Dear Sir

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

Letter from Thomas Jefferson to William G. Munford, Monticello, June 18, 1799.
1. 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) $\frac{1}{2}$

2. 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.

3. 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)

4. The diagram below shows the construction of the perpendicular bisector of $AB$.

Which statement is not true?
   1) $AC = CB$
   2) $CB = \frac{1}{2} AB$
   3) $AC = 2AB$
   4) $AC + CB = AB$
5 Which graph could be used to find the solution to the following system of equations?

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

1)  
2)  
3)  
4)  

6 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 \( R \).

7 The diagram below illustrates the construction of \( PS \) parallel to \( RQ \) through point \( P \).

Which statement justifies this construction?

1) \( m\angle 1 = m\angle 2 \)  
2) \( m\angle 1 = m\angle 3 \)  
3) \( \overline{PR} \cong \overline{RQ} \)  
4) \( \overline{PS} \cong \overline{RQ} \)
8 The figure in the diagram below is a triangular prism.

![Triangular Prism Diagram]

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

9 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) $m\angle ABC = 60$

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

![Triangle with Midpoints and Altitude Diagram]

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

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

![Circle and Chord Diagram]

What is the length of $\overline{BD}$?
1) 12
2) 10
3) 8
4) 4

12 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) $y = \frac{1}{2}x - \frac{25}{2}$

13 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) $\left(3,4\frac{1}{2}\right)$
14 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 = \(\sqrt{C}\)

15 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) \(x^2 + 6x + 8\)

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

17 In the diagram below, \(\overline{PS}\) is a tangent to circle \(O\) at point \(S\), \(\overline{PQR}\) is a secant, \(PS = x\), \(PQ = 3\), and \(PR = x + 18\).

What is the length of \(\overline{PS}\)?
1) 6
2) 9
3) 3
4) 27

18 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

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 \(k_2\).
19. In the diagram below of \( \triangle ABC \), \( D \) is a point on \( AB \), \( AC = 7 \), \( AD = 6 \), and \( BC = 18 \).

![Diagram of \( \triangle ABC \) with points labeled A, B, C, D, and line segments AD, DB, and AC drawn.]

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

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

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

![Diagram of \( \triangle PRT \) with points labeled P, R, T, Q, and S drawn.]

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

22. 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

23. The endpoints of \( \overline{AB} \) are \( A(3, 2) \) and \( B(7, 1) \). If \( \overline{A''B''} \) is the result of the transformation of \( \overline{AB} \) under \( D_2 \circ T_{-4,3} \), what are the coordinates of \( A'' \) and \( B'' \)?
1) \( A''(-2, 10) \) and \( B''(6, 8) \)
2) \( A''(-1, 5) \) and \( B''(3, 4) \)
3) \( A''(2, 7) \) and \( B''(10, 5) \)
4) \( A''(14, -2) \) and \( B''(22, -4) \)
24 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

25 In which triangle do the three altitudes intersect outside the triangle?
1) a right triangle
2) an acute triangle
3) an obtuse triangle
4) an equilateral triangle

26 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 $2:1$.

27 What is the measure of an interior angle of a regular octagon?
1) $45^\circ$
2) $60^\circ$
3) $120^\circ$
4) $135^\circ$

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

29 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.
30 The vertices of \( \triangle ABC \) are \( A(3,2) \), \( B(6,1) \), and \( C(4,6) \). Identify and graph a transformation of \( \triangle ABC \) such that its image, \( \triangle A'B'C' \), results in \( AB \parallel A'B' \).

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

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

33 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.

34 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.

35 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 \( GH \parallel DE \).
36 In the diagram below of circle $O$, chords $DF$, $DE$, $FG$, and $EG$ 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.

37 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.

38 In the diagram below, quadrilateral $ABCD$ is inscribed in circle $O$, $AB \parallel DC$, and diagonals $AC$ and $BD$ are drawn. Prove that $\triangle ACD \cong \triangle BDC$. 
0609ge

1 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°

2 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

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

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

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

5 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) \((7, -4)\)
6 In the diagram of circle $O$ below, chords $AB$ and $CD$ are parallel, and $BD$ is a diameter of the circle.

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

7 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) $y = -2x - 9$

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

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

9 In an equilateral triangle, what is the difference between the sum of the exterior angles and the sum of the interior angles?
1) $180^\circ$
2) $120^\circ$
3) $90^\circ$
4) $60^\circ$

10 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) $(x + 3)^2 + (y - 5)^2 = 4$
11 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) $BC < AC < AB$

12 In a coordinate plane, how many points are both 5 units from the origin and 2 units from the x-axis?
1) 1
2) 2
3) 3
4) 4

13 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.

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

15 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

16 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
17 In the diagram of $\triangle ABC$ and $\triangle EDC$ below, $\overline{AE}$ and $\overline{BD}$ intersect at $C$, and $\angle CAB \cong \angle CED$.

Which method can be used to show that $\triangle ABC$ must be similar to $\triangle EDC$?
1) SAS
2) AA
3) SSS
4) HL

18 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

19 Square $LMNO$ is shown in the diagram below.

What are the coordinates of the midpoint of diagonal $LN$?
1) \(\left(\frac{4}{2}, \frac{-2}{2}\right)\)
2) \(\left(\frac{-3}{2}, \frac{3}{2}\right)\)
3) \(\left(\frac{-2}{2}, \frac{3}{2}\right)\)
4) \(\left(\frac{-2}{2}, \frac{4}{2}\right)\)
20 Which graph represents a circle with the equation 
\[(x - 5)^2 + (y + 1)^2 = 9?\]

21 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

22 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 \(\sqrt{13}\)

23 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
24 Side $PQ$ of $\triangle PQR$ is extended through $Q$ to point $T$. Which statement is not always true?
1) $m \angle RQT > m \angle R$
2) $m \angle RQT > m \angle P$
3) $m \angle RQT = m \angle P + m \angle R$
4) $m \angle RQT > m \angle PQR$

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

26 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) $3y = -2x + 12$

27 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

28 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

29 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 $\triangle ABC$.

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

31 Find an equation of the line passing through the point $(5,4)$ and parallel to the line whose equation is $2x + y = 3$. 
32. 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.

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

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

35. 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 $SE$. 
36 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.]

37 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.]

38 Given: $\triangle ABC$ and $\triangle EDC$, $C$ is the midpoint of $BD$ and $AE$
Prove: $AB \parallel DE$
1 Based on the diagram below, which statement is true?

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

2 The diagram below shows the construction of the bisector of $\angle ABC$.

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

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

4 In the diagram of circle $O$ below, chord $\overline{CD}$ is parallel to diameter $\overline{AOB}$ and $m\angle AC = 30$.

What is $m\angle CD$?
1) $150$
2) $120$
3) $100$
4) $60$
5 In the diagram of trapezoid \(ABCD\) below, diagonals \(AC\) and \(BD\) intersect at \(E\) and \(\triangle ABC \cong \triangle DCB\).

![](image)

Which statement is true based on the given information?

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

6 Which transformation produces a figure similar but not congruent to the original figure?

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

7 In the diagram below of parallelogram \(ABCD\) with diagonals \(AC\) and \(BD\), \(\angle 1 = 45\) and \(\angle DCB = 120\).

![](image)

What is the measure of \(\angle 2\)?

1) 15\(^{\circ}\)
2) 30\(^{\circ}\)
3) 45\(^{\circ}\)
4) 60\(^{\circ}\)

8 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.

![](image)

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.
9. 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) \( y - 2x = 3 \)

10. The endpoints of \( CD \) are \( C(-2, -4) \) and \( D(6, 2) \).
    What are the coordinates of the midpoint of \( CD \)?
    1) \( (2, 3) \)
    2) \( (2, -1) \)
    3) \( (4, -2) \)
    4) \( (4, 3) \)

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

12. 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 \( (3, 1) \)

13. The diagonal \( AC \) is drawn in parallelogram \( ABCD \). Which method can \textit{not} be used to prove that \( \triangle ABC \cong \triangle CDA \)?
    1) SSS
    2) SAS
    3) SSA
    4) ASA

14. In the diagram below, line \( k \) is perpendicular to plane \( P \) at point \( T \).
    ![Diagram of a parallelogram with line \( k \) perpendicular to plane \( P \)]
    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 \( P \).
15 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

16 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) \( \{26, 8, 15\} \)

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

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

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

20 In the diagram below of \( \triangle ACT \), \( D \) is the midpoint of \( \overline{AC} \), \( O \) is the midpoint of \( \overline{AT} \), and \( G \) is the midpoint of \( \overline{CT} \).

If \( AC = 10 \), \( AT = 18 \), and \( CT = 22 \), what is the perimeter of parallelogram \( CDOG \)?
1) 21
2) 25
3) 32
4) 40
21 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) $(x - 5)^2 + (y + 1)^2 = 9$

22 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

23 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

24 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.
25 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 \( \triangle ABC \)

26 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

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

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

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

29 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 \( x \).
30 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?

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

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

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

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

35 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]
36 On the set of axes below, sketch the points that are 5 units from the origin and sketch the points that are 2 units from the line \( y = 3 \). Label with an \( \times \) all points that satisfy both conditions.

37 Triangle \( DEG \) has the coordinates \( D(1,1) \), \( E(5,1) \), and \( G(5,4) \). Triangle \( DEG \) is rotated 90° about the origin to form \( \triangle D'E'G' \). On the grid below, graph and label \( \triangle DEG \) and \( \triangle D'E'G' \). State the coordinates of the vertices \( D' \), \( E' \), and \( G' \). Justify that this transformation preserves distance.

38 Given: Quadrilateral \( ABCD \), diagonal \( \overline{AFEC} \), 
\( \overline{AE} \cong \overline{FC} \), \( BF \perp \overline{AC} \), \( DE \perp \overline{AC} \), \( \angle 1 \cong \angle 2 \)
Prove: \( ABCD \) is a parallelogram.
1. 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

2. 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

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

5 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 \( AB > BC \)

6 Which transformation is not always an isometry?
1) rotation
2) dilation
3) reflection
4) translation

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

8 In the diagram below, tangent \( PA \) and secant \( PBC \) are drawn to circle \( O \) from external point \( P \).

If \( PB = 4 \) and \( BC = 5 \), what is the length of \( PA \)?
1) 20
2) 9
3) 8
4) 6
9 Which geometric principle is used to justify the construction below?

\[ \text{Diagram showing a construction with a line perpendicular to two parallel lines.} \]

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.

