JMAP
REGENTS BY DATE

NY Geometry CCSS Regents Exam Questions
from Spring 2014 to August 2017 Sorted by Date
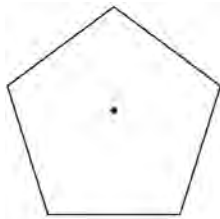
2014 Geometry Common Core State Standards Sample Items

1 What are the coordinates of the point on the directed line segment from $K(-5,-4)$ to $L(5,1)$ that partitions the segment into a ratio of 3 to 2?
1) $(-3,-3)$
2) $(-1,-2)$
3) $\left(0,-\dfrac{3}{2}\right)$
4) $(1,-1)$

2 A regular pentagon is shown in the diagram below.


If the pentagon is rotated clockwise around its center, the minimum number of degrees it must be rotated to carry the pentagon onto itself is
1) 54°
2) 72°
3) 108°
4) 360°

3 The equation of line h is $2x + y = 1$. Line m is the image of line h after a dilation of scale factor 4 with respect to the origin. What is the equation of the line m?
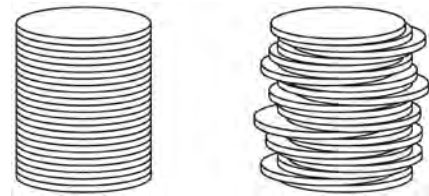1) $y = -2x + 1$
2) $y = -2x + 4$
3) $y = 2x + 4$
4) $y = 2x + 1$

4 As shown in the diagram below, circle A has a radius of 3 and circle B has a radius of 5.
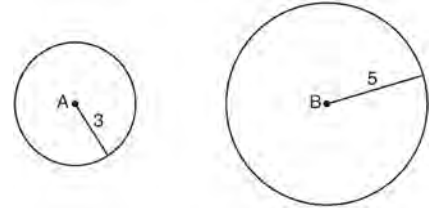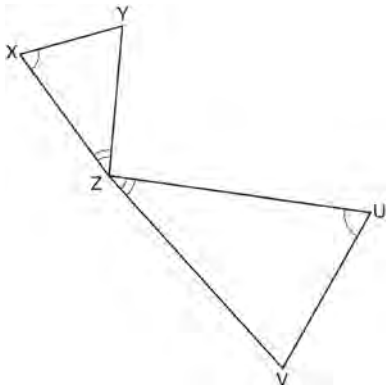

Use transformations to explain why circles A and B are similar.

5 Two stacks of 23 quarters each are shown below. One stack forms a cylinder but the other stack does not form a cylinder.

Use Cavelieri's principle to explain why the volumes of these two stacks of quarters are equal.
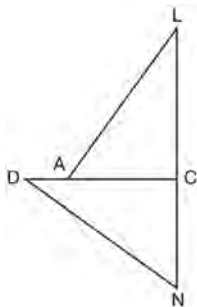
6　In the diagram below, triangles *XYZ* and *UVZ* are drawn such that $\angle X \cong \angle U$ and $\angle XZY \cong \angle UZV$.

Describe a sequence of similarity transformations that shows $\triangle XYZ$ is similar to $\triangle UVZ$.

7　Explain why $\cos(x) = \sin(90 - x)$ for *x* such that $0 < x < 90$.

8　In the diagram of $\triangle LAC$ and $\triangle DNC$ below, $\overline{LA} \cong \overline{DN}$, $\overline{CA} \cong \overline{CN}$, and $\overline{DAC} \perp \overline{LCN}$.


a) Prove that $\triangle LAC \cong \triangle DNC$.
b) Describe a sequence of rigid motions that will map $\triangle LAC$ onto $\triangle DNC$.

9　As shown below, a canoe is approaching a lighthouse on the coastline of a lake. The front of the canoe is 1.5 feet above the water and an observer in the lighthouse is 112 feet above the water.


(Not drawn to scale)
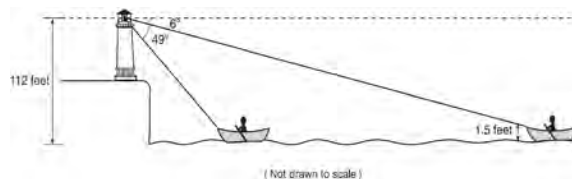
At 5:00, the observer in the lighthouse measured the angle of depression to the front of the canoe to be 6°. Five minutes later, the observer measured and saw the angle of depression to the front of the canoe had increased by 49°. Determine and state, to the *nearest foot per minute*, the average speed at which the canoe traveled toward the lighthouse.

