ANS: 1

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

\(-4 + x = 2 \), \( 3 + y = 10 \).

\( x = 6 \), \( y = 7 \).

PTS: 2 REF: 081115ge STA: G.G.66 TOP: Midpoint

72 ANS: 4

\( -5 = \frac{-3 + x}{2} \), \( 2 = \frac{6 + y}{2} \).

\(-10 = -3 + x \), \( 4 = 6 + y \).

\(-7 = x \), \( -2 = y \).

PTS: 2 REF: 081203ge STA: G.G.66 TOP: Midpoint
73 ANS: 3
\[ \frac{4 + x}{2} = 6 \quad \frac{2 + y}{2} = 8 \]
\[ 4 + x = 12 \quad 2 + y = 16 \]
\[ x = 8 \quad y = 14 \]

PTS: 2  REF: 011305ge  STA: G.G.66  TOP: Midpoint

74 ANS: 2
\[ M_x = \frac{8 + (-3)}{2} = 2.5 \quad M_y = \frac{-4 + 2}{2} = -1 \]

PTS: 2  REF: 061312ge  STA: G.G.66  TOP: Midpoint

75 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

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

PTS: 2  REF: fall0831ge  STA: G.G.67  TOP: Distance

77 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

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

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

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

PTS: 2  REF: 061021ge  STA: G.G.67  TOP: Distance

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

PTS: 2  REF: 081013ge  STA: G.G.67  TOP: Distance
81 ANS: 4
\[ d = \sqrt{(-5 - 3)^2 + (4 - (-6))^2} = \sqrt{64 + 100} = \sqrt{164} = \sqrt{4 \cdot 41} = 2 \sqrt{41} \]

PTS: 2  REF: 011121ge  STA: G.G.67  TOP: Distance
KEY: general

82 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

83 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

84 ANS: 1
\[ d = \sqrt{(4 - 1)^2 + (7 - 11)^2} = \sqrt{9 + 16} = \sqrt{25} = 5 \]

PTS: 2  REF: 011205ge  STA: G.G.67  TOP: Distance
KEY: general

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

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

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

PTS: 2  REF: 081232ge  STA: G.G.67  TOP: Distance

87 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

88 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

89 ANS: 3  PTS: 2  REF: fall0816ge  STA: G.G.1  TOP: Planes

90 ANS: 4  PTS: 2  REF: 011012ge  STA: G.G.1  TOP: Planes

91 ANS: 3  PTS: 2  REF: 061017ge  STA: G.G.1  TOP: Planes
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.
The lateral edges of a prism are parallel.
127 ANS:

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

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

129 ANS:

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

130 ANS: 4 PTS: 2 REF: 081106ge STA: G.G.17 TOP: Constructions

131 ANS:

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

132 ANS:

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

133 ANS: 2 PTS: 2 REF: 081205ge STA: G.G.17 TOP: Constructions
134 ANS:

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

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

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

137 ANS: 4  PTS: 2  REF: 081005ge  STA: G.G.18
TOP: Constructions

138 ANS: 1  PTS: 2  REF: 011120ge  STA: G.G.18
TOP: Constructions

139 ANS: 2  PTS: 2  REF: 061101ge  STA: G.G.18
TOP: Constructions

140 ANS:

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

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

PTS: 2  REF: 011430ge  STA: G.G.18  TOP: Constructions

143 ANS: 1  PTS: 2  REF: fall0807ge  STA: G.G.19  TOP: Constructions

144 ANS:

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

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

146 ANS: 2  PTS: 2  REF: 061020ge  STA: G.G.19  TOP: Constructions

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

148 ANS:

PTS: 2  REF: 081233ge  STA: G.G.19  TOP: Constructions
154 ANS: 

155 ANS: 1 PTS: 2 REF: 011207ge STA: G.G.20 TOP: Constructions

156 ANS: 3 PTS: 2 REF: 011309ge STA: G.G.20 TOP: Constructions

157 ANS: 

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

PTS: 2    REF: 060932ge    STA: G.G.22    TOP: Locus

159 ANS: 2    PTS: 2    REF: 011011ge    STA: G.G.22
TOP: Locus

160 ANS:

PTS: 2    REF: 061033ge    STA: G.G.22    TOP: Locus

161 ANS:

PTS: 2    REF: 081033ge    STA: G.G.22    TOP: Locus

162 ANS: 2    PTS: 2    REF: 061121ge    STA: G.G.22
TOP: Locus
163 ANS:

PTS: 2  REF: 011230ge  STA: G.G.22  TOP: Locus
164 ANS: 2  PTS: 2  REF: 011317ge  STA: G.G.22
TOP: Locus
165 ANS: 4  PTS: 2  REF: 061303ge  STA: G.G.22
TOP: Locus
166 ANS:

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

PTS: 2  REF: 011434ge  STA: G.G.22  TOP: Locus
172 ANS:

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

173 ANS:

PTS: 4  REF: 061135ge  STA: G.G.23  TOP: Locus

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

175 ANS:

PTS: 2  REF: 061234ge  STA: G.G.23  TOP: Locus
176 ANS:

PTS: 2
REF: 081234ge
STA: G.G.23
TOP: Locus

177 ANS:

PTS: 2
REF: 011331ge
STA: G.G.23
TOP: Locus

178 ANS:

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

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

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

181 ANS: 4
The marked 60° angle and the angle above it are on the same straight line and supplementary. This unmarked supplementary angle is 120°. Because the unmarked 120° angle and the marked 120° angle are alternate exterior angles and congruent, \( d \parallel e \).

PTS: 2
REF: 080901ge
STA: G.G.35
TOP: Parallel Lines and Transversals

182 ANS: 2
PTS: 2
REF: 061007ge
STA: G.G.35
TOP: Parallel Lines and Transversals
ANS: Yes, \( m\angle ABD = m\angle BDC = 44 \). 
\[ 180 - (93 + 43) = 44 \] 
\[ x + 19 + 2x + 6 + 3x + 5 = 180. \] 
Because alternate interior angles \( \angle ABD \) and \( \angle CDB \) are congruent, \( AB \) is parallel to \( DC \).

\[ 6x + 30 = 180 \] 
\[ 6x = 150 \] 
\[ x = 25 \] 
\[ x + 19 = 44 \]
190  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

191  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

192  ANS: 2
x^2 + (x + 7)^2 = 13^2
x^2 + x^2 + 14x + 49 = 169
2x^2 + 14x - 120 = 0
2x^2 + 7x - 60 = 0
(x + 12)(x - 5) = 0
x = 5
2x = 10

PTS: 2  REF: 061024ge  STA: G.G.48  TOP: Pythagorean Theorem

193  ANS: 3
8^2 + 24^2 \neq 25^2

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

194  ANS: 3
x^2 + 7^2 = (x + 1)^2
x + 1 = 25
x^2 + 49 = x^2 + 2x + 1
48 = 2x
24 = x

PTS: 2  REF: 081127ge  STA: G.G.48  TOP: Pythagorean Theorem
195  ANS: 2
   \[2^2 + 3^2 \neq 4^2\]

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

196  ANS: 1
If \(\angle A\) is at minimum (50°) and \(\angle B\) is at minimum (90°), \(\angle C\) is at maximum of 40° (180° - (50° + 90°)). If \(\angle A\) is at maximum (60°) and \(\angle B\) is at maximum (100°), \(\angle C\) is at minimum of 20° (180° - (60° + 100°)).