10 Which equation represents the circle whose center is \((-2,3)\) and whose radius is 5?

\[ \begin{align*}
1) & \quad (x - 2)^2 + (y + 3)^2 = 5 \\
2) & \quad (x + 2)^2 + (y - 3)^2 = 5 \\
3) & \quad (x + 2)^2 + (y - 3)^2 = 25 \\
4) & \quad (x - 2)^2 + (y + 3)^2 = 25 \\
\end{align*} \]

11 Towns \(A\) and \(B\) are 16 miles apart. How many points are 10 miles from town \(A\) and 12 miles from town \(B\)?

\[ \begin{align*}
1) & \quad 1 \\
2) & \quad 2 \\
3) & \quad 3 \\
4) & \quad 0 \\
\end{align*} \]

12 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?

\[ \begin{align*}
1) & \quad \text{Lines } j \text{ and } k \text{ are in perpendicular planes.} \\
2) & \quad \text{Line } m \text{ is in the same plane as lines } j \text{ and } k. \\
3) & \quad \text{Line } m \text{ is parallel to the plane containing lines } j \text{ and } k. \\
4) & \quad \text{Line } m \text{ is perpendicular to the plane containing lines } j \text{ and } k. \\
\end{align*} \]

13 In the diagram below of parallelogram \(STUV\), \(SV = x + 3\), \(VU = 2x - 1\), and \(TU = 4x - 3\).

What is the length of \(SV\)?

\[ \begin{align*}
1) & \quad 5 \\
2) & \quad 2 \\
3) & \quad 7 \\
4) & \quad 4 \\
\end{align*} \]

14 Which equation represents a line parallel to the line whose equation is \(2y - 5x = 10\)?

\[ \begin{align*}
1) & \quad 5y - 2x = 25 \\
2) & \quad 5y + 2x = 10 \\
3) & \quad 4y - 10x = 12 \\
4) & \quad 2y + 10x = 8 \\
\end{align*} \]
15 In the diagram below of circle O, chords AD and BC intersect at E, \( m\overarc{AC} = 87 \), and \( m\overarc{BD} = 35 \).

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

16 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) \( \sqrt{110} \)

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

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

What technique can be used to prove that \( \triangle PST \sim \triangle RQT \)?
1) SAS
2) SSS
3) ASA
4) AA
20 The equation of a circle is \((x - 2)^2 + (y + 4)^2 = 4\). Which diagram is the graph of the circle?

1)  

2)  

3)  

4)  

21 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) \(\frac{10}{11}\)  

3) 16  

4) \(\frac{18}{19}\)  

22 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) \(\frac{\text{perimeter of } \triangle ABC}{\text{perimeter of } \triangle DEF} = \frac{3}{2}\)
23. 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

24. 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

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

26. 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)

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

1) $\frac{2}{3}\pi$
2) $\frac{3}{2}\pi$
3) $\frac{27}{8}\pi$
4) $\frac{3,888}{8}\pi$

28. 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.
29. In $\triangle RST$, $m\angle RST = 46$ and $RS \cong ST$. Find $m\angle STR$.

30. 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.

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

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

33. 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 $EB$.

34. 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 $TD$.

35. In $\triangle KLM$, $m\angle K = 36$ and $KM = 5$. The transformation $D_3$ 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.
36 Given: $JKLM$ is a parallelogram.
- $JM \cong LN$
- $\angle LMN \cong \angle LNM$
Prove: $JKLM$ is a rhombus.

37 On the grid below, graph the points that are equidistant from both the $x$ and $y$ axes and the points that are 5 units from the origin. Label with an $X$ all points that satisfy both conditions.

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

\[
y = (x - 2)^2 + 4
\]
\[
4x + 2y = 14
\]
1. 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) $EF \cong CD$

2. 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.

3. 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) $GB \parallel HC$

4. 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
5 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 $\angle A$

6 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

7 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.

8 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

9 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.

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

11 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
12 Which diagram shows the construction of an equilateral triangle?

1) 

2) 

3) 

4) 

13 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 

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

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

1) glide reflection 
2) translation 
3) line reflection 
4) rotation
16. In isosceles trapezoid $ABCD$, $AB \cong CD$. If $BC = 20$, $AD = 36$, and $AB = 17$, what is the length of the altitude of the trapezoid?

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

17. In plane $\mathcal{P}$, lines $m$ and $n$ intersect at point $A$. If line $k$ is perpendicular to line $m$ and line $n$ at point $A$, then line $k$ is

1) contained in plane $\mathcal{P}$  
2) parallel to plane $\mathcal{P}$  
3) perpendicular to plane $\mathcal{P}$  
4) skew to plane $\mathcal{P}$

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

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

1) $T_{3,-3}$  
2) $D_{\frac{1}{2}}$  
3) $R_{90^\circ}$  
4) $r_{y=x}$
19 In the diagram below of circle $O$, chords $AE$ and $DC$ intersect at point $B$, such that $m\widehat{AC} = 36$ and $m\widehat{DE} = 20$.

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

20 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.

21 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

22 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
23. In the diagram below of circle $O$, secant $AB$ intersects circle $O$ at $D$, secant $AOC$ intersects circle $O$ at $E$, $AE = 4$, $AB = 12$, and $DB = 6$. What is the length of $OC$?
   1) 4.5
   2) 7
   3) 9
   4) 14

24. 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

25. In the diagram below of $\triangle ABC$, $CD$ is the bisector of $\angle ABC$, $AE$ is the bisector of $\angle CAB$, and $BG$ is drawn. Which statement must be true?
   1) $DG = EG$
   2) $AG = BG$
   3) $\angle AEB \cong \angle AEC$
   4) $\angle DBG \cong \angle EBG$

26. 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) $\triangle AEC \sim \triangle BDE$
   3) $\angle ACB \cong \angle CBD$
   4) $\overline{CA} \cong \overline{DB}$
27 Two lines are represented by the equations 
\[ -\frac{1}{2}y = 6x + 10 \quad \text{and} \quad y = mx. \] For which value of \( m \) will the lines be parallel?
1) \(-12\)
2) \(-3\)
3) \(3\)
4) \(12\)

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

29 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.

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

31 In right \(\triangle DEF, \angle D = 90\) and \(\angle F\) is 12 degrees less than twice \(\angle E.\) Find \(\angle E.\)

32 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 \(\triangle XYZ.\)

33 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.
34 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 $288 \text{ cm}^3$.

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

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

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

38 In the diagram below, quadrilateral $STAR$ is a rhombus with diagonals $\overline{SA}$ and $\overline{TR}$ 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 $m\angle TAS$. 

![Diagram of quadrilateral STAR with points labeled and equations for the sides and angles given.](image-url)

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

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

1) 45º
2) 60º
3) 90º
4) 180º

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

What is the length, in centimeters, of \( EF \)?

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

4. What is the solution of the following system of equations?

\[
\begin{align*}
y &= (x + 3)^2 - 4 \\
y &= 2x + 5
\end{align*}
\]

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

5. One step in a construction uses the endpoints of \( \overline{AB} \) to create arcs with the same radii. The arcs intersect above and below the segment. What is the relationship of \( \overline{AB} \) and the line connecting the points of intersection of these arcs?

1) collinear
2) congruent
3) parallel
4) perpendicular
6 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

7 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) \( \angle AEG \cong \angle ODL \)

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

9 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

10 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) \( y = -2x + 17 \)

11 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) \( \angle C, \angle A, \angle B \)

12 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) 140º
2) 100º
3) 70º
4) 50º

13 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) \( \sqrt{145} \)
14 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

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

16 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

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

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

18 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
19 If a line segment has endpoints $A(3x + 5, 3y)$ and $B(x - 1, -y)$, what are the coordinates of the midpoint of $AB$?
1) $(x + 3, 2y)$
2) $(2x + 2, y)$
3) $(2x + 3, y)$
4) $(4x + 4, 2y)$

20 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) $288\pi$

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

22 In the diagram below of regular pentagon $ABCDE$, $EB$ is drawn.

What is the measure of $\angle AEB$?
1) $36^\circ$
2) $54^\circ$
3) $72^\circ$
4) $108^\circ$

23 $\triangle ABC$ 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) $\frac{\text{perimeter of } \triangle ABC}{\text{perimeter of } \triangle DEF}$

24 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) $-6$

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

What is $m\widehat{RS}$?
1) $50$
2) $60$
3) $90$
4) $110$
26 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.

27 In the diagram below of \( \triangle ACT \), \( \overrightarrow{BE} \parallel \overrightarrow{AT} \).

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

28 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.

29 The diagram below shows isosceles trapezoid \( ABCD \) with \( AB \parallel DC \) and \( AD \cong BC \). If \( m \angle BAD = 2x \) and \( m \angle BCD = 3x + 5 \), find \( m \angle BAD \).

30 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.
31 In the diagram below of \( \triangle HQP \), side \( \overline{HP} \) is extended through \( P \) to \( T \), \( \angle QPT = 6x + 20 \), \( \angle HQP = x + 40 \), and \( \angle PHQ = 4x - 5 \). Find \( \angle QPT \).

![Diagram of \( \triangle HQP \) with angles labeled]

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

![Line segment AB with points labeled]

33 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 with cars A and B labeled]

34 Write an equation for circle \( O \) shown on the graph below.

![Graph with circle O and axes labeled]
35 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.

37 In the diagram below, $\triangle RST$ is a $3 \times 4 \times 5$ right triangle. The altitude, $h$, to the hypotenuse has been drawn. Determine the length of $h$.

38 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.]
1 In the diagram below, $AB$, $BC$, and $AC$ are tangents to circle $O$ at points $F$, $E$, and $D$, respectively, $AF = 6$, $CD = 5$, and $BE = 4$.

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

2 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 $N'O'$

3 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) $8x + 20$

4 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.
5 The diagram below shows a rectangular prism.

Which pair of edges are segments of lines that are coplanar?
1) \( \overline{AB} \) and \( \overline{DH} \)
2) \( \overline{AE} \) and \( \overline{DC} \)
3) \( \overline{BC} \) and \( \overline{EH} \)
4) \( \overline{CG} \) and \( \overline{EF} \)

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

7 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) \( (-15,-8) \)

8 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

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

10 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) \( (9,6) \)

11 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\}
12. In the diagram below of rhombus $ABCD$, $m\angle C = 100$.

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

13. 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

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

15. 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) $\overline{AB}, \overline{BC}, \overline{AC}$
2) $\overline{BC}, \overline{AC}, \overline{AB}$
3) $\overline{AC}, \overline{BC}, \overline{AB}$
4) $\overline{BC}, \overline{AB}, \overline{AC}$

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

17. 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) $2,160\pi$
18 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.

19 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°.

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

21 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) \( 2\sqrt{41} \)
22. 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

23. 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

24. 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
25 Which graph represents a circle with the equation 

\[(x - 3)^2 + (y + 1)^2 = 4?\]

26 The point (3,−2) is rotated 90° about the origin and then dilated by a scale factor of 4. What are the coordinates of the resulting image?

1) (−12,8) 
2) (12,−8) 
3) (8,12) 
4) (−8,−12)

27 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 \(m\angle ACD = 5x + 5\).