10　In the diagram below of circle *O*, diameter $\overline{AB}$ and radii $\overline{OC}$ and $\overline{OD}$ are drawn. The length of $\overline{AB}$ is 12 and the measure of $\angle COD$ is 20 degrees.
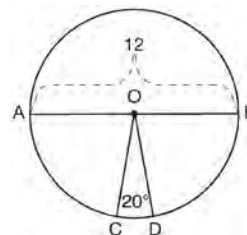

If $\overparen{AC} \cong \overparen{BD}$, find the area of sector *BOD* in terms of π.

2

11 Given: $\triangle XYZ$, $\overline{XY} \cong \overline{ZY}$, and $\overline{YW}$ bisects $\angle XYZ$
Prove that $\angle YWZ$ is a right angle.
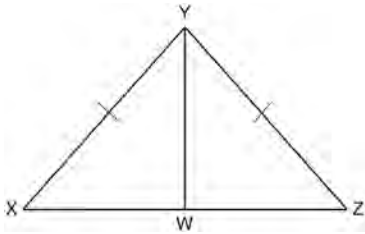
12 Trees that are cut down and stripped of their
branches for timber are approximately cylindrical.
A timber company specializes in a certain type of
tree that has a typical diameter of 50 cm and a
typical height of about 10 meters. The density of
the wood is 380 kilograms per cubic meter, and the
wood can be sold by mass at a rate of $4.75 per
kilogram. Determine and state the minimum
number of whole trees that must be sold to raise at
least $50,000.

13 In the diagram below, secant $\overline{ACD}$ and tangent $\overline{AB}$
are drawn from external point A to circle O.
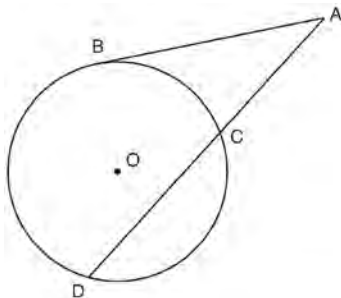
Prove the theorem: If a secant and a tangent are
drawn to a circle from an external point, the
product of the lengths of the secant segment and its
external segment equals the length of the tangent
segment squared. $(AC \cdot AD = AB^2)$

14 Given: D is the image of A after a reflection over
$\overleftrightarrow{CH}$.

$\overleftrightarrow{CH}$ is the perpendicular bisector of $\overline{BCE}$
$\triangle ABC$ and $\triangle DEC$ are drawn
Prove: $\triangle ABC \cong \triangle DEC$
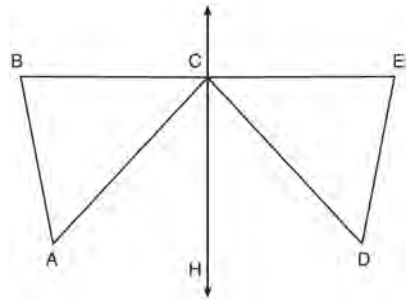
15 A man who is 5 feet 9 inches tall casts a shadow of
8 feet 6 inches. Assuming that the man is standing
perpendicular to the ground, what is the angle of
elevation from the end of the shadow to the top of
the man's head, to the *nearest tenth of a degree*?
1) 34.1
2) 34.5
3) 42.6
4) 55.9

3

16 The image of $\triangle ABC$ after a rotation of 90º clockwise about the origin is $\triangle DEF$, as shown below.
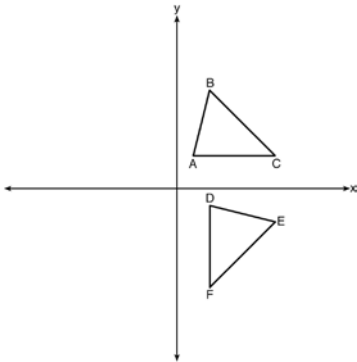
Which statement is true?
1) $\overline{BC} \cong \overline{DE}$
2) $\overline{AB} \cong \overline{DF}$
3) $\angle C \cong \angle E$
4) $\angle A \cong \angle D$

17 The line $y = 2x - 4$ is dilated by a scale factor of $\frac{3}{2}$ and centered at the origin. Which equation represents the image of the line after the dilation?
1) $y = 2x - 4$
2) $y = 2x - 6$
3) $y = 3x - 4$
4) $y = 3x - 6$

18 In the diagram below, the circle shown has radius 10. Angle B intercepts an arc with a length of 2π.
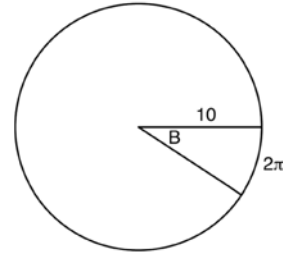
What is the measure of angle B, in radians?
1) $10 + 2\pi$
2) 20π
3) $\frac{\pi}{5}$
4) $\frac{5}{\pi}$

19 In isosceles $\triangle MNP$, line segment NO bisects vertex $\angle MNP$, as shown below. If $MP = 16$, find the length of $\overline{MO}$ and explain your answer.