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

197  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

198  ANS:
\[26. \quad x + 3x + 5x - 54 = 180\]
\[9x = 234\]
\[x = 26\]

PTS: 2  REF: 080933ge  STA: G.G.30  TOP: Interior and Exterior Angles of Triangles

199  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

200  ANS:
\[34. \quad 2x - 12 + x + 90 = 180\]
\[3x + 78 = 90\]
\[3x = 102\]
\[x = 34\]

PTS: 2  REF: 061031ge  STA: G.G.30  TOP: Interior and Exterior Angles of Triangles

201  ANS: 1
\[3x + 5 + 4x - 15 + 2x + 10 = 180. \quad m\angle D = 3(20) + 5 = 65. \quad m\angle E = 4(20) - 15 = 65.\]
\[9x = 180\]
\[x = 20\]

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

202  ANS: 4
\[\frac{5}{2 + 3 + 5} \times 180 = 90\]

PTS: 2  REF: 081119ge  STA: G.G.30  TOP: Interior and Exterior Angles of Triangles
203 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

204 ANS: 4  PTS: 2  REF: 081206ge  STA: G.G.30
TOP: Interior and Exterior Angles of Triangles

205 ANS: 1
\[
\frac{180 - 52}{2} = 64. \ 180 - (90 + 64) = 26
\]
PTS: 2  REF: 011314ge  STA: G.G.30  TOP: Interior and Exterior Angles of Triangles

206 ANS: 3
\[
3x + 1 + 4x - 17 + 5x - 20 = 180. \ 3(18) + 1 = 55
12x - 36 = 180 \ 4(18) - 17 = 55
12x = 216 \ 5(18) - 20 = 70
x = 18
\]
PTS: 2  REF: 061308ge  STA: G.G.30  TOP: Interior and Exterior Angles of Triangles

207 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

208 ANS: 4
\[
180 - (40 + 40) = 100
\]
PTS: 2  REF: 080903ge  STA: G.G.31  TOP: Isosceles Triangle Theorem

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

210 ANS:
\[
67. \frac{180 - 46}{2} = 67
\]
PTS: 2  REF: 011029ge  STA: G.G.31  TOP: Isosceles Triangle Theorem

211 ANS: 3  PTS: 2  REF: 061004ge  STA: G.G.31
TOP: Isosceles Triangle Theorem
212 ANS:

\[ \triangle ABC \]

\[ \angle A = 60^\circ, \angle B = 68^\circ, \angle C = 32^\circ \]

PTS: 2  REF: 011129ge  STA: G.G.31  TOP: Isosceles Triangle Theorem

213 ANS: 4  PTS: 2  REF: 061124ge  STA: G.G.31
TOP: Isosceles Triangle Theorem

214 ANS:

No, \( \angle KGH \) is not congruent to \( \angle GKH \).

PTS: 2  REF: 081135ge  STA: G.G.31  TOP: Isosceles Triangle Theorem

215 ANS: 1

\[ \triangle LMN \]

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

216 ANS: 2

\[ 3x + x + 20 + x + 20 = 180 \]

\[ 5x = 40 \]

\[ x = 28 \]

PTS: 2  REF: 081222ge  STA: G.G.31  TOP: Isosceles Triangle Theorem
217 ANS:
\[ x + 3x - 60 + 5x - 30 = 180 \quad 5(30) - 30 = 120 \quad 6y - 8 = 4y - 2 \quad \overline{DC} = 10 + 10 = 20 \]
\[ 9x - 90 = 180 \quad m\angle BAC = 180 - 120 = 60 \quad 2y = 6 \]
\[ 9x = 270 \quad y = 3 \]
\[ x = 30 = m\angle D \quad 4(3) - 2 = 10 = \overline{BC} \]

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

218 ANS: 4

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

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

219 ANS: 1

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

220 ANS:

\[ 6x + 20 = x + 40 + 4x - 5 \]
\[ 6x + 20 = 5x + 35 \]
\[ x = 15 \]
\[ 6((15)) + 20 = 110 \]

PTS: 2  REF: 081031ge  STA: G.G.32  TOP: Exterior Angle Theorem
221 ANS: 3
\[x + 2x + 15 = 5x + 15 \quad 2(5) + 15 = 25\]
\[3x + 15 = 5x + 5\]
\[10 = 2x\]
\[5 = x\]

PTS: 2 \hspace{1em} REF: 011127ge \hspace{1em} STA: G.G.32 \hspace{1em} TOP: Exterior Angle Theorem

222 ANS: 2

PTS: 2 \hspace{1em} REF: 061107ge \hspace{1em} STA: G.G.32

TOP: Exterior Angle Theorem

223 ANS: 3

PTS: 2 \hspace{1em} REF: 081111ge \hspace{1em} STA: G.G.32

TOP: Exterior Angle Theorem

224 ANS: 2

PTS: 2 \hspace{1em} REF: 011206ge \hspace{1em} STA: G.G.32

TOP: Exterior Angle Theorem

225 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 \hspace{1em} REF: 061225ge \hspace{1em} STA: G.G.32 \hspace{1em} TOP: Exterior Angle Theorem

226 ANS: 4
\[6x = x + 40 + 3x + 10. \quad m\angle CAB = 25 + 40 = 65\]
\[6x = 4x + 50\]
\[2x = 50\]
\[x = 25\]

PTS: 2 \hspace{1em} REF: 081310ge \hspace{1em} STA: G.G.32 \hspace{1em} TOP: Exterior Angle Theorem

227 ANS: 2
\[m\angle ABC = 55, \text{ so } m\angle ACR = 60 + 55 = 115\]

PTS: 2 \hspace{1em} REF: 011414ge \hspace{1em} STA: G.G.32 \hspace{1em} TOP: Exterior Angle Theorem

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

PTS: 2 \hspace{1em} REF: fall0819ge \hspace{1em} STA: G.G.33 \hspace{1em} TOP: Triangle Inequality Theorem

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

PTS: 2 \hspace{1em} REF: 080916ge \hspace{1em} STA: G.G.33 \hspace{1em} TOP: Triangle Inequality Theorem

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

PTS: 2 \hspace{1em} REF: 011228ge \hspace{1em} STA: G.G.33 \hspace{1em} TOP: Triangle Inequality Theorem
Longest side of a triangle is opposite the largest angle. Shortest side is opposite the smallest angle.

\[ AC: \ \text{m} \angle BCA = 63 \text{ and m} \angle ABC = 80. \ \overline{AC} \text{ is the longest side as it is opposite the largest angle.} \]

\[ m \angle A = 80 \]

\[ x^2 + 12 + 11x + 5 + 13x - 17 = 180. \ \text{m} \angle A = 6^2 + 12 = 48 \ . \ \angle B \text{ is the largest angle, so } \overline{AC} \text{ in the longest side.} \]

\[ x^2 + 24x - 180 = 0 \]
\[ (x + 30)(x - 6) = 0 \]
\[ x = 6 \]
242 ANS: 4  
\[ \Delta ABC \sim \Delta DBE. \quad \frac{AB}{DB} = \frac{AC}{DE} \]
\[ \frac{9}{2} = \frac{x}{3} \]
\[ x = 13.5 \]