![Diagram of triangle ABC with point D extended]

What is \(m\angle B\)?

1) 5 
2) 20 
3) 25 
4) 55

28 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
29 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 $m\angle C$.

![Diagram of triangle ACD with B as a point on AC]

30 Triangle $ABC$ has vertices $A(-2,2)$, $B(-1,-3)$, and $C(4,0)$. Find the coordinates of the vertices of $\triangle A'B'C'$, the image of $\triangle ABC$ after the transformation $r_{x-axis}$. [The use of the grid is optional.]

![Grid with points A(-2,2), B(-1,-3), C(4,0)]

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

32 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.

![Diagram of circle O with chord AB bisecting chord CD]

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

![Construction of angle bisector]

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

![Line with equation 2y - 6x = 4]
35 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.

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

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

38 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.]
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1. 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

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

3. 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
4 In the diagram below of ΔACE, medians AD, EB, and CF intersect at G. The length of FG is 12 cm. What is the length, in centimeters, of GC?
1) 24  
2) 12  
3) 6  
4) 4

5 In the diagram below of circle O, chord AB is parallel to chord CD.
Which statement must be true?
1) AC ≅ BD  
2) AB ≅ CD  
3) AB ≅ CD  
4) ABD ≅ CDB

6 In the diagram below, line p intersects line m and line n.
If m∠1 = 7x and m∠2 = 5x + 30, lines m and n are parallel when x equals
1) 12.5  
2) 15  
3) 87.5  
4) 105

7 In the diagram of ΔKLM below, m∠L = 70, m∠M = 50, and MK is extended through N.
What is the measure of ∠LKN?
1) 60°  
2) 120°  
3) 180°  
4) 300°
8 If two distinct planes, \( A \) and \( B \), are perpendicular to line \( c \), then which statement is true?
1) Planes \( A \) and \( B \) are parallel to each other.
2) Planes \( A \) and \( B \) are perpendicular to each other.
3) The intersection of planes \( A \) and \( B \) is a line parallel to line \( c \).
4) The intersection of planes \( A \) and \( B \) is a line perpendicular to line \( c \).

9 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) \( \sqrt{233} \)

10 What is an equation of circle \( O \) shown in the graph below?

11 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) \( \overline{AC} \cong \overline{DB} \)
4) \( \overline{DE} \cong \overline{EB} \)

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

13 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

14 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 \(4\)

15 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
16 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

17 In the diagram below of circle $O$, $PA$ is tangent to circle $O$ at $A$, and $PBC$ is a secant with points $B$ and $C$ on the circle.

If $PA = 8$ and $PB = 4$, what is the length of $BC$?
1) 20
2) 16
3) 15
4) 12

18 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 $n$.

19 In $\triangle DEF$, $m\angle D = 3x + 5$, $m\angle E = 4x - 15$, and $m\angle F = 2x + 10$. Which statement is true?
1) $DF = FE$
2) $DE = FE$
3) $m\angle E = m\angle F$
4) $m\angle D = m\angle F$

20 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

21 A man wants to place a new bird bath in his yard so that it is 30 feet from a fence, $f$, and also 10 feet from a light pole, $P$. As shown in the diagram below, the light pole is 35 feet away from the fence.

How many locations are possible for the bird bath?
1) 1
2) 2
3) 3
4) 0
22 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

23 Which lines 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

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

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

26 When ΔABC is dilated by a scale factor of 2, its image is ΔA′B′C′. Which statement is true?
1) AC ≅ A′C′
2) ∠A ≅ ∠A′
3) perimeter of ΔABC = perimeter of ΔA′B′C′
4) 2(area of ΔABC) = area of ΔA′B′C′

27 What is the slope of a line that is perpendicular to the line whose equation is 3x + 5y = 4?
1) −3/5
2) 3/5
3) −5/3
4) 5/3

28 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√7
2) 4√7
3) 7√3
4) 12

29 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.
30 Using a compass and straightedge, on the diagram below of $RS$, construct an equilateral triangle with $RS$ as one side. [Leave all construction marks.]

31 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.

32 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.]

33 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 $EB$.

34 In circle $O$, diameter $RS$ has endpoints $R(3a, 2b - 1)$ and $S(a - 6, 4b + 5)$. Find the coordinates of point $O$, in terms of $a$ and $b$. Express your answer in simplest form.

35 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.
36 In the diagram below, tangent $ML$ and secant $MNK$ are drawn to circle $O$. The ratio $mLN : mNK : mKL$ is $3:4:5$. Find $m\angle LMK$.

37 Solve the following system of equations graphically.

\[
\begin{align*}
2x^2 - 4x &= y + 1 \\
x + y &= 1
\end{align*}
\]

38 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: $\angle AOP \cong \angle BOP$. 
1 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

2 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) \( AC \congYZ \)
4) \( CB \cong XZ \)

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

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

4 Pentagon \( PQRST \) has \( \overrightarrow{PQ} \) parallel to \( \overrightarrow{TS} \). 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) \( T'P' \)

5 In the diagram below of \( \triangle PAO \), \( \overrightarrow{AP} \) is tangent to circle \( O \) at point \( A \), \( OB = 7 \), and \( BP = 18 \).

What is the length of \( AP \)?
1) 10
2) 12
3) 17
4) 24
6. 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) $2(m\angle ABC) = m\angle CBD$

7. 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) $2\sqrt{26}$

8. 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) $(-3,2)$

9. 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

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

11. In the diagram below of $\triangle BCD$, side $\overline{DB}$ is extended to point $A$.

Which statement must be true?
1) $m\angle C > m\angle D$
2) $m\angle ABC < m\angle D$
3) $m\angle ABC > m\angle C$
4) $m\angle ABC > m\angle C + m\angle D$
12. 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) $y = \frac{1}{2}x + 1$

13. 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) $(-4b, -3a)$

14. As shown in the diagram below, $AC$ bisects $\angle BAD$ and $\angle B \equiv \angle D$.

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

15. 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) $(-5,2)$

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

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

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

18. 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 $(6,4)$

19. 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
20 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

21 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

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

23 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

24 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) \(4\sqrt{2}\)

25 What is the measure of each interior angle of a regular hexagon?
1) \(60^\circ\)
2) \(120^\circ\)
3) \(135^\circ\)
4) \(270^\circ\)

26 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) \(y = 2x - 12\)
27 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

28 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

29 In the diagram below, trapezoid \(ABCD\), with bases \(AB\) and \(DC\), is inscribed in circle \(O\), with diameter \(DC\). If \(m\angle A = 80\)°, find \(m\angle B\).

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

31 A sphere has a diameter of 18 meters. Find the volume of the sphere, in cubic meters, in terms of \(\pi\).
32 Write an equation of the circle graphed in the diagram below.

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

34 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.]

35 In the diagram below of \( \triangle GJK \), \( H \) is a point on \( \overline{GJ}, \overline{HJ} \cong \overline{JK} \), \( m\angle G = 28^\circ \), and \( m\angle GJK = 70^\circ \). Determine whether \( \triangle GHK \) is an isosceles triangle and justify your answer.
36. As shown on the set of axes below, \( \triangle GHS \) has vertices \( G(3,1), H(5,3), \) and \( S(1,4) \). Graph and state the coordinates of \( \triangle G''H''S'' \), the image of \( \triangle GHS \) after the transformation \( T_{-3,1} \circ D_2 \).

37. 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.]

38. Given: \( \triangle ABC \) with vertices \( A(-6,-2), B(2,8), \) and \( C(6,-2) \). \( AB \) has midpoint \( D \), \( BC \) has midpoint \( E \), and \( AC \) has midpoint \( F \). Prove: \( ADEF \) is a parallelogram. \( ADEF \) is not a rhombus. [The use of the grid is optional.]
0112ge

1. 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

2. 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

3. 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

4. In the diagram below, \( MATH \) 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

5. 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

6. In \( \triangle FGH \), \( m\angle F = 42 \) and an exterior angle at vertex \( H \) has a measure of 104. What is \( m\angle G \)?
1) 34  
2) 62  
3) 76  
4) 146
7. Which diagram represents a correct construction of equilateral $\triangle ABC$, given side $AB$?

8. In the diagram below, $\triangle ABC$ is circumscribed about circle $O$ and the sides of $\triangle ABC$ are tangent to the circle at points $D, E, F$.

![Diagram of a triangle circumscribed about a circle with tangents](image)

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

9. 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) $\angle BAC \cong \angle EDF$

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

11. When a quadrilateral is reflected over the line $y = x$, which geometric relationship is not preserved?
1) congruence
2) orientation
3) parallelism
4) perpendicularly
12. 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) \((x - 2)^2 + (y + 8)^2 = 81\)

13. 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

14. In the diagram below of circle O, chords \(AB\) and \(CD\) intersect at E.

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

15. 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

16. The diagram below shows a pair of congruent triangles, with \(\angle ADB \cong \angle CBD\) 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) \(AD \cong CD\)

17. 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) \(y = \frac{5}{3}x + 1\)

18. 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
19 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

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

21 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

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

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

24 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) $y = 2x - 1$
25. The coordinates of the endpoints of $\overline{AB}$ 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) $y = 3$

26. 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

27. In $\triangle PQR$, $\angle PRQ$ is a right angle and $\overline{RT}$ is drawn perpendicular to hypotenuse $\overline{PQ}$. If $PT = x$, $RT = 6$, and $TQ = 4x$, what is the length of $PQ$?
1) 9
2) 12
3) 3
4) 15

28. 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) $3 < AC < 7$

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

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

31. Determine whether the two lines represented by the equations $y = 2x + 3$ and $2y + x = 6$ are parallel, perpendicular, or neither. Justify your response.
32. The coordinates of the vertices of \( \triangle RST \) are \( R(-2,3), S(4,4), \) and \( T(2,-2) \). Triangle \( R'S'T' \) is the image of \( \triangle RST \) after a rotation of 90° about the origin. State the coordinates of the vertices of \( \triangle R'S'T' \). [The use of the set of axes below is optional.]

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

34. 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 \( CE \).

35. Triangle \( ABC \) has coordinates \( A(2,-2), B(2,1), \) and \( C(4,-2) \). Triangle \( A'B'C' \) is the image of \( \triangle ABC \) under \( T_{3,-2} \). On the set of axes below, graph and label \( \triangle ABC \) and its image, \( \triangle A'B'C' \). Determine the relationship between the area of \( \triangle ABC \) and the area of \( \triangle A'B'C' \). Justify your response.
36 A paint can is in the shape of a right circular cylinder. The volume of the paint can is 600π 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.

37 Triangle HKL has vertices H(−7, 2), K(3, −4), and L(5, 4). The midpoint of HL is M and the midpoint of LK is N. Determine and state the coordinates of points M and N. Justify the statement: MN is parallel to HK. [The use of the set of axes below is optional.]