20 A contractor needs to purchase 500 bricks. The dimensions of each brick are 5.1 cm by 10.2 cm by 20.3 cm, and the density of each brick is 1920 kg/m^3. The maximum capacity of the contractor's trailer is 900 kg. Can the trailer hold the weight of 500 bricks? Justify your answer.

21 In right triangle ABC with the right angle at C, $\sin A = 2x + 0.1$ and $\cos B = 4x - 0.7$. Determine and state the value of x. Explain your answer.
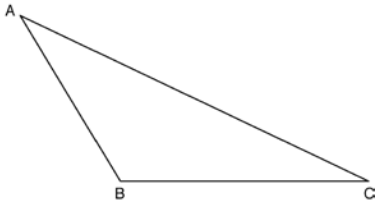
22 Given right triangles ABC and DEF where $\angle C$ and $\angle F$ are right angles, $\overline{AC} \cong \overline{DF}$ and $\overline{CB} \cong \overline{FE}$. Describe a precise sequence of rigid motions which would show $\triangle ABC \cong \triangle DEF$.
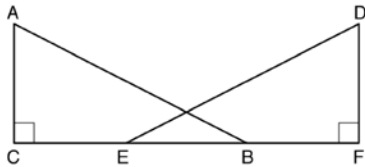
23 Using a compass and straightedge, construct an altitude of triangle ABC below. [Leave all construction marks.]

24 Prove the sum of the exterior angles of a triangle is $360°$.
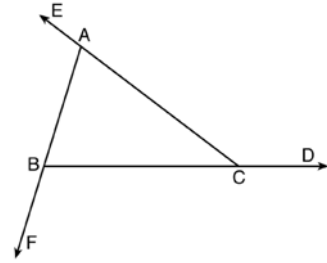
25 In rhombus $MATH$, the coordinates of the endpoints of the diagonal $\overline{MT}$ are $M(0,-1)$ and $T(4,6)$. Write an equation of the line that contains diagonal $\overline{AH}$. [Use of the set of axes below is optional.] Using the given information, explain how you know that your line contains diagonal $\overline{AH}$.

5
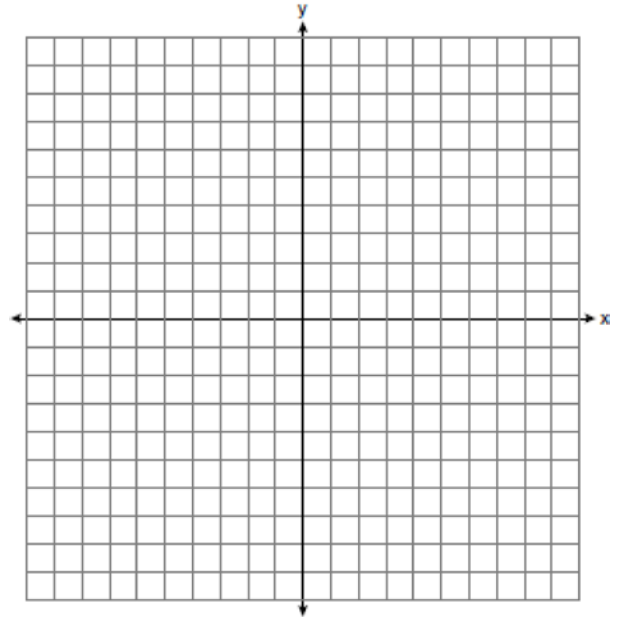
26 Using a straightedge and compass, construct a square inscribed in circle *O* below. [Leave all construction marks.]

Determine the measure of the arc intercepted by two adjacent sides of the constructed square. Explain your reasoning.