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

243 ANS: 
5. \( \frac{3}{x} = \frac{6 + 3}{15} \)
\[ 9x = 45 \]
\[ x = 5 \]

PTS: 2  REF: 011033ge  STA: G.G.46  TOP: Side Splitter Theorem

244 ANS: 2  
\[ \frac{3}{7} = \frac{6}{x} \]
\[ 3x = 42 \]
\[ x = 14 \]

PTS: 2  REF: 081027ge  STA: G.G.46  TOP: Side Splitter Theorem

245 ANS: 
32. \( \frac{16}{20} = \frac{x - 3}{x + 5} \). \( AC = x - 3 = 35 - 3 = 32 \)
\[ 16x + 80 = 20x - 60 \]
\[ 140 = 4x \]
\[ 35 = x \]

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

246 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
\[
\frac{5}{7} = \frac{10}{x}
\]
\[5x = 70\]
\[x = 14\]

**PTS:** 2  
**REF:** 081103ge  
**STA:** G.G.46  
**TOP:** Side Splitter Theorem

\[
\frac{8}{2} = \frac{12}{x}
\]
\[8x = 24\]
\[x = 3\]

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

249 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
Geometry Regents Exam Questions by Performance Indicator: Topic
Answer Section

251 ANS: 3

252 ANS:
37. Since $DE$ is a midsegment, $AC = 14$. $10 + 13 + 14 = 37$

253 ANS: 1

254 ANS: 2
$$\frac{4x + 10}{2} = 2x + 5$$

255 ANS:
$$M\left(\frac{-7 + 5}{2}, \frac{2 + 4}{2}\right) = M(-1,3). \quad N\left(\frac{3 + 5}{2}, \frac{-4 + 4}{2}\right) = N(4,0). \quad MN \text{ is a midsegment.}$$
20 + 8 + 10 + 6 = 44.

\[3x - 15 = 2(6)\]
\[3x = 27\]
\[x = 9\]

\[BG\] is also an angle bisector since it intersects the concurrence of \(CD\) and \(AE\)
267 ANS:

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

PTS: 2      REF: 081134ge    STA: G.G.21
TOP: Centroid, Orthocenter, Incenter and Circumcenter

268 ANS: 3      PTS: 2      REF: 011202ge    STA: G.G.21
TOP: Centroid, Orthocenter, Incenter and Circumcenter

269 ANS: 1      PTS: 2      REF: 061214ge    STA: G.G.21
TOP: Centroid, Orthocenter, Incenter and Circumcenter

270 ANS: 4      PTS: 2      REF: 081224ge    STA: G.G.21
TOP: Centroid, Orthocenter, Incenter and Circumcenter

271 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

272 ANS:
6. The centroid divides each median into segments whose lengths are in the ratio 2 : 1. \(\overline{TD} = 6 \text{ and } \overline{DB} = 3\)

PTS: 2      REF: 011034ge    STA: G.G.43    TOP: Centroid

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

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

274 ANS: 1      PTS: 2      REF: 061104ge    STA: G.G.43
TOP: Centroid

275 ANS: 1
7x + 4 = 2(2x + 5). \(PM = 2(2) + 5 = 9\)
7x + 4 = 4x + 10
3x = 6
x = 2

PTS: 2      REF: 011226ge    STA: G.G.43    TOP: Centroid
276. 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

277. 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

278. ANS: 1
\[2x + x = 12. \quad \overline{BD} = 2(4) = 8\]
\[3x = 12\]
\[x = 4\]

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

279. 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

280. ANS:
\[15 + 5\sqrt{5}\]

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

281. ANS: 2    PTS: 2
REF: 061115ge    STA: G.G.69
TOP: Triangles in the Coordinate Plane

282. ANS: 2
REF: 081226ge    STA: G.G.69
TOP: Triangles in the Coordinate Plane

283. ANS: 3
\[AB = 8 - 4 = 4. \quad BC = \sqrt{(-2 - (-5))^2 + (8 - 6)^2} = \sqrt{13}. \quad AC = \sqrt{(-2 - (-5))^2 + (4 - 6)^2} = \sqrt{13}\]

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

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

PTS: 2    REF: 061331ge    STA: G.G.69    TOP: Triangles in the Coordinate Plane
The sum of the interior angles of a pentagon is \((5 - 2)180 = 540\).

\[
\text{sum of interior } \angle s = \text{sum of exterior } \angle s
\]

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

\[
180n - 360 = 180n - 180n + 360
\]

\[
180n = 720
\]

\[
n = 4
\]

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

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

\[
\angle A = \frac{(n - 2)180}{n} = \frac{(5 - 2)180}{5} = 108 \quad \angle AEB = \frac{180 - 108}{2} = 36
\]
292 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

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

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

294 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

295 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

296 ANS: 4
\[
(n - 2)180 - n\left(\frac{(n - 2)180}{n}\right) = 180n - 360 - 180n + 180n - 360 = 180n - 720.
\]
\[
180(5) - 720 = 180
\]

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

297 ANS: 3
The regular polygon with the smallest interior angle is an equilateral triangle, with 60°. 180° - 60° = 120°

PTS: 2 REF: 011417ge STA: G.G.37 TOP: Interior and Exterior Angles of Polygons

298 ANS: 1
\[\angle DCB \text{ and } \angle ADC \text{ are supplementary adjacent angles of a parallelogram. } 180 - 120 = 60. \quad \angle 2 = 60 - 45 = 15.\]

PTS: 2 REF: 080907ge STA: G.G.38 TOP: Parallelograms

299 ANS: 1
Opposite sides of a parallelogram are congruent. \[4x - 3 = x + 3. \quad SV = (2) + 3 = 5.\]
\[
3x = 6
\]
\[
x \quad 2
\]

PTS: 2 REF: 011013ge STA: G.G.38 TOP: Parallelograms

300 ANS: 3
TOP: Parallelograms

PTS: 2 REF: 011104ge STA: G.G.38 TOP: Parallelograms
301 ANS: 3  PTS: 2  REF: 061111ge  STA: G.G.38
TOP: Parallelograms

302 ANS:
11. \[ x^2 + 6x = x + 14. \]
\[ 6(2) - 1 = 11 \]
\[ x^2 + 5x - 14 = 0 \]
\[ (x + 7)(x - 2) = 0 \]
\[ x = 2 \]

303 ANS: 8

PTS: 2  REF: 081235ge  STA: G.G.38  TOP: Parallelograms

304 ANS: 1


305 ANS: 3

\[ \sqrt{5^2 + 12^2} = 13 \]

306 ANS: 1

PTS: 2  REF: 061116ge  STA: G.G.39  TOP: Special Parallelograms

307 ANS: 1

PTS: 2  REF: 061125ge  STA: G.G.39  TOP: Special Parallelograms

308 ANS: 3

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

309 ANS: 2

The diagonals of a rhombus are perpendicular. \[ 180 - (90 + 12) = 78 \]

310 ANS: 3

PTS: 2  REF: 011204ge  STA: G.G.39  TOP: Special Parallelograms

TOP: Special Parallelograms
311 ANS: 4  
\[2x - 8 = x + 2. \quad AE = 10 + 2 = 12. \quad AC = 2(AE) = 2(12) = 24\]
\[x = 10\]