38 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
0612ge

1. Triangle \(ABC\) is graphed on the set of axes below.

Which transformation produces an image that is similar to, but not congruent to, \(\Delta ABC\)?

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

2. 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

3. As shown in the diagram below, \(EF\) intersects planes \(P\), \(Q\), and \(R\).

If \(EF\) is perpendicular to planes \(P\) and \(R\), which statement must be true?

1) Plane \(P\) is perpendicular to plane \(Q\).
2) Plane \(R\) is perpendicular to plane \(P\).
3) Plane \(P\) is parallel to plane \(Q\).
4) Plane \(R\) is parallel to plane \(P\).

4. 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
5. 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

6. In the diagram below of $ABCD$, $AC \cong BD$.

Using this information, it could be proven that

1) $BC = AB$  
2) $AB = CD$  
3) $AD - BC = CD$  
4) $AB + CD = AD$

7. 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

8. 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.

9. 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) $(-1,3)$

10. 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) $(x - 4)^2 + y^2 = 36$
11 In the diagram of \( \triangle ABC \) shown below, \( D \) is the midpoint of \( AB \), \( E \) is the midpoint of \( BC \), and \( F \) is the midpoint of \( AC \).

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

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

12 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

13 If \( \overrightarrow{AB} \) is contained in plane \( P \), and \( \overrightarrow{AB} \) is perpendicular to plane \( R \), which statement is true?

1) \( \overrightarrow{AB} \) is parallel to plane \( R \)
2) Plane \( P \) is parallel to plane \( R \)
3) \( \overrightarrow{AB} \) is perpendicular to plane \( P \)
4) Plane \( P \) is perpendicular to plane \( R \)

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

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

15 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) \( y = \frac{1}{3}x + 3 \)

16 In the diagram of \( \triangle ABC \) shown below, \( \overline{DE} \parallel \overline{BC} \).

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

1) 6
2) 2
3) 3
4) 15
17 What is the length of $AB$ with endpoints $A(-1,0)$ and $B(4,-3)$?
1) $\sqrt{6}$
2) $\sqrt{18}$
3) $\sqrt{34}$
4) $\sqrt{50}$

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

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

20 Which graph represents a circle whose equation is $(x + 2)^2 + y^2 = 16$?
1)
2)
3)
4)
21. 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

22. In parallelogram $ABCD$ shown below, diagonals $AC$ and $BD$ intersect at $E$.

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

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

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

Which statement is not true?
1) $\angle A \cong \angle R$
2) $\frac{AB}{BC} = \frac{RC}{ST}$
3) $\frac{AB}{BC} = \frac{ST}{RS}$
4) $\frac{AB + BC + AC}{RS + ST + RT} = \frac{AC}{RS}$

25. In the diagram below of $\triangle ABC$, $BC$ is extended to $D$.

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

26. 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) $y = -\frac{3}{2}x + 2$
27. 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

28. 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.

29. 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 $(x, y) \rightarrow (x - 5, y - 1)$.

30. In the diagram below, $\ell \parallel m$ and $QR \perp ST$ at $R$.

If $m \angle 1 = 63$, find $m \angle 2$.

31. 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.
32 Using a compass and straightedge, construct the bisector of \(\angle CBA\). [Leave all construction marks.]

33 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?

34 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.

35 Given: \(AD\) bisects \(BC\) at \(E\).

\[
\begin{align*}
AB & \perp BC \\
DC & \perp BC
\end{align*}
\]

Prove: \(AB \cong DC\)
36 The coordinates of trapezoid \( ABCD \) are \( A(-4,5), B(1,5), C(1,2), \) and \( D(-6,2) \). Trapezoid \( A'B'C'D' \) is the image after the composition \( r_{x-axis} \circ r_{y=ax} \) is performed on trapezoid \( ABCD \). State the coordinates of trapezoid \( A'B'C'D' \). [The use of the set of axes below is optional.]

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

Find the length of \( RT \). Find the length of \( PS \).

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

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

\[
2y + 16 = 4x
\]
1. 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) $\overline{AG} \cong \overline{BH}$

2. 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

3. 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) $(-7,-2)$

4. 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

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

Which statement must be true?
1) $\overrightarrow{AF}$ bisects side $BC$
2) $\overrightarrow{AF}$ bisects $\angle BAC$
3) $\overrightarrow{AF} \perp BC$
4) $\triangle ABG \sim \triangle ACG$
6 In the diagram of \(\triangle JEA\) below, \(m\angle JEA = 90\) and \(m\angle EAJ = 48\). Line segment \(MS\) connects points \(M\) and \(S\) on the triangle, such that \(m\angle EMS = 59\).

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

7 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) \(EC \cong EA\)

8 Given that \(ABCD\) is a parallelogram, a student wrote the proof below to show that a pair of its opposite angles are congruent.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (ABCD) is a parallelogram.</td>
<td>1. Given</td>
</tr>
<tr>
<td>2. (BC \cong AD)</td>
<td>2. Opposite sides of a parallelogram are congruent.</td>
</tr>
<tr>
<td>(AB \cong CD)</td>
<td></td>
</tr>
<tr>
<td>3. (\overline{AC} \cong \overline{DA})</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.

9 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) \((x - 3)^2 + (y + 5)^2 = 16\)
10. 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

11. As shown in the diagram below, $\overline{FJ}$ is contained in plane $\mathcal{R}$, $\overline{BC}$ and $\overline{DE}$ are contained in plane $\mathcal{S}$, and $\overline{FJ}$, $\overline{BC}$, and $\overline{DE}$ intersect at $A$.

Which fact is not sufficient to show that planes $\mathcal{R}$ and $\mathcal{S}$ are perpendicular?
1) $\overline{FA} \perp \overline{DE}$
2) $\overline{AD} \perp \overline{AF}$
3) $\overline{BC} \perp \overline{FJ}$
4) $\overline{DE} \perp \overline{BC}$

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

13. 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
14. The angle formed by the radius of a circle and a tangent to that circle has a measure of
   1) 45°
   2) 90°
   3) 135°
   4) 180°

15. 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$\pi$

16. 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) $\angle ABC \cong \angle EDF$

17. 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) $y = -\frac{2}{3}x + \frac{8}{3}$

18. 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.

19. 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) $\overline{AB}$
   2) $\overline{DC}$
   3) $\overline{AD}$
   4) $\overline{BD}$

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

What is the length of $\overline{BP}$?
   1) 6
   2) 9
   3) 3
   4) 12
21 In the diagram below, \( EF \) is the median of trapezoid \( ABCD \).

\[ \begin{array}{c}
\begin{array}{c}
A
\
D
\
E
\
F
\
C
\end{array}
\end{array} \]

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

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

\[ \begin{array}{c}
\begin{array}{c}
A
\
B
\
C
\end{array}
\end{array} \]

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

23 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

24 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

25 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) \(3x + y = 0 \)

26 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

27 In the diagram below, \( DE \) joins the midpoints of two sides of \( \triangle ABC \).

\[ \begin{array}{c}
\begin{array}{c}
D
\
E
\
A
\
B
\
C
\end{array}
\end{array} \]

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

28 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) \( y = -2x - 5 \)
29 Write the negation of the statement “2 is a prime number,” and determine the truth value of the negation.

30 The coordinates of the vertices of \( \triangle ABC \) are \( A(1,2), B(-4,3), \) and \( C(-3,-5) \). State the coordinates of \( \triangle A'B'C' \), the image of \( \triangle ABC \) after a rotation of 90º about the origin. [The use of the set of axes below is optional.]

31 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 \( \pi \).

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

33 Using a compass and straightedge, construct a line perpendicular to \( AB \) through point \( P \). [Leave all construction marks.]

34 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 \( \times \) all points that satisfy both conditions.
35 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.

36 The vertices of $\triangle RST$ are $R(-6, 5)$, $S(-7, -2)$, and $T(1, 4)$. The image of $\triangle RST$ after the composition $T_{-2,3} \circ r_{y=x}$ is $\triangle R"S"T"$. State the coordinates of $\triangle R"S"T"$. [The use of the set of axes below is optional.]

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

38 Chords $\overline{AB}$ and $\overline{CD}$ 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 $m\widehat{DA} = 56$, $m\widehat{DB} = 112$, and the ratio of $m\angle AC : m\angle CB = 3 : 1$.

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

7
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

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

3 ANS: 1  
$(x, y) \rightarrow (x + 3, y + 1)$

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

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

5 ANS: 3  

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

6 ANS: 2  
PTS: 2  
REF: fall0806ge  
STA: G.G.9  
TOP: Planes

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

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

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

9 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

10 ANS: 4  
Median $BF$ bisects $\overline{AC}$ so that $\overline{CF} \cong \overline{FA}$.

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

11 ANS: 3  
Because $OC$ is a radius, its length is 5. Since $CE = 2$, $OE = 3$. $\triangle EDO$ is a 3-4-5 triangle. If $ED = 4$, $BD = 8$.

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

\[ y = mx + b \]

\[-11 = 2(-3) + b \]

\[-5 = b \]

\[ M_x = \frac{2 + (-4)}{2} = -1. \]

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

\[- \]

\[ x^2 = 3(x + 18) \]

\[ x^2 - 3x - 54 = 0 \]

\[ (x - 9)(x + 6) = 0 \]

\[ x = 9 \]

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

\[ M_y = \frac{3 + 3}{2} = 3. \] The center is (2,3). \( d = \sqrt{(-2-6)^2 + (3-3)^2} = \sqrt{64 + 0} = 8 \). If the diameter is 8, the radius is 4 and \( r^2 = 16 \).
\[ \Delta PRT \text{ and } \Delta SRQ \text{ share } \angle R \text{ and it is given that } \angle RPT \cong \angle RSQ. \]

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

22  ANS: 4
3y + 1 = 6x + 4. 2y + 1 = x − 9
3y = 6x + 3 2y = x − 10
y = 2x + 1  y = \frac{1}{2} x − 5

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

23  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

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

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

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

PTS: 2  REF: fall0826ge  STA: G.G.45  TOP: Similarity  KEY: perimeter and area

27  ANS: 4
\( (n − 2)180 = (8 − 2)180 = 1080. \frac{1080}{8} = 135. \)

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

28  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

29  ANS:
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

ID: A
30 ANS:

31 ANS:

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

32 ANS:

33 ANS:

22.4. \( V = \pi r^2 h \)

12566.4 = \( \pi r^2 \cdot 8 \)

\( r^2 = \frac{12566.4}{8\pi} \)

\( r \approx 22.4 \)

34 ANS:

Contrapositive-If two angles of a triangle are not congruent, the sides opposite those angles are not congruent.
35 ANS:

Because G and H are midpoints of the sides of a triangle, EH is a midsegment and parallel to the third side.