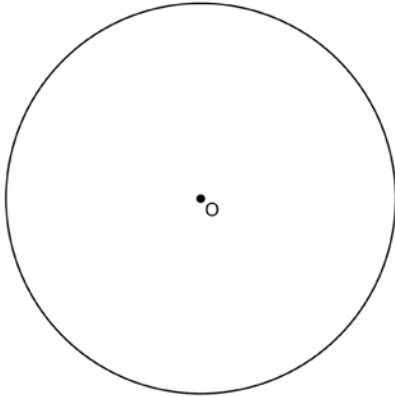27 The map below shows the three tallest mountain peaks in New York State: Mount Marcy, Algonquin Peak, and Mount Haystack. Mount Haystack, the shortest peak, is 4960 feet tall. Surveyors have determined the horizontal distance between Mount Haystack and Mount Marcy is 6336 feet and the horizontal distance between Mount Marcy and Algonquin Peak is 20,493 feet.
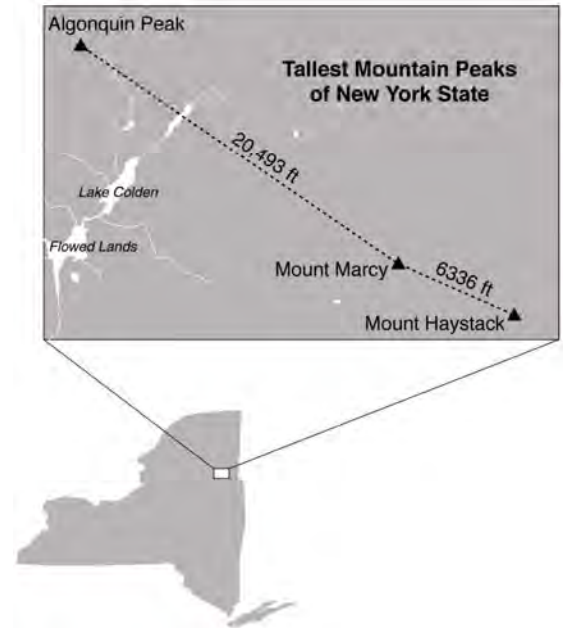
The angle of depression from the peak of Mount Marcy to the peak of Mount Haystack is 3.47 degrees. The angle of elevation from the peak of Algonquin Peak to the peak of Mount Marcy is 0.64 degrees. What are the heights, to the *nearest foot*, of Mount Marcy and Algonquin Peak? Justify your answer.

0615geo

1 Which object is formed when right triangle *RST* shown below is rotated around leg $\overline{RS}$?
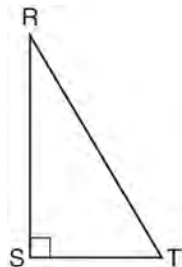
1) a pyramid with a square base
2) an isosceles triangle
3) a right triangle
4) a cone

2 The vertices of $\triangle JKL$ have coordinates $J(5,1)$, $K(-2,-3)$, and $L(-4,1)$. Under which transformation is the image $\triangle J'K'L'$ *not* congruent to $\triangle JKL$?
1) a translation of two units to the right and two units down
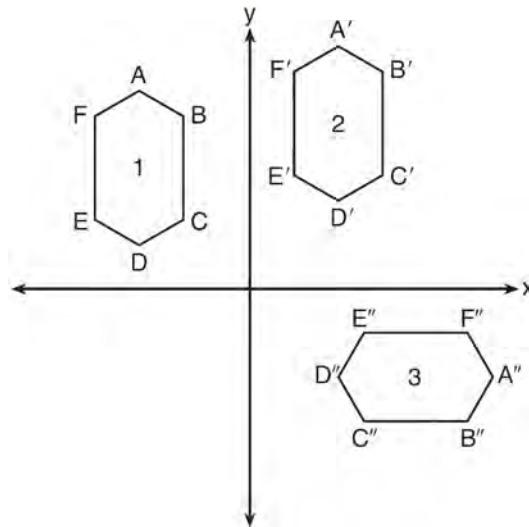2) a counterclockwise rotation of 180 degrees around the origin
3) a reflection over the *x*-axis
4) a dilation with a scale factor of 2 and centered at the origin

3 The center of circle *Q* has coordinates $(3,-2)$. If circle *Q* passes through $R(7,1)$, what is the length of its diameter?
1) 50
2) 25
3) 10
4) 5

4 In the diagram below, congruent figures 1, 2, and 3 are drawn.

Which sequence of transformations maps figure 1 onto figure 2 and then figure 2 onto figure 3?
1) a reflection followed by a translation
2) a rotation followed by a translation
3) a translation followed by a reflection
4) a translation followed by a rotation

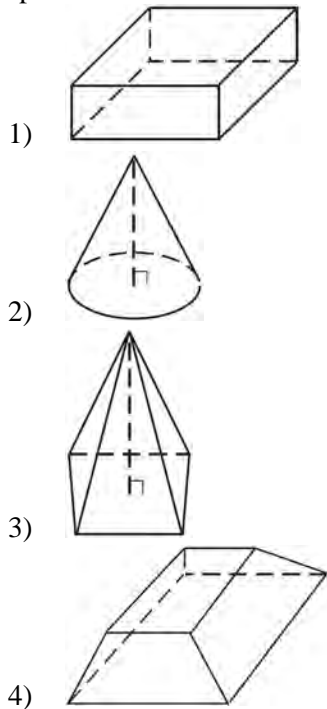5 As shown in the diagram below, the angle of elevation from a point on the ground to the top of the tree is 34°.
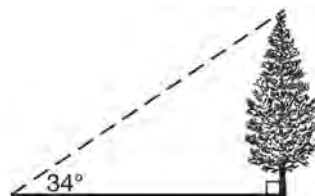
If the point is 20 feet from the base of the tree, what is the height of the tree, to the *nearest tenth of a foot*?
1) 29.7
2) 16.6
3) 13.5
4) 11.2