PTS: 2  
REF: 011327ge  
STA: G.G.39  
TOP: Special Parallelograms

312 ANS: 2  
\[\sqrt{8^2 + 15^2} = 17\]

PTS: 2  
REF: 061326ge  
STA: G.G.39  
TOP: Special Parallelograms

313 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

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

315 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

316 ANS: 3  
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

317 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

318 ANS: 4  
PTS: 2  
REF: 061008ge  
STA: G.G.40  
TOP: Trapezoids

TOP: Trapezoids
319 ANS: 3

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

PTS: 2 \hspace{1em} \text{REF: 061016ge} \hspace{1em} \text{STA: G.G.40} \hspace{1em} \text{TOP: Trapezoids}

320 ANS:
70. \(3x + 5 + 3x + 5 + 2x + 2x = 180\)
   \[
   10x + 10 = 360
   \]
   \[
   10x = 350
   \]
   \[
   x = 35
   \]
   \[
   2x = 70
   \]

PTS: 2 \hspace{1em} \text{REF: 081029ge} \hspace{1em} \text{STA: G.G.40} \hspace{1em} \text{TOP: Trapezoids}

321 ANS: 4

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

PTS: 2 \hspace{1em} \text{REF: 011219ge} \hspace{1em} \text{STA: G.G.40} \hspace{1em} \text{TOP: Trapezoids}

322 ANS: 1

\[
\frac{40 - 24}{2} = 8. \quad \sqrt{10^2 - 8^2} = 6.
\]

PTS: 2 \hspace{1em} \text{REF: 061204ge} \hspace{1em} \text{STA: G.G.40} \hspace{1em} \text{TOP: Trapezoids}

323 ANS: 1

The length of the midsegment of a trapezoid is the average of the lengths of its bases.
\[
\frac{x + 3 + 5x - 9}{2} = 2x + 2.
\]
\[
6x - 6 = 4x + 4
\]
\[
2x = 10
\]
\[
x = 5
\]

PTS: 2 \hspace{1em} \text{REF: 081221ge} \hspace{1em} \text{STA: G.G.40} \hspace{1em} \text{TOP: Trapezoids}
324 ANS: 3

\[ 2(4x + 20) + 2(3x - 15) = 360. \quad \angle D = 3(25) - 15 = 60 \]

\[ 8x + 40 + 6x - 30 = 360 \]

\[ 14x + 10 = 360 \]

\[ 14x = 350 \]

\[ x = 25 \]

PTS: 2 REF: 011321ge STA: G.G.40 TOP: Trapezoids

325 ANS: 2

Isosceles or not, \( \triangle RSV \) and \( \triangle RST \) 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

326 ANS:

\[ 12x - 4 + 180 - 6x + 6x + 7x + 13 = 360. \quad 16y + 1 = \frac{12y + 1 + 18y + 6}{2} \]

\[ 19x + 189 = 360 \]

\[ 32y + 2 = 30y + 7 \]

\[ 19x = 171 \]

\[ 2y = 5 \]

\[ x = 9 \]

\[ y = \frac{5}{2} \]

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

327 ANS: 1 PTS: 2 REF: 080918ge STA: G.G.41 TOP: Special Quadrilaterals

328 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

329 ANS:

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

PTS: 4 REF: 081038ge STA: G.G.69 TOP: Quadrilaterals in the Coordinate Plane
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.

$$m_{AB} = \frac{-2+8}{2}, \frac{-6+2}{2} = D(2, 3)$$

$$m_{BC} = \frac{8-2}{2}, \frac{6+2}{2} = E(4, 3)$$

$$m_{DE} = \frac{3-2}{4-0} = \frac{5}{4}$$

$$AF = \sqrt{5^2 + 4^2} = \sqrt{41}$$

$$AD = \sqrt{2^2 + 3^2} = \sqrt{13}$$

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

$$\sqrt{(-2-4)^2 + (-3-(-1))^2} = \sqrt{40} = \sqrt{4 \times 10} = 2\sqrt{10}$$

$$m_{AB} = \frac{4-1}{4-2} = \frac{3}{2}$$

$$m_{BC} = \frac{-2}{3}$$
335 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.

\[
MN = \sqrt{(-5 - 0)^2 + (5 - 3)^2} = \sqrt{29}.
\]
\[
NA = \sqrt{(0 - 2)^2 + (3 - 4)^2} = \sqrt{53}.
\]

\(MN\) is not congruent to \(NP\), so \(MNPQ\) is not a rhombus since not all sides are congruent.

336 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 \(ED = 4\), \(BD = 8\).

337 ANS: 1
The closer a chord is to the center of a circle, the longer the chord.

338 ANS: 3
PTS: 6 REF: 081338ge STA: G.G.69 TOP: Quadrilaterals in the Coordinate Plane

PTS: 2 REF: fall0811ge STA: G.G.49 TOP: Chords

PTS: 2 REF: 011005ge STA: G.G.49 TOP: Chords
\[ \sqrt{6^2 - 2^2} = \sqrt{32} = \sqrt{16} \sqrt{2} = 4 \sqrt{2} \]

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

ANS:

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

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

ANS: 2

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

PTS: 2  REF: 061221ge  STA: G.G.49  TOP: Chords

TOP: Chords

ANS: 3

\[ 2(y + 10) = 4y - 20. \ DF = y + 10 = 20 + 10 = 30. \ OA = OD = \sqrt{16^2 + 30^2} = 34 \]

\[ 2y + 20 = 4y - 20 \]

\[ 40 = 2y \]

\[ 20 = y \]

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

TOP: Chords

ANS: 4

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

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

TOP: Chords

ANS: 2

Parallel chords intercept congruent arcs. \( m\overarc{AD} = m\overarc{BC} = 60 \). \( m\angle CDB = \frac{1}{2} m\overarc{BC} = 30 \).

PTS: 2  REF: 060906ge  STA: G.G.52  TOP: Chords

TOP: Chords

ANS: 2

Parallel chords intercept congruent arcs. \( m\overarc{AC} = m\overarc{BD} = 30 \). \( 180 - 30 - 30 = 120 \).

PTS: 2  REF: 080904ge  STA: G.G.52  TOP: Chords
348 ANS: 1
Parallel lines intercept congruent arcs.

349 ANS: 1
Parallel lines intercept congruent arcs.

350 ANS: $\frac{180 - 80}{2} = 50$

351 ANS:
$2x - 20 = x + 20. \ m\overline{AB} = x + 20 = 40 + 20 = 60$
$x = 40$

352 ANS: 3
$\frac{180 - 70}{2} = 55$

353 ANS: 4
Parallel lines intercept congruent arcs.

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

355 ANS: 1
Parallel chords intercept congruent arcs. $m\overline{AC} = m\overline{BD}$. $\frac{180 - 110}{2} = 35$

356 ANS: 4
If the ratio of $TA$ to $AC$ is 1:3, the ratio of $TE$ to $ES$ is also 1:3. $x + 3x = 24$. $3(6) = 18$.
$x = 6$