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

36 ANS:

\(\angle D, \angle G\) and 24° or \(\angle E, \angle F\) and 84°. \(m \overline{FE} = \frac{2}{15} \times 360 = 48\). Since the chords forming \(\angle D\) and \(\angle G\) are intercepted by \(\overline{FE}\), their measure is 24°. \(m \overline{GD} = \frac{7}{15} \times 360 = 168\). Since the chords forming \(\angle E\) and \(\angle F\) are intercepted by \(\overline{GD}\), their measure is 84°.

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

KEY: inscribed

37 ANS:

\(\triangle ABD \cong \triangle BCD\) since parallel chords intersect congruent arcs. \(\angle BDC \cong \angle ACD\) because inscribed angles that intercept congruent arcs are congruent. \(\overline{AD} \cong \overline{BC}\) since congruent chords intersect congruent arcs. \(\overline{DC} \cong \overline{CD}\) because of the reflexive property. Therefore, \(\triangle ACD \cong \triangle BDC\) because of SAS.

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

38 ANS:

Because \(\overline{AB} \parallel \overline{DC}\), \(\overline{AD} \cong \overline{BC}\) since parallel chords intersect congruent arcs. \(\triangle BDC \cong \triangle ACD\) because inscribed angles that intercept congruent arcs are congruent. \(\overline{AD} \cong \overline{BC}\) since congruent chords intersect congruent arcs. \(\overline{DC} \cong \overline{CD}\) because of the reflexive property. Therefore, \(\triangle ACD \cong \triangle BDC\) because of SAS.

PTS: 6 REF: fall0838ge STA: G.G.27 TOP: Circle Proofs
1 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

2 ANS: 3

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

3 ANS: 1

PTS: 2 REF: 060903ge STA: G.G.56 TOP: Identifying Transformations

4 ANS: 4

PTS: 2 REF: 060904ge STA: G.G.13 TOP: Solids

5 ANS: 3

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

6 ANS: 2

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

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

7 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

8 ANS: 3

PTS: 2 REF: 060908ge STA: G.G.60 TOP: Identifying Transformations

9 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

10 ANS: 2

PTS: 2 REF: 060910ge STA: G.G.71 TOP: Equations of Circles

11 ANS: 2

Longest side of a triangle is opposite the largest angle. Shortest side is opposite the smallest angle.

PTS: 2 REF: 060911ge STA: G.G.34 TOP: Angle Side Relationship
The centroid divides each median into segments whose lengths are in the ratio 2 : 1.

\[ \overline{AB} = 10 \text{ since } \triangle ABC \text{ is a 6-8-10 triangle. } \]

\[ 6^2 = 10x \]

\[ 3.6 = x \]

\[ 4(x + 4) = 8^2 \]

\[ 4x + 16 = 64 \]

\[ x = 12 \]

\[ \angle ACB \text{ and } \angle ECD \text{ are congruent vertical angles and } \angle CAB \cong \angle CED. \]

\[ V = \frac{1}{3} \pi r^2 h = \frac{1}{3} \pi \cdot 4^2 \cdot 12 \approx 201 \]
23 ANS: 1

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

PTS: 2 REF: 060923ge STA: G.G.70 TOP: Quadratic-Linear Systems

24 ANS: 4

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

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

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

26 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

27 ANS: 4

\[ \triangle ABC \sim \triangle DBE. \quad \frac{AB}{DB} = \frac{AC}{DE} \]

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

\[ x = 13.5 \]

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

28 ANS: 3 PTS: 2 REF: 060928ge STA: G.G.8 TOP: Planes

29 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
30 ANS:

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

\[ 4 = (-2)(5) + b \]
\[ b = 14 \]

31 ANS:

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

\[ 4 = (-2)(5) + b \]
\[ b = 14 \]

32 ANS:

True. The first statement is true and the second statement is false. In a disjunction, if either statement is true, the disjunction is true.

33 ANS:

True. The first statement is true and the second statement is false. In a disjunction, if either statement is true, the disjunction is true.
34 ANS:
20. $5x + 10 = 4x + 30$

$$x = 20$$

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

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

$$x = 6$$

PTS: 4   REF: 060935ge   STA: G.G.50   TOP: Tangents
KEY: common tangency

36 ANS:

$$15 + 5\sqrt{5}.$$ 

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

37 ANS:

PTS: 4   REF: 060937ge   STA: G.G.54   TOP: Compositions of Transformations
KEY: grids
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 \( \overline{AB} \parallel \overline{ED} \) because \( \angle CDE \) and \( \angle CBA \) are congruent alternate interior angles.

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, \( d \parallel e \).

ANS: 4

\[ 180 - (40 + 40) = 100 \]

ANS: 4

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

ANS: 2

A dilation affects distance, not angle measure.

\[ \overparen{AC} \]

\[ \overparen{BD} \]

\[ 180 - 30 - 30 = 120 \]

\[ 180 - 120 = 60 \]

\[ \angle 2 = 60 - 45 = 15 \]

ANS: 1

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

\[ M_x = \frac{-2 + 6}{2} = 2 \]

\[ M_y = \frac{-4 + 2}{2} = -1 \]

\[ 2 \]

\[ \frac{0.5}{-2} \]

\[ 2 \]

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

\[ 3 \]

\[ \frac{3}{2} \]

\[ 4 \]

\[ \frac{4}{2} \]

\[ 5 \]

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

\[ 6 \]

\[ \frac{6}{2} \]

\[ 7 \]

\[ \frac{7}{2} \]

\[ 8 \]

\[ \frac{8}{2} \]

\[ 9 \]

\[ \frac{9}{2} \]

\[ 10 \]

\[ \frac{10}{2} \]

\[ 11 \]

\[ \frac{11}{2} \]
12 ANS: 4

\[ y + x = 4 \quad x^2 - 6x + 10 = -x + 4 \quad y + x = 4 \quad y + 2 = 4 \]
\[ y = -x + 4 \quad x^2 - 5x + 6 = 0 \quad y + 3 = 4 \quad y = 2 \]
\[ (x - 3)(x - 2) = 0 \quad y = 1 \]
\[ x = 3 \text{ or } 2 \]

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

13 ANS: 3   PTS: 2   REF: 080913ge   STA: G.G.28
TOP: Triangle Congruency

14 ANS: 4   PTS: 2   REF: 080914ge   STA: G.G.7
TOP: Planes

15 ANS: 4   PTS: 2   REF: 080915ge   STA: G.G.56
TOP: Identifying Transformations

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

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

17 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

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

19 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

20 ANS: 3

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

21 ANS: 2   PTS: 2   REF: 080921ge   STA: G.G.72
TOP: Equations of Circles
22. ANS: 4
Let $AD = x$. $36x = 12^2$

$x = 4$

PTS: 2  REF: 080922ge  STA: G.G.47  TOP: Similarity

KEY: leg

23. ANS: 2
$4(4x - 3) = 3(2x + 8)$

$16x - 12 = 6x + 24$

$10x = 36$

$x = 3.6$

PTS: 2  REF: 080923ge  STA: G.G.53  TOP: Segments Intercepted by Circle

KEY: two chords

24. ANS: 3
TOP: Negations

25. ANS: 4
TOP: Centroid, Orthocenter, Incenter and Circumcenter

26. 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

27. ANS: 2
TOP: Planes

28. ANS: 3
TOP: Tangents  KEY: common tangency

29. ANS:
3. The non-parallel sides of an isosceles trapezoid are congruent. $2x + 5 = 3x + 2$

$x = 3$

PTS: 2  REF: 080929ge  STA: G.G.40  TOP: Trapezoids

30. ANS:

$2016. V = \frac{1}{3} Bh = \frac{1}{3} s^2 h = \frac{1}{3} 12^2 \cdot 42 = 2016$

PTS: 2  REF: 080930ge  STA: G.G.13  TOP: Volume
31 ANS:
\[ y = \frac{2}{3}x - 9. \] The slope of \(2x - 3y = 11\) is \(\frac{A}{B} = \frac{-2}{-3} = \frac{2}{3}\). 
\[ -5 = \left(\frac{2}{3}\right)(6) + b \]
\[ -5 = 4 + b \]
\[ b = -9 \]

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

32 ANS:

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

33 ANS:
26. \( x + 3x + 5x - 54 = 180 \)
\[ 9x = 234 \]
\[ x = 26 \]

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

34 ANS:
\( \overline{AC} \). \( m\angle BCA = 63 \) and \( m\angle ABC = 80 \). \( \overline{AC} \) is the longest side as it is opposite the largest angle.

PTS: 2  REF: 080934ge  STA: G.G.34  TOP: Angle Side Relationship
$y = \frac{4}{3} x - 6$. \( M_x = \frac{-1 + 7}{2} = 3 \) The perpendicular bisector goes through \( (3, -2) \) and has a slope of \( \frac{4}{3} \).

\[
M_y = \frac{1 + (-5)}{2} = -2
\]

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

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

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

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

36  ANS:

PTS: 4  REF: 080936ge  STA: G.G.23  TOP: Locus

37  ANS:

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

38 ANS:

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

PTS: 6 \quad REF: 080938ge \quad STA: G.G.41 \quad TOP: Special Quadrilaterals
1 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

2 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

3 ANS: 2  PTS: 2

PTS: 2  REF: 011003ge  STA: G.G.55

TOP: Properties of Transformations

4 ANS: 2  PTS: 2

PTS: 2  REF: 011004ge  STA: G.G.17

TOP: Constructions

5 ANS: 1

The closer a chord is to the center of a circle, the longer the chord.