6 Which figure can have the same cross section as a sphere?

1)

2)

3)

4)

7 A shipping container is in the shape of a right rectangular prism with a length of 12 feet, a width of 8.5 feet, and a height of 4 feet. The container is completely filled with contents that weigh, on average, 0.25 pound per cubic foot. What is the weight, in pounds, of the contents in the container?
1) 1,632
2) 408
3) 102
4) 92

8 In the diagram of circle A shown below, chords $\overline{CD}$ and $\overline{EF}$ intersect at G, and chords $\overline{CE}$ and $\overline{FD}$ are drawn.
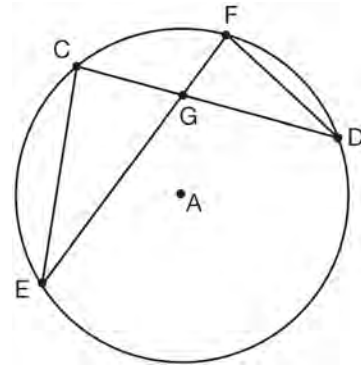
Which statement is *not* always true?
1) $\overline{CG} \cong \overline{FG}$
2) $\angle CEG \cong \angle FDG$
3) $\dfrac{CE}{EG} = \dfrac{FD}{DG}$
4) $\triangle CEG \sim \triangle FDG$

9 Which equation represents a line that is perpendicular to the line represented by $2x - y = 7$?
1) $y = -\dfrac{1}{2}x + 6$
2) $y = \dfrac{1}{2}x + 6$
3) $y = -2x + 6$
4) $y = 2x + 6$

10 Which regular polygon has a minimum rotation of 45° to carry the polygon onto itself?
1) octagon
2) decagon
3) hexagon
4) pentagon

11 In the diagram of $\triangle ADC$ below, $\overline{EB} \parallel \overline{DC}$, $AE = 9$, $ED = 5$, and $AB = 9.2$.
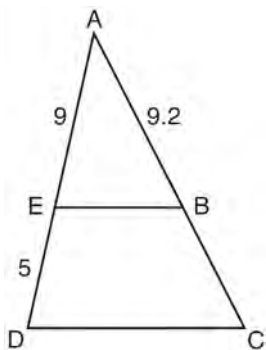
What is the length of $\overline{AC}$, to the *nearest tenth*?
1) 5.1
2) 5.2
3) 14.3
4) 14.4

12 In scalene triangle ABC shown in the diagram below, $m\angle C = 90°$.
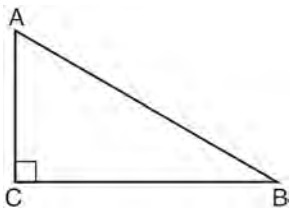
Which equation is always true?
1) $\sin A = \sin B$
2) $\cos A = \cos B$
3) $\cos A = \sin C$
4) $\sin A = \cos B$

13 Quadrilateral $ABCD$ has diagonals $\overline{AC}$ and $\overline{BD}$. Which information is *not* sufficient to prove $ABCD$ is a parallelogram?
1) $\overline{AC}$ and $\overline{BD}$ bisect each other.
2) $\overline{AB} \cong \overline{CD}$ and $\overline{BC} \cong \overline{AD}$
3) $\overline{AB} \cong \overline{CD}$ and $\overline{AB} \parallel \overline{CD}$
4) $\overline{AB} \cong \overline{CD}$ and $\overline{BC} \parallel \overline{AD}$

14 The equation of a circle is $x^2 + y^2 + 6y = 7$. What are the coordinates of the center and the length of the radius of the circle?
1) center $(0,3)$ and radius 4
2) center $(0,-3)$ and radius 4
3) center $(0,3)$ and radius 16
4) center $(0,-3)$ and radius 16

15 Triangles ABC and DEF are drawn below.
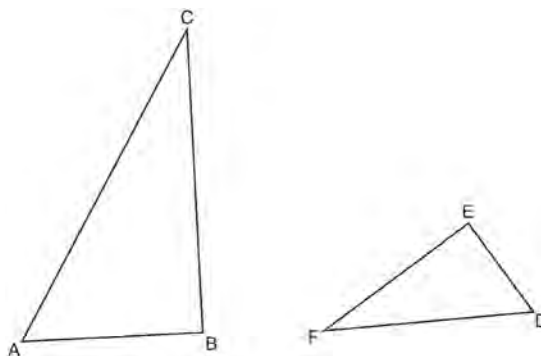
If $AB = 9$, $BC = 15$, $DE = 6$, $EF = 10$, and $\angle B \cong \angle E$, which statement is true?
1) $\angle CAB \cong \angle DEF$
2) $\dfrac{AB}{CB} = \dfrac{FE}{DE}$
3) $\triangle ABC \sim \triangle DEF$
4) $\dfrac{AB}{DE} = \dfrac{FE}{CB}$