357 ANS: 3
PTS: 2
REF: fall0824ge
TOP: Tangents
KEY: common tangency

358 ANS: 3
PTS: 2
REF: 080928ge
TOP: Tangents
KEY: common tangency
359 ANS: 1 PTS: 2 REF: 061013ge STA: G.G.50
TOP: Tangents KEY: point of tangency
360 ANS: 1 PTS: 2 REF: 081012ge STA: G.G.50
TOP: Tangents KEY: two tangents
361 ANS: 4
$$\sqrt{25^2 - 7^2} = 24$$
PTS: 2 REF: 081105ge STA: G.G.50 TOP: Tangents
KEY: point of tangency
362 ANS: 2 PTS: 2 REF: 081214ge STA: G.G.50
TOP: Tangents KEY: point of tangency
363 ANS:
\[\begin{array}{c}
\text{PTS: 2 REF: 011330ge STA: G.G.50 TOP: Tangents} \\
\text{KEY: common tangency}
\end{array}\]
364 ANS: 2
$$\sqrt{15^2 - 12^2} = 9$$
PTS: 2 REF: 081325ge STA: G.G.50 TOP: Tangents
KEY: point of tangency
365 ANS: 3
$$180 - 38 = 142$$
PTS: 2 REF: 011419ge STA: G.G.50 TOP: Tangents
KEY: two tangents
366 ANS: 4 PTS: 2 REF: 011428ge STA: G.G.50
TOP: Tangents KEY: common tangency
367 ANS:
\[\begin{array}{c}
\angle D, \angle G \text{ and } 24^\circ \text{ or } \angle E, \angle F \text{ and } 84^\circ. \quad \overleftrightarrow{FE} = \frac{2}{15} \times 360 = 48. \quad \text{Since the chords forming } \angle D \text{ and } \angle G \text{ are} \\
\text{intercepted by } \overleftrightarrow{FE}, \text{ their measure is } 24^\circ. \quad \overleftrightarrow{GD} = \frac{7}{15} \times 360 = 168. \quad \text{Since the chords forming } \angle E \text{ and } \angle F \text{ are} \\
\text{intercepted by } \overleftrightarrow{GD}, \text{ their measure is } 84^\circ.
\end{array}\]
PTS: 4 REF: fall0836ge STA: G.G.51 TOP: Arcs Determined by Angles
KEY: inscribed
368 ANS: 2
$$\frac{87 + 35}{2} = \frac{122}{2} = 61$$
PTS: 2 REF: 011015ge STA: G.G.51 TOP: Arcs Determined by Angles
KEY: inside circle
369 \[\text{ANS: } 3\]
\[\frac{36 + 20}{2} = 28\]

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

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

\[
\begin{align*}
\text{PTS: } 2 & \quad \text{REF: } 061026GE \quad \text{STA: } G.G.51 \quad \text{TOP: Arcs Determined by Angles} \\
\text{KEY: inscribed} & \\
\end{align*}
\]

371 \[\text{ANS: } 2\]
\[
\begin{align*}
\frac{140 - RS}{2} & = 40 \\
140 - RS & = 80 \\
RS & = 60
\end{align*}
\]

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

372 \[\text{ANS: } 4\]
\[\text{PTS: } 2\]

\[
\begin{align*}
\text{REF: } 011124ge & \quad \text{STA: } G.G.51 \\
\text{TOP: Arcs Determined by Angles} & \\
\text{KEY: inscribed} & \\
\end{align*}
\]

373 \[\text{ANS: } 30\]
\[3x + 4x + 5x = 360. \quad mLN : mNK : mKL = 90:120:150. \quad \frac{150 - 90}{2} = 30\]
\[x = 20\]

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

374 \[\text{ANS: } 2\]
\[
\begin{align*}
\frac{50 + x}{2} & = 34 \\
50 + x & = 68 \\
x & = 18
\end{align*}
\]

PTS: 2  REF: 011214ge  STA: G.G.51  TOP: Arcs Determined by Angles
KEY: inside circle
375 \text{ ANS: } \sqrt{52, 40, 80}.
\[ 360 - (56 + 112) = 192. \quad \frac{192 - 112}{2} = 40. \quad \frac{112 + 48}{2} = 80 \]
\[ \frac{1}{4} \times 192 = 48 \]
\[ \frac{56 + 48}{2} = 52 \]

376 \text{ ANS: } 1
\[ \frac{70 - 20}{2} = 25 \]

377 \text{ ANS: } 2

378 \text{ ANS: } 2
\[ x^2 = 3(x + 18) \]
\[ x^2 - 3x - 54 = 0 \]
\[ (x - 9)(x + 6) = 0 \]
\[ x = 9 \]

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

380 \text{ ANS: } 2
\[ 4(4x - 3) = 3(2x + 8) \]
\[ 16x - 12 = 6x + 24 \]
\[ 10x = 36 \]
\[ x = 3.6 \]
381 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

382 ANS: 2
\[(d + 4)4 = 12(6)\]
\[4d + 16 = 72\]
\[d = 14\]
\[r = 7\]

PTS: 2  REF: 061023ge  STA: G.G.53  TOP: Segments Intercepted by Circle
KEY: two secants

383 ANS: 1
\[4x = 6 \cdot 10\]
\[x = 15\]

PTS: 2  REF: 081017ge  STA: G.G.53  TOP: Segments Intercepted by Circle
KEY: two chords

384 ANS: 3

PTS: 2  REF: 011101ge  STA: G.G.53  TOP: Segments Intercepted by Circle
KEY: two tangents
385 ANS:
\[ x^2 = 9 \cdot 8 \]
\[ x = \sqrt{72} \]
\[ x = \sqrt{36} \cdot \sqrt{2} \]
\[ x = 6 \sqrt{2} \]

PTS: 2            REF: 011132ge  STA: G.G.53  TOP: Segments Intercepted by Circle
KEY: two chords

386 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

387 ANS: 4            PTS: 2            REF: 011208ge  STA: G.G.53  TOP: Segments Intercepted by Circle
KEY: two tangents

388 ANS:
\[ x(x + 2) = 12 \cdot 2. \quad RT = 6 + 4 = 10. \quad y \cdot y = 18 \cdot 8 \]
\[ x^2 + 2x - 24 = 0 \]
\[ (x + 6)(x - 4) = 0 \]
\[ x = 4 \]
\[ y^2 = 144 \]
\[ y = 12 \]

PTS: 4            REF: 061237ge  STA: G.G.53  TOP: Segments Intercepted by Circle
KEY: tangent and secant
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

ANS: 1

\[
8 \times 12 = 16x
\]

\[
6 = x
\]

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

KEY: two chords

ANS: 1

\[
M_x = \frac{-2 + 6}{2} = 2. \quad M_y = \frac{3 + 3}{2} = 3. \quad \text{The center is (2, 3).} \quad d = \sqrt{(-2 - 6)^2 + (3 - 3)^2} = \sqrt{64 + 0} = 8. \quad \text{If the diameter is 8, the radius is 4 and } r^2 = 16.
\]

PTS: 2  REF: fall0820ge  STA: G.G.71  TOP: Equations of Circles

ANS: 2

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

TOP: Equations of Circles

ANS: 3

PTS: 2  REF: 011010ge  STA: G.G.71

TOP: Equations of Circles

ANS: 4

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

\[
r = 5
\]

\[
r^2 = 25
\]

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


ANS: 3

PTS: 2  REF: 011116ge  STA: G.G.71

TOP: Equations of Circles

ANS: 4

PTS: 2  REF: 081110ge  STA: G.G.71

TOP: Equations of Circles

ANS: 4

PTS: 2  REF: 011212ge  STA: G.G.71

TOP: Equations of Circles

ANS: 3

PTS: 2  REF: 061210ge  STA: G.G.71

TOP: Equations of Circles

ANS: 3

PTS: 2  REF: 081209ge  STA: G.G.71

TOP: Equations of Circles

ANS: 3

If \( r = 5 \), then \( r^2 = 25. \quad (x + 3)^2 + (y - 2)^2 = 25 \)

PTS: 2  REF: 011332ge  STA: G.G.71  TOP: Equations of Circles
The radius is 4. \( r^2 = 16 \).