PTS: 2  REF: 011005ge  STA: G.G.49  TOP: Chords

6 ANS: 2  PTS: 2

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

TOP: Isometries

7 ANS: 3  PTS: 2

PTS: 2  REF: 011007ge  STA: G.G.31

TOP: Isosceles Triangle Theorem

8 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

9 ANS: 4  PTS: 2

PTS: 2  REF: 011009ge  STA: G.G.19

TOP: Constructions

10 ANS: 3  PTS: 2

PTS: 2  REF: 011010ge  STA: G.G.71

TOP: Equations of Circles

11 ANS: 2  PTS: 2

PTS: 2  REF: 011011ge  STA: G.G.22

TOP: Locus

12 ANS: 4  PTS: 2

PTS: 2  REF: 011012ge  STA: G.G.1

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

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

14 ANS: 3
\[m = \frac{-A}{B} = \frac{5}{2}, \quad m = \frac{-A}{B} = \frac{10}{4} = \frac{5}{2}\]

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

15 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

16 ANS: 1
\[a^2 + (5\sqrt{2})^2 = (2\sqrt{15})^2\]
\[a^2 + (25 \times 2) = 4 \times 15\]
\[a^2 + 160 = 60\]
\[a^2 = 10\]
\[a = \sqrt{10}\]

PTS: 2 REF: 011016ge STA: G.G.48 TOP: Pythagorean Theorem

17 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

18 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

TOP: Similarity Proofs

19 ANS: 4
PTS: 2 REF: 011019ge STA: G.G.44

TOP: Graphing Circles
21 ANS: 1

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

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

22 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

23 ANS: 3

. The sum of the interior angles of a pentagon is \((5 - 2)180 = 540\.\)

PTS: 2 REF: 011023ge STA: G.G.36 TOP: Interior and Exterior Angles of Polygons

24 ANS: 1 PTS: 2 REF: 011024ge STA: G.G.3 TOP: Planes

25 ANS: 3

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

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

26 ANS: 1

\(A'(2,4)\)

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

KEY: basic

27 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

28 ANS: 3 PTS: 2 REF: 011028ge STA: G.G.26 TOP: Conditional Statements
29 ANS:
\[ \frac{180 - 46}{2} = 67 \]

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

30 ANS:
4. \[ l_1 w_1 h_1 = l_2 w_2 h_2 \]
\[ 10 \times 2 \times h = 5 \times w_2 \times h \]
\[ 20 = 5w_2 \]
\[ w_2 = 4 \]

PTS: 2  REF: 011030ge  STA: G.G.11  TOP: Volume

31 ANS:
\[ C_x = \frac{Q_x + R_x}{2} \]
\[ C_y = \frac{Q_y + R_y}{2} \]
\[ 3.5 = \frac{1 + R_x}{2} \]
\[ 2 = \frac{8 + R_y}{2} \]
\[ 7 = 1 + R_x \]
\[ 4 = 8 + R_y \]
\[ 6 = R_x \]
\[ -4 = R_y \]

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

32 ANS:

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

33 ANS:
\[ \frac{3}{x} = \frac{6 + 3}{15} \]
\[ 9x = 45 \]
\[ x = 5 \]

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

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

PTS: 2  REF: 011034ge  STA: G.G.43  TOP: Centroid
ANS:
36, because a dilation does not affect angle measure. 10, because a dilation does affect distance.

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

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

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

ANS:  

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

ANS:  

PTS: 6  REF: 011038ge  STA: G.G.70  TOP: Quadratic-Linear Systems
1 ANS: 1
Parallel lines intercept congruent arcs.

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

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


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


6 ANS: 4
\[ L = 2\pi r h = 2\pi \cdot 5 \cdot 11 \approx 345.6 \]

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

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

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

9 ANS: 1 PTS: 2 REF: 061009ge STA: G.G.26 TOP: Converse

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

11 ANS: 3

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

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

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

14 ANS: 4
The radius is 4. \[ r^2 = 16. \]

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

16 ANS: 3

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

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

17 ANS: 3  
PTS: 2  
REF: 061017ge  
STA: G.G.1  
TOP: Planes

18 ANS: 4  
PTS: 2  
REF: 061018ge  
STA: G.G.56  
TOP: Identifying Transformations

19 ANS: 3  
\[ \frac{36 + 20}{2} = 28 \]

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

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

21 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

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

23 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
24 ANS: 2
\[ x^2 + (x + 7)^2 = 13^2 \]
\[ x^2 + x^2 + 7x + 7x + 49 = 169 \]
\[ 2x^2 + 14x - 120 = 0 \]
\[ x^2 + 7x - 60 = 0 \]
\[ (x + 12)(x - 5) = 0 \]
\[ x = 5 \]
\[ 2x = 10 \]

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

25 ANS: 4
\[ BG \] is also an angle bisector since it intersects the concurrence of \( CD \) and \( AE \)

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

26 ANS: 2

PTS: 2 REF: 061026GE STA: G.G.51 TOP: Arcs Determined by Angles
KEY: inscribed

27 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

28 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

29 ANS:
\[ 452. \ SA = 4\pi r^2 = 4\pi \cdot 6^2 = 144\pi \approx 452 \]

PTS: 2 REF: 061029ge STA: G.G.16 TOP: Volume and Surface Area
30 ANS:
37. Since $\overline{DE}$ is a midsegment, $AC = 14$. $10 + 13 + 14 = 37$

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

31 ANS:
34. $2x - 12 + x + 90 = 180$
   
   $3x + 78 = 90$
   
   $3x = 102$
   
   $x = 34$

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

32 ANS:

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

KEY: grids

33 ANS:

PTS: 2 REF: 061033ge STA: G.G.22 TOP: Locus
34 ANS:
18. \( V = \frac{1}{3} Bh = \frac{1}{3} lwh \)

\[ 288 = \frac{1}{3} \cdot 8 \cdot 6 \cdot h \]

\[ 288 = 16h \]

\[ 18 = h \]

PTS: 2 REF: 061034ge STA: G.G.13 TOP: Volume

35 ANS:
\[ \overline{BD} \cong \overline{DB} \ (\text{Reflexive Property}); \ \triangle ABD \cong \triangle CDB \ (\text{SSS}); \ \angle BDC \cong \angle ABD \ (\text{CPCTC}). \]

PTS: 4 REF: 061035ge STA: G.G.27 TOP: Quadrilateral Proofs

36 ANS:
\[ y = \frac{2}{3} x + 1 \]

\[ 2y + 3x = 6 \]

\[ y = \frac{2}{3} x + \frac{1}{5} \]

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

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

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

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

\[ r = 5 \]

\[ r^2 = 25 \]

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

PTS: 2 REF: 061037ge STA: G.G.71 TOP: Equations of Circles
38 ANS:

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

\[ 5x = 35 \quad \Rightarrow x = 7 \]

\[ z = 8 \]

\[ 14y + 6 = 90 \quad \Rightarrow 14y = 84 \quad \Rightarrow y = 6 \]

0810ge
Answer Section

1 ANS: 4

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

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

3 ANS: 1

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

4 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

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

6 ANS: 4

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

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

KEY: basic
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: 
\[ y = mx + b \]
\[ 3 = -2(7) + b \]
\[ 17 = b \]

Longest side of a triangle is opposite the largest angle. Shortest side is opposite the smallest angle.

\[ d = \sqrt{(-6 - 2)^2 + (4 - (-5))^2} = \sqrt{64 + 81} = \sqrt{145} \]
16 ANS: 4
sum of interior \( \angle s \) = sum of exterior \( \angle s \)

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

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

\[
180n = 720
\]

\[
n = 4
\]

PTS: 2 REF: 081016ge STA: G.G.36 TOP: Interior and Exterior Angles of Polygons

17 ANS: 1

4x = 6 \cdot 10

\[
x = 15
\]

PTS: 2 REF: 081017ge STA: G.G.53 TOP: Segments Intercepted by Circle

KEY: two chords

18 ANS: 1

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

\[
\overline{GC} = 2\overline{FG}
\]

\[
\overline{GC} + \overline{FG} = 24
\]

\[
2\overline{FG} + \overline{FG} = 24
\]

\[
3\overline{FG} = 24
\]

\[
\overline{FG} = 8
\]

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

19 ANS: 2

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

PTS: 2 REF: 081019ge STA: G.G.66 TOP: Midpoint
20 ANS: 4

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

\[ 144\pi = 4\pi r^2 \]

\[ 36 = r^2 \]

\[ 6 = r \]

PTS: 2 \hspace{1em} REF: 081020ge \hspace{1em} STA: G.G.16 \hspace{1em} TOP: Volume and Surface Area

21 ANS: 3 \hspace{1em} PTS: 2 \hspace{1em} REF: 081021ge \hspace{1em} STA: G.G.57

TOP: Properties of Transformations

22 ANS: 1

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

PTS: 2 \hspace{1em} REF: 081022ge \hspace{1em} STA: G.G.37 \hspace{1em} TOP: Interior and Exterior Angles of Polygons

23 ANS: 4 \hspace{1em} PTS: 2 \hspace{1em} REF: 081023ge \hspace{1em} STA: G.G.45

TOP: Similarity \hspace{1em} KEY: perimeter and area

24 ANS: 3

\[ 2y = -6x + 8 \quad \text{Perpendicular lines have slope the opposite and reciprocal of each other.} \]

\[ y = -3x + 4 \]

\[ m = -3 \]

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

PTS: 2 \hspace{1em} REF: 081024ge \hspace{1em} STA: G.G.62 \hspace{1em} TOP: Parallel and Perpendicular Lines

25 ANS: 2

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

\[ 140 - RS = 80 \]

\[ RS = 60 \]

PTS: 2 \hspace{1em} REF: 081025ge \hspace{1em} STA: G.G.51 \hspace{1em} TOP: Arcs Determined by Angles

KEY: outside circle

26 ANS: 3 \hspace{1em} PTS: 2 \hspace{1em} REF: 081026ge \hspace{1em} STA: G.G.26

TOP: Contrapositive

27 ANS: 2

\[ \frac{3}{7} = \frac{6}{x} \]

\[ 3x = 42 \]

\[ x = 14 \]

PTS: 2 \hspace{1em} REF: 081027ge \hspace{1em} STA: G.G.46 \hspace{1em} TOP: Side Splitter Theorem
28 ANS: 1 PTS: 2 REF: 081028ge STA: G.G.21
TOP: Centroid, Orthocenter, Incenter and Circumcenter

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

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

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

32 ANS:

33 ANS:

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

PTS: 2 REF: 081033ge STA: G.G.22 TOP: Locus
34 ANS:
\[(x + 1)^2 + (y - 2)^2 = 36\]

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

35 ANS:
Yes, \( m\angle ABD = m\angle BDC = 44 \) \( 180 - (93 + 43) = 44 \) \( x + 19 + 2x + 6 + 3x + 5 = 180 \). Because alternate interior angles \( \angle ABD \) and \( \angle CDB \) are congruent, \( AB \) is parallel to \( DC \).