16 If $\triangle ABC$ is dilated by a scale factor of 3, which statement is true of the image $\triangle A'B'C'$?
1) $3A'B' = AB$
2) $B'C' = 3BC$
3) $m\angle A' = 3(m\angle A)$
4) $3(m\angle C') = m\angle C$

17 Steve drew line segments $ABCD$, EFG, BF, and CF as shown in the diagram below. Scalene $\triangle BFC$ is formed.
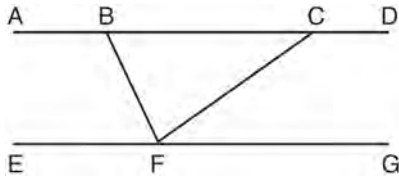
Which statement will allow Steve to prove $\overline{ABCD} \parallel \overline{EFG}$?
1) $\angle CFG \cong \angle FCB$
2) $\angle ABF \cong \angle BFC$
3) $\angle EFB \cong \angle CFB$
4) $\angle CBF \cong \angle GFC$

18 In the diagram below, $\overline{CD}$ is the image of $\overline{AB}$ after a dilation of scale factor k with center E.

Which ratio is equal to the scale factor k of the dilation?
1) $\dfrac{EC}{EA}$
2) $\dfrac{BA}{EA}$
3) $\dfrac{EA}{BA}$
4) $\dfrac{EA}{EC}$

19 A gallon of paint will cover approximately 450 square feet. An artist wants to paint all the outside surfaces of a cube measuring 12 feet on each edge. What is the *least* number of gallons of paint he must buy to paint the cube?
1) 1
2) 2
3) 3
4) 4

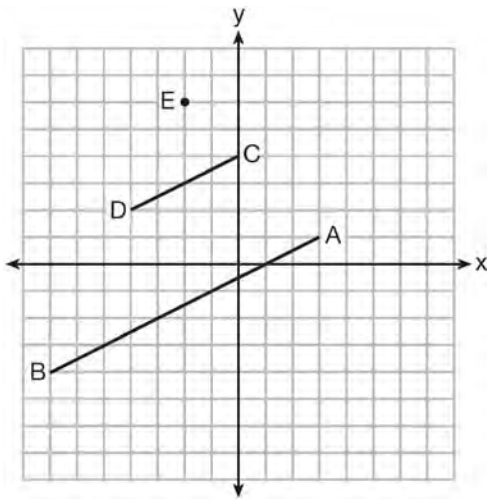20 In circle O shown below, diameter $\overline{AC}$ is perpendicular to $\overline{CD}$ at point C, and chords $\overline{AB}$, $\overline{BC}$, $\overline{AE}$, and $\overline{CE}$ are drawn.
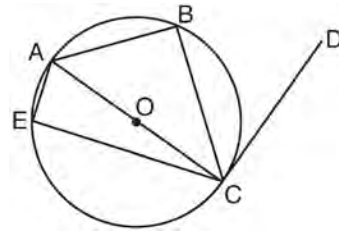
Which statement is *not* always true?
1) $\angle ACB \cong \angle BCD$
2) $\angle ABC \cong \angle ACD$
3) $\angle BAC \cong \angle DCB$
4) $\angle CBA \cong \angle AEC$

21 In the diagram below, $\triangle ABC \sim \triangle DEC$.
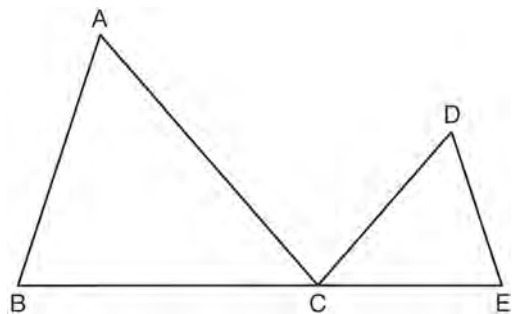
If $AC = 12$, $DC = 7$, $DE = 5$, and the perimeter of $\triangle ABC$ is 30, what is the perimeter of $\triangle DEC$?
1) 12.5
2) 14.0
3) 14.8
4) 17.5

22 The line $3y = -2x + 8$ is transformed by a dilation centered at the origin. Which linear equation could be its image?
1) $2x + 3y = 5$
2) $2x - 3y = 5$
3) $3x + 2y = 5$
4) $3x - 2y = 5$