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

\[
(x - 5)^2 + (y + 4)^2 = 36
\]
421 ANS: 1   PTS: 2   REF: 061223ge   STA: G.G.73
TOP: Equations of Circles

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

423 ANS: 4   PTS: 2   REF: 061319ge   STA: G.G.73
TOP: Equations of Circles

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

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

426 ANS: 4   PTS: 2   REF: 011426ge   STA: G.G.73
TOP: Equations of Circles

427 ANS: 1   PTS: 2   REF: 060920ge   STA: G.G.74
TOP: Graphing Circles

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

429 ANS: 2   PTS: 2   REF: 011125ge   STA: G.G.74
TOP: Graphing Circles

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

431 ANS: 1   PTS: 2   REF: 061325ge   STA: G.G.74
TOP: Graphing Circles

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

433 ANS:
4. \(l_1w_1h_1 = l_2w_2h_2\)
\[10 \times 2 \times h = 5 \times w_2 \times h\]
\[20 = 5w_2\]
\[w_2 = 4\]

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

435 ANS: 1
If two prisms have equal heights and volume, the area of their bases is equal.


22
\[
\begin{align*}
3x^2 + 18x + 24 &= 3(x^2 + 6x + 8) \\
&= 3(x + 4)(x + 2)
\end{align*}
\]

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

\[
(11)(8)h = 800
\]
\[
h \approx 9.1
\]

PTS: 2
REF: 061131ge
STA: G.G.12
TOP: Volume

\[
Bh = V
\]
\[
12h = 84
\]
\[
h = 7
\]

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

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

PTS: 2
REF: 080930ge
STA: G.G.13
TOP: Volume

\[
18. \quad V = \frac{1}{3}Bh = \frac{1}{3}lwh
\]
\[
288 = \frac{1}{3} \cdot 8 \cdot 6 \cdot h
\]
\[
288 = 16h
\]
\[
18 = h
\]

PTS: 2
REF: 061034ge
STA: G.G.13
TOP: Volume

\[
22.4. \quad V = \pi r^2h
\]
\[
12566.4 = \pi r^2 \cdot 8
\]
\[
r^2 = \frac{12566.4}{8\pi}
\]
\[
r \approx 22.4
\]

PTS: 2
REF: fall0833ge
STA: G.G.14
TOP: Volume and Lateral Area
444 ANS: 1
\[ V = \pi r^2 h \]
\[ 1000 = \pi r^2 \cdot 8 \]
\[ r^2 = \frac{1000}{8\pi} \]
\[ r \approx 6.3 \]

PTS: 2 REF: 080926ge STA: G.G.14 TOP: Volume and Lateral Area

445 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

446 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

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

PTS: 2 REF: 011117ge STA: G.G.14 TOP: Volume and Lateral Area

448 ANS:
\[ V = \pi r^2 h \quad L = 2\pi rh = 2\pi \cdot 5 \cdot \sqrt{2} \cdot 12 \approx 533.1 \]
\[ 600\pi = \pi r^2 \cdot 12 \]
\[ 50 = r^2 \]
\[ \sqrt{25} \sqrt{2} = r \]
\[ 5\sqrt{2} = r \]

PTS: 4 REF: 011236ge STA: G.G.14 TOP: Volume and Lateral Area

449 ANS:
\[ L = 2\pi rh = 2\pi \cdot 12 \cdot 22 \approx 1659. \quad \frac{1659}{600} \approx 2.8. \quad 3 \text{ cans are needed.} \]

PTS: 2 REF: 061233ge STA: G.G.14 TOP: Volume and Lateral Area

450 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

451 ANS:
\[ L = 2\pi rh = 2\pi \cdot 3 \approx 94.25. \quad V = \pi r^2 h = \pi (3)^2 (5) \approx 141.37 \]

PTS: 4 REF: 011335ge STA: G.G.14 TOP: Volume and Lateral Area
\[ L = 2\pi rh = 2\pi \cdot 3 \cdot 7 = 42\pi \]

\[ 18\pi \cdot 42 = 2375 \]

\[ V = \frac{1}{3} \pi r^2 h = \frac{1}{3} \pi \cdot 4^2 \cdot 12 \approx 201 \]

\[ 375\pi \ L = \pi rl = \pi (15)(25) = 375\pi \]

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

\[ 10 = l \]

\[ 452. \ SA = 4\pi r^2 = 4\pi \cdot 6^2 = 144\pi \approx 452 \]

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

\[ 144\pi = 4\pi r^2 \]

\[ 36 = r^2 \]

\[ 6 = r \]

\[ 459. \ ANS: \]

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

\[ 460. \ ANS: \]

\[ V = \frac{4}{3} \pi \cdot 9^3 = 972\pi \]

\[ PTS: 2 \]

\[ REF: \ 061329ge \]

\[ STA: \ G.G.14 \]

\[ TOP: \ Volume \ and \ Lateral \ Area \]

\[ PTS: 2 \]

\[ REF: \ 011418ge \]

\[ STA: \ G.G.14 \]

\[ TOP: \ Volume \ and \ Lateral \ Area \]

\[ PTS: 2 \]

\[ REF: \ 060921ge \]

\[ STA: \ G.G.15 \]

\[ TOP: \ Volume \]

\[ PTS: 2 \]

\[ REF: \ 081030ge \]

\[ STA: \ G.G.15 \]

\[ TOP: \ Lateral \ Area \]

\[ PTS: 2 \]

\[ REF: \ 081314ge \]

\[ STA: \ G.G.15 \]

\[ TOP: \ Volume \ and \ Lateral \ Area \]

\[ PTS: 2 \]

\[ REF: \ 061029ge \]

\[ STA: \ G.G.16 \]

\[ TOP: \ Volume \ and \ Surface \ Area \]

\[ PTS: 2 \]

\[ REF: \ 061029ge \]

\[ STA: \ G.G.16 \]

\[ TOP: \ Volume \ and \ Surface \ Area \]

\[ PTS: 2 \]

\[ REF: \ 081020ge \]

\[ STA: \ G.G.16 \]

\[ TOP: \ Surface \ Area \]

\[ PTS: 2 \]

\[ REF: \ 061122ge \]

\[ STA: \ G.G.16 \]

\[ TOP: \ Volume \ and \ Surface \ Area \]

\[ PTS: 2 \]

\[ REF: \ 081131ge \]

\[ STA: \ G.G.16 \]

\[ TOP: \ Volume \ and \ Surface \ Area \]
461 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

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

PTS: 2   REF: 081215ge   STA: G.G.16   TOP: Volume and Surface Area

463 ANS: 1
\[ V = \frac{4}{3} \pi r^3 \]
\[ 44.6022 = \frac{4}{3} \pi r^3 \]
\[ 10.648 \approx r^3 \]
\[ 2.2 \approx r \]