PTS: 4 REF: 081035ge STA: G.G.35 TOP: Parallel Lines and Transversals

36 ANS:

| A"(8,2), B"(2,0), C"(6,-8) |

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

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

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

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

PTS: 4  REF: 081038ge  STA: G.G.69  TOP: Quadrilaterals in the Coordinate Plane
ANS: 3

PTS: 2  
KEY: two tangents

ANS: 1  
TOP: Properties of Transformations

ANS: 2

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

PTS: 2  
TOP: Midsegments

ANS: 3  
TOP: Parallelograms

ANS: 2

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

PTS: 2  
TOP: Midpoint

ANS: 3

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

PTS: 2  
TOP: Translations

ANS: 4  
TOP: Angle Proofs

ANS: 2  
TOP: Planes

ANS: 3  
KEY: Centroid, Orthocenter, Incenter and Circumcenter

ANS: 3

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

PTS: 2  
TOP: Pythagorean Theorem

ANS: 1  
TOP: Special Parallelograms
13 ANS: 3

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

14 ANS: 4

\[ y = mx + b \]

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

\[ 3 = -3 + b \]

\[ 6 = b \]

PTS: 2  REF: 011114ge  STA: G.G.65  TOP: Parallel and Perpendicular Lines

15 ANS: 4

\[ \text{m} \angle A = 80 \]

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

16 ANS: 3

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

17 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

18 ANS: 4

PTS: 2  REF: 011118ge  STA: G.G.25  TOP: Compound Statements  KEY: general

19 ANS: 4

\[ x + 6y = 12 \]

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

\[ 6y = -x + 12 \]

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

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

\[ m = -3 \]

\[ m = -\frac{1}{6} \]

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

20 ANS: 1

PTS: 2  REF: 011120ge  STA: G.G.18  TOP: Constructions
21) 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

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

TOP: Triangle Congruency

23) ANS: 4

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

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

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

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

\[ x = 4 \]

PTS: 2  REF: 011123ge  STA: G.G.47  TOP: Similarity

KEY: leg

24) ANS: 4  PTS: 2  REF: 011124ge  STA: G.G.51

TOP: Arcs Determined by Angles  KEY: inscribed

25) ANS: 2  PTS: 2  REF: 011125ge  STA: G.G.74

TOP: Graphing Circles

26) ANS: 3

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

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

KEY: basic

27) ANS: 3

\[ x + 2x + 15 = 5x + 15 \]

\[ 2(5) + 15 = 25 \]

\[ 3x + 15 = 5x + 5 \]

\[ 10 = 2x \]

\[ 5 = x \]

PTS: 2  REF: 011127ge  STA: G.G.32  TOP: Exterior Angle Theorem

28) ANS: 1  PTS: 2  REF: 011128ge  STA: G.G.2

TOP: Planes

29) ANS:

\[ \begin{align*}
A & \rightarrow B \\
B & \rightarrow C \\
C & \rightarrow D \\
D & \rightarrow \end{align*} \]

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

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

31 ANS:

\[(5 - 2)180 = 540. \quad \frac{540}{5} = 108 \text{ interior.} \quad 180 - 108 = 72 \text{ exterior}\]

PTS: 2    REF: 011131ge    STA: G.G.37    TOP: Interior and Exterior Angles of Polygons

32 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

33 ANS:

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

34 ANS:

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

35 ANS:

\[ \angle B \text{ and } \angle E \text{ are right angles because of the definition of perpendicular lines. } \angle B \cong \angle E \text{ because all right angles are congruent. } \angle BFD \text{ and } \angle DFE \text{ are supplementary and } \angle ECA \text{ and } \angle ACB \text{ are supplementary because of the definition of supplementary angles. } \angle DFE \cong \angle ACB \text{ because angles supplementary to congruent angles are congruent. } \triangle ABC \sim \triangle DEF \text{ because of AA.} \]

36 ANS:

\[ 16 \frac{x - 3}{x + 5} = \frac{20}{x + 5} . \quad AC = x - 3 = 35 - 3 = 32 \]

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

\[ 140 = 4x \]

\[ 35 = x \]

37 ANS:

The length of each side of quadrilateral is 5. Since each side is congruent, quadrilateral \( MATH \) is a rhombus. The slope of \( MH \) is 0 and the slope of \( HT \) is \( -\frac{4}{3} \). Since the slopes are not negative reciprocals, the sides are not perpendicular and do not form right angles. Since adjacent sides are not perpendicular, quadrilateral \( MATH \) is not a square.

38 ANS:

\[ \text{The length of each side of quadrilateral is 5. Since each side is congruent, quadrilateral } \]

\[ \text{MATH is a rhombus. The slope of } \overline{MH} \text{ is 0 and the slope of } \overline{HT} \text{ is } -\frac{4}{3} \text{. Since the slopes are not negative reciprocals, the sides are not perpendicular and do not form right angles. Since adjacent sides are not perpendicular, quadrilateral } \]

\[ \text{MATH is not a square.} \]

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

PTS: 4 REF: 011136ge STA: G.G.44 TOP: Similarity Proofs

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

PTS: 6 REF: 011138ge STA: G.G.69 TOP: Quadrilaterals in the Coordinate Plane
### Answer Section

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1. $7x = 5x + 30$
   
   $2x = 30$
   
   $x = 15$

2. $d = \sqrt{(-1 - 7)^2 + (9 - 4)^2} = \sqrt{64 + 25} = \sqrt{89}$

3. $V = \frac{4}{3} \pi r^3 = \frac{4}{3} \pi \cdot 3^3 = 36\pi$
16 ANS: 3
\[ \sqrt{5^2 + 12^2} = 13 \]

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

17 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

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

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

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

20 ANS: 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

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

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

23 ANS: 2
The slope of a line in standard form is \( -\frac{A}{B} \), so the slope of this line is \( -\frac{4}{3} \). A parallel line would also have a slope of \( -\frac{4}{3} \). Since the answers are in standard form, use the point-slope formula.
\[ y - 2 = -\frac{4}{3} (x + 5) \]
\[ 3y - 6 = -4x - 20 \]
\[ 4x + 3y = -14 \]

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


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

28 ANS: 1
$x^2 = 7(16 - 7)$
$x^2 = 63$
$x = \sqrt{9}\sqrt{7}$
$x = 3\sqrt{7}$

29 ANS:
The medians of a triangle are not concurrent. False.

30 ANS:

PTS: 2  REF: 061129ge  STA: G.G.24  TOP: Negations

PTS: 2  REF: 061130ge  STA: G.G.20  TOP: Constructions
31 ANS:
9.1. \((11)(8)h = 800\)
\[ h \approx 9.1 \]

PTS: 2 REF: 061131ge STA: G.G.12 TOP: Volume

32 ANS:
Yes. A reflection is an isometry.

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

33 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

34 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

35 ANS:

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

36 ANS:
30. \( 3x + 4x + 5x = 360. \) \( m\overarc{LN} : m\overarc{NK} : m\overarc{KL} = 90:120:150. \) \[ \frac{150 - 90}{2} = 30 \]
\[ x = 20 \]

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

KEY: outside circle
37 ANS:

\[ (\frac{3}{2}, \frac{3}{2}) \]

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

38 ANS:

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

PTS: 5 REF: 061138ge STA: G.G.27 TOP: Circle Proofs
0811ge
Answer Section

1 ANS: 4 PTS: 2 REF: 081101ge STA: G.G.25
TOP: Compound Statements KEY: conjunction

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

3 ANS: 3
\[ \frac{5}{7} = \frac{10}{x} \]

\[ 5x = 70 \]
\[ x = 14 \]

PTS: 2 REF: 081103ge STA: G.G.46 TOP: Side Splitter Theorem
KEY: point of tangency

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

5 ANS: 4
\[ \sqrt{25^2 - 7^2} = 24 \]

PTS: 2 REF: 081105ge STA: G.G.50 TOP: Tangents
KEY: general

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

7 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: basic

8 ANS: 2 PTS: 2 REF: 081108ge STA: G.G.54
TOP: Reflections

9 ANS: 3
\[ 7x = 5x + 30 \]
\[ 2x = 30 \]
\[ x = 15 \]

PTS: 2 REF: 081109ge STA: G.G.35 TOP: Parallel Lines and Transversals

10 ANS: 4 PTS: 2 REF: 081110ge STA: G.G.71
TOP: Equations of Circles

11 ANS: 3 PTS: 2 REF: 081111ge STA: G.G.32
TOP: Exterior Angle Theorem
12 ANS: 2
\[ m = \frac{-A}{B} = \frac{-4}{2} = -2 \]
\[ y = mx + b \]
\[ 2 = -2(2) + b \]
\[ 6 = b \]

PTS: 2 REF: 081112ge STA: G.G.65 TOP: Parallel and Perpendicular Lines

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

14 ANS: 4

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

15 ANS: 1
\[ 1 = \frac{-4 + x}{2}, \quad 5 = \frac{3 + y}{2} \]
\[ -4 + x = 2 \quad 3 + y = 10 \]
\[ x = 6 \quad y = 7 \]

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

16 ANS: 1 PTS: 2 REF: 081116ge STA: G.G.7
TOP: Planes

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

18 ANS: 3

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

19 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

20 ANS: 2 PTS: 2 REF: 081120ge STA: G.G.8
TOP: Planes
21 ANS: 1 PTS: 2 REF: 081121ge STA: G.G.39
TOP: Special Parallelograms

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


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

24 ANS: 4
$$\sqrt{6^2 - 2^2} = \sqrt{32} = \sqrt{16 \cdot 2} = 4\sqrt{2}$$

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

25 ANS: 2
$(n - 2)180 = (6 - 2)180 = 720$. $\frac{720}{6} = 120$.

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

26 ANS: 1
$$m = \left( \frac{8 + 0}{2}, \frac{2 + 6}{2} \right) = (4,4)$$
$$m = \frac{6 - 2}{0 - 8} = \frac{4}{-8} = \frac{1}{2}$$
$$m_{\perp} = 2$$
$$y = mx + b$$
$$4 = 2(4) + b$$
$$-4 = b$$

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

27 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

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

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

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

\[ V = \frac{4}{3} \pi \cdot 9^3 = 972\pi \]

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

31 ANS:

\[ (x - 5)^2 + (y + 4)^2 = 36 \]

PTS: 2 REF: 081131ge STA: G.G.16 TOP: Surface Area

32 ANS:

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

PTS: 2 REF: 081132ge STA: G.G.72 TOP: Equations of Circles

33 ANS:

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

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

34 ANS:

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

PTS: 2 REF: 081134ge STA: G.G.21 TOP: Centroid, Orthocenter, Incenter and Circumcenter
35 ANS: No, $\angle KGH$ is not congruent to $\angle GKH$.