23 A circle with a radius of 5 was divided into 24 congruent sectors. The sectors were then rearranged, as shown in the diagram below.
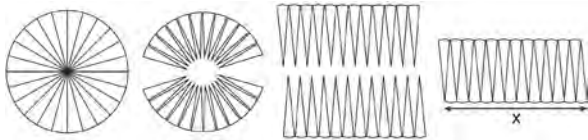
To the *nearest integer*, the value of x is
1) 31
2) 16
3) 12
4) 10

24 Which statement is sufficient evidence that $\triangle DEF$ is congruent to $\triangle ABC$?
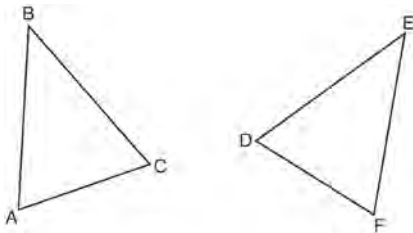
1) $AB = DE$ and $BC = EF$
2) $\angle D \cong \angle A$, $\angle B \cong \angle E$, $\angle C \cong \angle F$
3) There is a sequence of rigid motions that maps $\overline{AB}$ onto $\overline{DE}$, $\overline{BC}$ onto $\overline{EF}$, and $\overline{AC}$ onto $\overline{DF}$.
4) There is a sequence of rigid motions that maps point A onto point D, $\overline{AB}$ onto $\overline{DE}$, and $\angle B$ onto $\angle E$.

25 Use a compass and straightedge to construct an inscribed square in circle T shown below. [Leave all construction marks.]
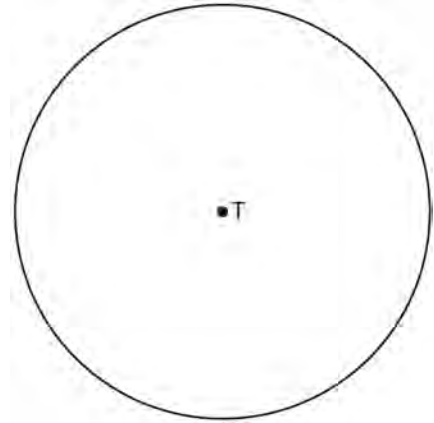
26 The diagram below shows parallelogram $LMNO$ with diagonal $\overline{LN}$, m$\angle M = 118°$, and m$\angle LNO = 22°$.
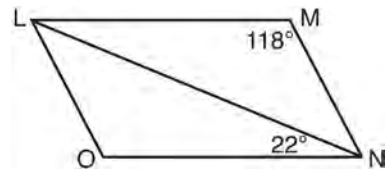
Explain why m$\angle NLO$ is 40 degrees.

27 The coordinates of the endpoints of $\overline{AB}$ are $A(-6,-5)$ and $B(4,0)$. Point P is on $\overline{AB}$. Determine and state the coordinates of point P, such that $AP:PB$ is $2:3$. [The use of the set of axes below is optional.]
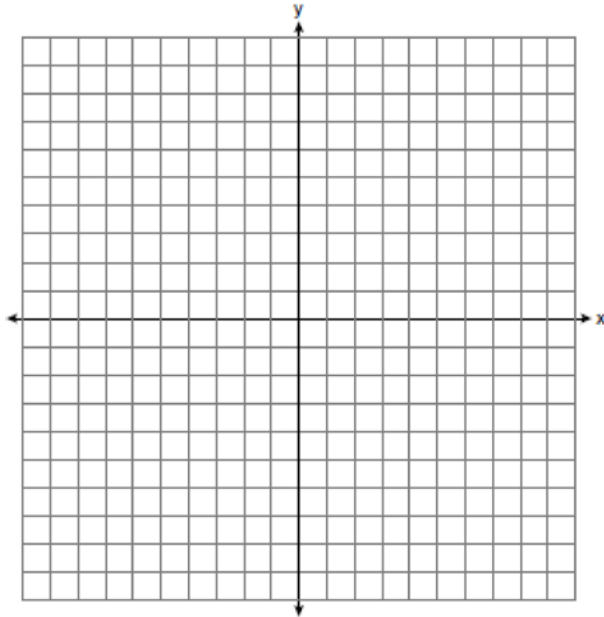
28 The diagram below shows a ramp connecting the ground to a loading platform 4.5 feet above the ground. The ramp measures 11.75 feet from the ground to the top of the loading platform.
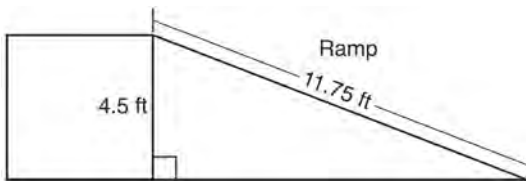
Determine and state, to the *nearest degree*, the angle of elevation formed by the ramp and the ground.