PTS: 2   REF: 061317ge   STA: G.G.16   TOP: Volume and Surface Area

464 ANS:
\[ SA = 4 \pi r^2 = 4 \pi \cdot 2.5^2 = 25 \pi \approx 78.54 \]

PTS: 2   REF: 011429ge   STA: G.G.16   TOP: Volume and Surface Area

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

PTS: 2   REF: fall0826ge   STA: G.G.45   TOP: Similarity
KEY: perimeter and area

466 ANS:
20. 5x + 10 = 4x + 30
\[ x = 20 \]

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

467 ANS: 2
Because the triangles are similar, \[ \frac{m\angle A}{m\angle D} = 1 \]

PTS: 2   REF: 011022ge   STA: G.G.45   TOP: Similarity
KEY: perimeter and area

468 ANS: 4
180 – (50 + 30) = 100

PTS: 2   REF: 081006ge   STA: G.G.45   TOP: Similarity
KEY: basic
469 ANS: 4  PTS: 2  REF: 081023ge  STA: G.G.45
TOP: Similarity  KEY: perimeter and area

470 ANS: 3
\[ \frac{7x}{4} = \frac{7}{x} \cdot 7(2) = 14 \]
\[ 7x^2 = 28 \]
\[ x = 2 \]

PTS: 2  REF: 061120ge  STA: G.G.45  TOP: Similarity
KEY: basic

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

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

472 ANS: 3  PTS: 2  REF: 061224ge  STA: G.G.45
TOP: Similarity  KEY: basic

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

474 ANS: 2
Perimeter of \( \Delta DEF \) 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

475 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
\[ \frac{15}{18} = \frac{5}{6} \]

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

\[ 2\sqrt{3}. \ x^2 = 3 \cdot 4 \]
\[ x = \sqrt{12} = 2\sqrt{3} \]

PTS: 2  REF: fall0829ge  STA: G.G.47  TOP: Similarity
KEY: altitude

\[ AB = 10 \text{ since } \triangle ABC \text{ is a 6-8-10 triangle.} \quad 6^2 = 10x \]
\[ 3.6 = x \]

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

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

PTS: 2  REF: 080922ge  STA: G.G.47  TOP: Similarity
KEY: leg

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

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

\[ 6^2 = x(x + 5) \]
\[ 36 = x^2 + 5x \]
\[ 0 = x^2 + 5x - 36 \]
\[ 0 = (x + 9)(x - 4) \]
\[ x = 4 \]

PTS: 2  REF: 011123ge  STA: G.G.47  TOP: Similarity
KEY: leg
482 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

483 ANS: 4
\[ x \cdot 4x = 6^2 \]
\[ PQ = 4x + x = 5x = 5(3) = 15 \]
\[ 4x^2 = 36 \]
\[ x = 3 \]

PTS: 2  REF: 011227ge  STA: G.G.47  TOP: Similarity
KEY: leg

484 ANS: 1
\[ x^2 = 3 \times 12 \]
\[ x = 6 \]

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

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

PTS: 2  REF: 061327ge  STA: G.G.47  TOP: Similarity
KEY: altitude
Geometry Regents Exam Questions by Performance Indicator: Topic
Answer Section

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

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

487 ANS:
\[ 4x \cdot x = 6^2 \]
\[ 4x^2 = 36 \]
\[ x^2 = 9 \]
\[ x = 3 \]
\[ BD = 4(3) = 12 \]

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

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

PTS: 2
REF: 011232ge
STA: G.G.54
TOP: Rotations

489 ANS:

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

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

490 ANS: 4
\[ (x,y) \rightarrow (-x,-y) \]

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

491 ANS: 4
PTS: 2
REF: 011421ge
STA: G.G.54
TOP: Rotations
492 ANS: 3 PTS: 2 REF: 060905ge STA: G.G.54 TOP: Reflections KEY: basic

493 ANS: 

494 ANS: 

495 ANS: 2 PTS: 2 REF: 081108ge STA: G.G.54 TOP: Reflections KEY: basic

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

497 ANS: 1 
(x,y) → (x + 3, y + 1)

498 ANS: 3 
−5 + 3 = −2 2 + −4 = −2

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

PTS: 2 REF: 011107ge STA: G.G.54 TOP: Translations
499 ANS:

T′(−6, 3), A′(−3, 3), P′(−3, −1)

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

500 ANS:

A′(2, 2), B′(3, 0), C(1, −1)

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

501 ANS:

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

KEY: grids

502 ANS: 1

A′(2, 4)

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

KEY: basic

503 ANS: 3

(3, −2) → (2, 3) → (8, 12)

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

KEY: basic

504 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
505 ANS:

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

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

506 ANS:

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

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

507 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 KEY: grids REF: 061236ge STA: G.G.58 TOP: Compositions of Transformations

508 ANS:

\[ S'(1,3), T'(2,4), P'(3,3) \]

PTS: 4 KEY: grids REF: 081236ge STA: G.G.58 TOP: Compositions of Transformations
\(A^{\prime\prime}(11, 1), B^{\prime\prime}(3, 7), C^{\prime\prime}(3, 1)\)

\(S^{\prime\prime}(5, -3), W^{\prime\prime}(3, -4), A^{\prime\prime}(2, 1), \text{ and } N^{\prime\prime}(4, 2)\)

\(M^{\prime\prime}(1, -2), A^{\prime\prime}(6, -2), T^{\prime\prime}(5, -4), H^{\prime\prime}(3, -4)\)
PTS: 3  REF: 011436ge  STA: G.G.58  TOP: Compositions of Transformations
KEY: grids

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


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

PTS: 1  REF: 011102ge  STA: G.G.55  TOP: Properties of Transformations

$D'(-1,1), E'(-1,5), G'(-4,5)$
Yes. A reflection is an isometry.

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

Distance is preserved after the reflection. 

\[
2x + 13 = 9x - 8 \\
21 = 7x \\
3 = x
\]

Distance is preserved after a rotation.

36, because a dilation does not affect angle measure. 10, because a dilation does affect distance.
532 ANS: 1 PTS: 2 REF: 060903ge STA: G.G.56
TOP: Identifying Transformations

533 ANS: 4 PTS: 2 REF: 080915ge STA: G.G.56
TOP: Identifying Transformations

534 ANS: 2 PTS: 2 REF: 011006ge STA: G.G.56
TOP: Identifying Transformations

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

536 ANS: 4 PTS: 2 REF: 061018ge STA: G.G.56
TOP: Identifying Transformations

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

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

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

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

541 ANS: 4 PTS: 2 REF: 011427ge STA: G.G.56
TOP: Identifying Transformations

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

543 ANS: 2

A dilation affects distance, not angle measure.

PTs: 2 REF: 080906ge STA: G.G.60 TOP: Identifying Transformations

544 ANS: 4 PTS: 2 REF: 061103ge STA: G.G.60
TOP: Identifying Transformations

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

546 ANS: 1

Translations and reflections do not affect distance.

PTs: 2 REF: 080908ge STA: G.G.61 TOP: Analytical Representations of Transformations

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

548 ANS: 4

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

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

549 ANS: 3 PTS: 2 REF: 080924ge STA: G.G.24
TOP: Negations

550 ANS: 2 PTS: 2 REF: 061002ge STA: G.G.24
TOP: Negations
The medians of a triangle are not concurrent. False.

2 is not a prime number, false.

True. The first statement is true and the second statement is false. In a disjunction, if either statement is true, the disjunction is true.