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

36 ANS: 

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

37 ANS: 

PTS: 2 REF: 081137ge STA: G.G.45 TOP: Similarity

KEY: basic

38 ANS: 

PTS: 6 REF: 081138ge STA: G.G.69 TOP: Quadrilaterals in the Coordinate Plane
0112ge
Answer Section

1 ANS: 2

\[6x + 42 = 18x - 12\]

\[54 = 12x\]

\[x = \frac{54}{12} = 4.5\]

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

2 ANS: 3

PTS: 2 REF: 011202ge STA: G.G.21

TOP: Centroid, Orthocenter, Incenter and Circumcenter

3 ANS: 2

PTS: 2 REF: 011203ge STA: G.G.73

TOP: Equations of Circles

4 ANS: 2

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

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

5 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

6 ANS: 2

PTS: 2 REF: 011206ge STA: G.G.32

TOP: Exterior Angle Theorem

7 ANS: 1

PTS: 2 REF: 011207ge STA: G.G.20

TOP: Constructions

8 ANS: 4

PTS: 2 REF: 011208ge STA: G.G.53

TOP: Segments Intercepted by Circle KEY: two tangents

9 ANS: 3

PTS: 2 REF: 011209ge STA: G.G.44

TOP: Similarity Proofs

10 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

11 ANS: 2

PTS: 2 REF: 011211ge STA: G.G.55

TOP: Properties of Transformations

12 ANS: 4

PTS: 2 REF: 011212ge STA: G.G.71

TOP: Equations of Circles

13 ANS: 1

PTS: 2 REF: 011213ge STA: G.G.24

TOP: Negations
2

\[
\frac{50 + x}{2} = 34
\]

\[
50 + x = 68
\]

\[
x = 18
\]

PTS: 2  REF: 011214ge  STA: G.G.51  TOP: Arcs Determined by Angles

KEY: inside circle

ANS: 2  PTS: 2  REF: 011215ge  STA: G.G.12  TOP: Volume


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

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

ANS: 4

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

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


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


ANS: 3

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

PTS: 2  REF: 011223ge  STA: G.G.36  TOP: Interior and Exterior Angles of Polygons

ANS: 3

\[
y = mx + b
\]

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

\[
-5 = b
\]

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

ANS: 4

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

PTS: 2  REF: 011225ge  STA: G.G.68  TOP: Perpendicular Bisector
26 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

27 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

28 ANS: 2
$5 - 3 = 2, 5 + 3 = 8$

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

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

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

30 ANS:

PTS: 2 REF: 011230ge STA: G.G.22 TOP: Locus

31 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

32 ANS:
$R'(-3, -2)$, $S'(-4, 4)$, and $T'(2, 2)$.

PTS: 2 REF: 011232ge STA: G.G.54 TOP: Rotations
33 ANS:

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

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

35 ANS:

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


36 ANS:

\[ V = \pi r^2 h, \ L = 2\pi rh = 2\pi \cdot 5\sqrt{2} \cdot 12 \approx 533.1 \]

\[ 600\pi = \pi r^2 \cdot 12 \]

\[ 50 = r^2 \]

\[ \sqrt{25} \sqrt{2} = r \]

\[ 5\sqrt{2} = r \]

PTS: 4  REF: 011236ge  STA: G.G.14  TOP: Volume

37 ANS:

\[ M\left(\frac{-7+5}{2}, \frac{2+4}{2}\right) = M(-1, 3). \]

\[ N\left(\frac{3+5}{2}, \frac{-4+4}{2}\right) = N(4, 0). \]

\[ \overrightarrow{MN} \text{ is a midsegment.} \]

PTS: 4  REF: 011237ge  STA: G.G.42  TOP: Midsegments
Quadrilateral $ABCD$, $AD \cong BC$ and $\angle DAE \cong \angle BCE$ are given. $AD \parallel BC$ because if two lines are cut by a transversal so that a pair of alternate interior angles are congruent, the lines are parallel. $ABCD$ is a parallelogram because if one pair of opposite sides of a quadrilateral are both congruent and parallel, the quadrilateral is a parallelogram. $AE \cong CE$ because the diagonals of a parallelogram bisect each other. $\angle FEA \cong \angle GEC$ as vertical angles. $\triangle AEF \cong \triangle CEG$ by ASA.
0612ge
Answer Section

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

2 ANS: 2 PTS: 2 REF: 061202ge STA: G.G.24
TOP: Negations

3 ANS: 4 PTS: 2 REF: 061203ge STA: G.G.9
TOP: Planes

4 ANS: 1

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

PTS: 2 REF: 061204ge STA: G.G.40 TOP: Trapezoids

5 ANS: 3

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

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

6 ANS: 2

\[ AC = BD \]
\[ AC - BC = BD - BC \]
\[ AB = CD \]

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

7 ANS: 2

\[ V = \frac{4}{3} \pi r^3 = \frac{4}{3} \pi \cdot \left( \frac{15}{2} \right)^3 \approx 1767.1 \]

PTS: 2 REF: 061207ge STA: G.G.16 TOP: Volume and Surface Area

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

9 ANS: 1

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

PTS: 2 REF: 061209ge STA: G.G.69 TOP: Quadrilaterals in the Coordinate Plane

10 ANS: 3 PTS: 2 REF: 061210ge STA: G.G.71
TOP: Equations of Circles
11 ANS: 4

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

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

12 ANS: 1

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

13 ANS: 4  PTS: 2  REF: 061213ge  STA: G.G.5  TOP: Planes

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

15 ANS: 4

\[m_{\perp} = -\frac{1}{3}, \ y = mx + b\]

\[6 = -\frac{1}{3} (-9) + b\]

\[6 = 3 + b\]

\[3 = b\]

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

16 ANS: 3

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

\[8x = 24\]

\[x = 3\]

PTS: 2  REF: 061216ge  STA: G.G.46  TOP: Side Splitter Theorem
17 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

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

19 ANS: 2  
\[m = \frac{-4}{-2} = 2, \ m_\perp = \frac{-1}{10}\]

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

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

21 ANS: 2  
\[\sqrt{17^2 - 15^2} = 8, \ 17 - 8 = 9\]

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

22 ANS: 3  
Opposite sides of a parallelogram are congruent and the diagonals of a parallelogram bisect each other.

PTS: 2  REF: 061222ge  STA: G.G.28  TOP: Triangle Congruency

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

24 ANS: 3  PTS: 2  REF: 061224ge  STA: G.G.45  
TOP: Similarity  KEY: basic

25 ANS: 4  
\[x^2 - 6x + 2x - 3 = 9x + 27\]
\[x^2 - 4x - 3 = 9x + 27\]
\[x^2 - 13x - 30 = 0\]
\[(x - 15)(x + 2) = 0\]
\[x = 15, -2\]

PTS: 2  REF: 061225ge  STA: G.G.32  TOP: Exterior Angle Theorem
26 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

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

28 ANS: 3 PTS: 2 REF: 061228ge STA: G.G.39
TOP: Special Parallelograms

29 ANS:

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

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

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

31 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

32 ANS:

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

\[ L = 2\pi rh = 2\pi \cdot 12 \cdot 22 \approx 1659. \quad \frac{1659}{600} \approx 2.8 \]

3 cans are needed.

PTS: 2 REFERENCES: 061233ge STANDARDS: G.G.14 TOPICS: Lateral Area

34 ANS:

PTS: 2 REFERENCES: 061234ge STANDARDS: G.G.23 TOPICS: Locus

35 ANS:

\[ \angle B \text{ and } \angle C \text{ are right angles because perpendicular lines form right angles. } \angle B \cong \angle C \text{ because all right angles are congruent. } \angle AEB \cong \angle DEC \text{ because vertical angles are congruent. } \triangle ABE \cong \triangle DCE \text{ because of ASA. } \overline{AB} \cong \overline{DC} \text{ because CPCTC.} \]

PTS: 4 REFERENCES: 061235ge STANDARDS: G.G.27 TOPICS: Triangle Proofs

36 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 REFERENCES: 061236ge STANDARDS: G.G.58 TOPICS: Compositions of Transformations KEY: grids
37 ANS:

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

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

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

\[ x = 4 \]

PTS: 4  REF: 061237ge  STA: G.G.53  TOP: Segments Intercepted by Circle

KEY: tangent and secant

38 ANS:

PTS: 6  REF: 061238ge  STA: G.G.70  TOP: Quadratic-Linear Systems
0812ge

Answer Section

1 ANS: 4
Parallel lines intercept congruent arcs.

PTS: 2 REF: 081201ge STA: G.G.52 TOP: Chords

2 ANS: 2 PTS: 2 REF: 081202ge STA: G.G.55
TOP: Properties of Transformations

3 ANS: 4
\[-5 = \frac{-3 + x}{2}, \quad 2 = \frac{6 + y}{2}\]

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

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

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

4 ANS: 3 PTS: 2 REF: 081204ge STA: G.G.59
TOP: Properties of Transformations

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

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

7 ANS: 1

\[AB = CD\]

\[AB + BC = CD + BC\]

\[AC = BD\]

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

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

9 ANS: 3 PTS: 2 REF: 081209ge STA: G.G.71
TOP: Equations of Circles

10 ANS: 1

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

11 ANS: 4 PTS: 2 REF: 081211ge STA: G.G.5
TOP: Planes
12 ANS: 2 PTS: 2 REF: 081212ge STA: G.G.72
TOP: Equations of Circles

13 ANS: 3
\[ 4x + 14 + 8x + 10 = 180 \]
\[ 12x = 156 \]
\[ x = 13 \]

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

14 ANS: 2 PTS: 2 REF: 081214ge STA: G.G.50
TOP: Tangents KEY: point of tangency

15 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

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

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

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

18 ANS: 3 PTS: 2 REF: 081218ge STA: G.G.1
TOP: Planes

19 ANS: 1

PTS: 2 REF: 081219ge STA: G.G.34 TOP: Angle Side Relationship

20 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
The length of the midsegment of a trapezoid is the average of the lengths of its bases. \(\frac{x+3+5x-9}{2} = 2x + 2\).

\[6x - 6 = 4x + 4\]
\[2x = 10\]
\[x = 5\]

PTS: 2
REF: 081221ge
STA: G.G.40
TOP: Trapezoids

\[3x + x + 20 + x + 20 = 180\]
\[5x = 40\]
\[x = 28\]

PTS: 2
REF: 081222ge
STA: G.G.31
TOP: Isosceles Triangle Theorem

\[180(n - 2) = n \left( 180 - \frac{180(n - 2)}{n} \right)\]
\[180n - 360 = 180n - 180n + 360\]
\[180n = 720\]
\[n = 4\]

PTS: 2
REF: 081223ge
STA: G.G.36
TOP: Interior and Exterior Angles of Polygons

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

PTS: 2
REF: 081225ge
STA: G.G.62
TOP: Parallel and Perpendicular Lines

\[2y = x + 2\]
The slope 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

2 is not a prime number, false.

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

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

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

31 ANS:

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

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

32 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

33 ANS:

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

34 ANS:

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

11. \(x^2 + 6x = x + 14\). \(6(2) - 1 = 11\)

\[x^2 + 5x - 14 = 0\]

\((x + 7)(x - 2) = 0\)

\(x = 2\)

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

36 ANS:

\[\text{Diagram of parallelogram}\]

PTS: 4  REF: 081236ge  STA: G.G.58  TOP: Compositions of Transformations

KEY: grids

37 ANS:

\[\text{Diagram of quadratic-linear system}\]

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

38 ANS:

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

\(\frac{1}{4} \times 192 = 48\)

\(\frac{56 + 48}{2} = 52\)

PTS: 6  REF: 081238ge  STA: G.G.51  TOP: Arcs Determined by Angles

KEY: inscribed