Contrapositive-If two angles of a triangle are not congruent, the sides opposite those angles are not congruent.
Opposite sides of a parallelogram are congruent and the diagonals of a parallelogram bisect each other.
(1) is true because of vertical angles. (3) and (4) are true because CPCTC.
ANS: \( \overline{AC} \cong \overline{EC} \) and \( \overline{DC} \cong \overline{BC} \) because of the definition of midpoint. \( \angle ACB \cong \angle ECD \) because of vertical angles. \( \triangle ABC \cong \triangle EDC \) because of SAS. \( \angle CDE \cong \angle CBA \) because of CPCTC. \( \overline{BD} \) is a transversal intersecting \( \overline{AB} \) and \( \overline{ED} \). Therefore \( \overline{AB} \parallel \overline{DE} \) because \( \angle CDE \) and \( \angle CBA \) are congruent alternate interior angles.

PTS: 6

588 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. \( \angle AEB \cong \angle DCE \) because vertical angles are congruent. \( \triangle ABE \cong \triangle DCE \) because of ASA. \( \overline{AB} \cong \overline{DC} \) because CPCTC.

PTS: 4

589 ANS: 1

\[ AB = CD \]
\[ AB + BC = CD + BC \]
\[ AC = BD \]

PTS: 2

590 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). \( \overline{B} \) is the midpoint of \( \overline{MH} \) and \( T \) is the midpoint of \( \overline{AH} \) (definition of median). \( \overline{mMB} = \frac{1}{2} \overline{mMH} \) and \( \overline{mAT} = \frac{1}{2} \overline{mAH} \) (definition of midpoint). \( \overline{MB} \cong \overline{AT} \) (multiplication postulate). \( \triangle MBA \cong \triangle ATM \) (SAS). \( \angle MBA \cong \angle ATM \) (CPCTC).

PTS: 6

591 ANS:
\( \triangle ABC, \overline{BD} \) bisects \( \angle ABC, \overline{BD} \perp \overline{AC} \) (Given). \( \angle CBD \cong \angle ABD \) (Definition of angle bisector). \( \overline{BD} \cong \overline{BD} \) (Reflexive property). \( \angle CDB \) and \( \angle ADB \) are right angles (Definition of perpendicular). \( \angle CDB \cong \angle ADB \) (All right angles are congruent). \( \triangle CDB \cong \triangle ADB \) (SAS). \( \overline{AB} \cong \overline{CB} \) (CPCTC).

PTS: 4
\[ FE \cong FE \text{ (Reflexive Property); } AE - FE \cong FC - EF \text{ (Line Segment Subtraction Theorem); } AF \cong CE \text{ (Substitution); } \angle BFA \cong \angle DEC \text{ (All right angles are congruent); } \triangle BFA \cong \triangle DEC \text{ (AAS); } AB \cong CD \text{ and } BF \cong DE \text{ (CPCTC); } \angle BFC \cong \angle DEA \text{ (All right angles are congruent); } \triangle BFC \cong \triangle DEA \text{ (SAS); } AD \cong CB \text{ (CPCTC); } ABCD \text{ is a parallelogram (opposite sides of quadrilateral } ABCD \text{ are congruent).}

\]

\text{PTS: 6} \quad \text{REF: 080938ge} \quad \text{STA: G.G.27} \quad \text{TOP: Quadrilateral Proofs}

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

\text{PTS: 4} \quad \text{REF: 011036ge} \quad \text{STA: G.G.27} \quad \text{TOP: Quadrilateral Proofs}

594 ANS:
\[ BD \cong DB \text{ (Reflexive Property); } \triangle ABD \cong \triangle CDB \text{ (SSS); } \angle BDC \cong \angle ABD \text{ (CPCTC).}
\]

\text{PTS: 4} \quad \text{REF: 061035ge} \quad \text{STA: G.G.27} \quad \text{TOP: Quadrilateral Proofs}

595 ANS:
Quadrilateral \( ABCD, \ AD \cong BC \) 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. \( AE \cong CE \) because the diagonals of a parallelogram bisect each other. \( \angle FEA \cong \angle GEC \) as vertical angles. \( \triangle AEF \cong \triangle CEG \) by ASA.

\text{PTS: 6} \quad \text{REF: 011238ge} \quad \text{STA: G.G.27} \quad \text{TOP: Quadrilateral Proofs}

596 ANS: 3 \quad \text{PTS: 2} \quad \text{REF: 081208ge} \quad \text{STA: G.G.27} \quad \text{TOP: Quadrilateral Proofs}
Old | New
---|---
14 | 597 ANS:

Rectangle $ABCD$ with points $E$ and $F$ on side $AB$, segments $CE$ and $DF$ intersect at $G$, and $\angle ADG \cong \angle BCE$ are given. $AD \cong BC$ because opposite sides of a rectangle are congruent. $\angle A$ and $\angle B$ are right angles and congruent because all angles of a rectangle are right and congruent. $\triangle ADF \cong \triangle BCE$ by ASA. $AF \cong BE$ per CPCTC. $EF \cong FE$ under the Reflexive Property. $AF - EF \cong BE - FE$ using the Subtraction Property of Segments. $AE \cong BF$ because of the Definition of Segments.


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

599 ANS:

Because $AB \parallel DC$, $AD \cong BC$ since parallel chords intersect congruent arcs. $\angle BDC \cong \angle ACD$ because inscribed angles that intercept congruent arcs are congruent. $\angle ACD \cong \angle BDC$ because inscribed angles that intercept the same arc are congruent. Therefore, $\triangle ACD \cong \triangle BDC$ because of AAS.

PTS: 6  REF: fall0838ge  STA: G.G.27  TOP: Circle Proofs

600 ANS:

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

PTS: 6  REF: 061138ge  STA: G.G.27  TOP: Circle Proofs

601 ANS:

2. The diameter of a circle is $\perp$ to a tangent at the point of tangency. 4. An angle inscribed in a semicircle is a right angle. 5. All right angles are congruent. 7. AA. 8. Corresponding sides of congruent triangles are in proportion. 9. The product of the means equals the product of the extremes.

PTS: 6  REF: 011438ge  STA: G.G.27  TOP: Circle Proofs

602 ANS: 1

$\triangle PRT$ and $\triangle SRQ$ share $\angle R$ and it is given that $\angle RPT \cong \angle RSQ$.

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

603 ANS: 2

$\angle ACB$ and $\angle ECD$ are congruent vertical angles and $\angle CAB \cong \angle CED$.

PTS: 2  REF: 060917ge  STA: G.G.44  TOP: Similarity Proofs

\[ \angle B \] and \( \angle E \) are right angles because of the definition of perpendicular lines. \( \angle B \cong \angle E \) because all right angles are congruent. \( \angle BFD \) and \( \angle DFE \) are supplementary and \( \angle ECA \) and \( \angle ACB \) are supplementary because of the definition of supplementary angles. \( \angle DFE \cong \angle ACB \) because angles supplementary to congruent angles are congruent. \( \triangle ABC \sim \triangle DEF \) because of AA.

606
\[ \angle ACB \cong \angle AED \] is given. \( \angle A \cong \angle A \) because of the reflexive property. Therefore \( \triangle ABC \sim \triangle ADE \) because of AA.

607
\[ \triangle ABC \sim \triangle DEF \] because of AA.

608
\[ \triangle ABC \sim \triangle DEF \] because of AA.