29 In the diagram below of circle O, the area of the shaded sector AOC is 12π in^2 and the length of $\overline{OA}$ is 6 inches. Determine and state m$\angle AOC$.
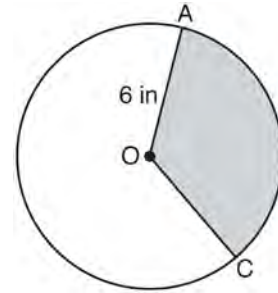
30 After a reflection over a line, $\triangle A'B'C'$ is the image of $\triangle ABC$. Explain why triangle ABC is congruent to triangle $\triangle A'B'C'$.

31 A flagpole casts a shadow 16.60 meters long. Tim stands at a distance of 12.45 meters from the base of the flagpole, such that the end of Tim's shadow meets the end of the flagpole's shadow. If Tim is 1.65 meters tall, determine and state the height of the flagpole to the *nearest tenth of a meter*.

32 In the diagram below, $\overline{EF}$ intersects $\overline{AB}$ and $\overline{CD}$ at G and H, respectively, and $\overline{GI}$ is drawn such that $\overline{GH} \cong \overline{IH}$.
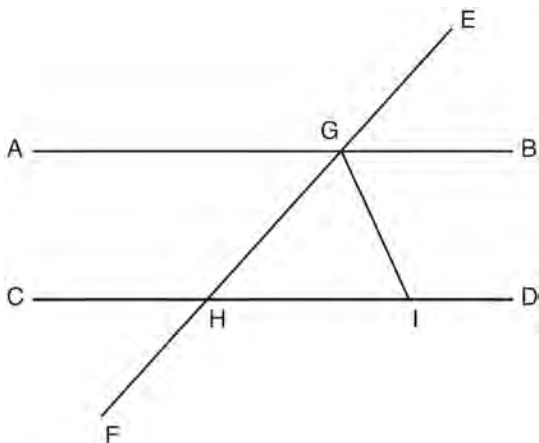
If m∠EGB = 50° and m∠DIG = 115°, explain why $\overline{AB} \parallel \overline{CD}$.

33 Given: Quadrilateral $ABCD$ is a parallelogram with diagonals $\overline{AC}$ and $\overline{BD}$ intersecting at E
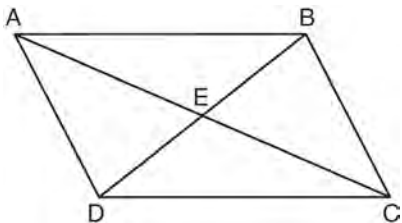
Prove: $\triangle AED \cong \triangle CEB$
Describe a single rigid motion that maps $\triangle AED$ onto $\triangle CEB$.

34 In the diagram below, the line of sight from the park ranger station, P, to the lifeguard chair, L, on the beach of a lake is perpendicular to the path joining the campground, C, and the first aid station, F. The campground is 0.25 mile from the lifeguard chair. The straight paths from both the campground and first aid station to the park ranger station are perpendicular.
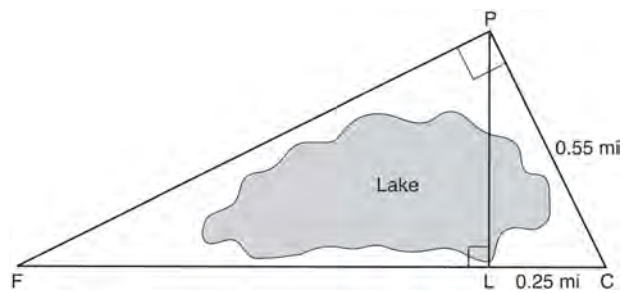
If the path from the park ranger station to the campground is 0.55 mile, determine and state, to the *nearest hundredth of a mile*, the distance between the park ranger station and the lifeguard chair. Gerald believes the distance from the first aid station to the campground is at least 1.5 miles. Is Gerald correct? Justify your answer.

7

35 The water tower in the picture below is modeled by the two-dimensional figure beside it. The water tower is composed of a hemisphere, a cylinder, and a cone. Let C be the center of the hemisphere and let D be the center of the base of the cone.

Source: http://en.wikipedia.org
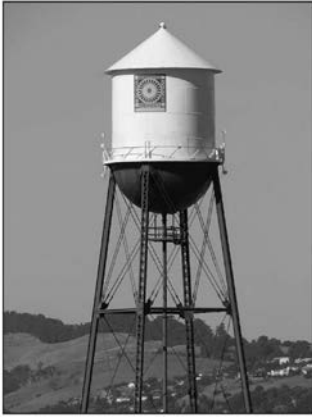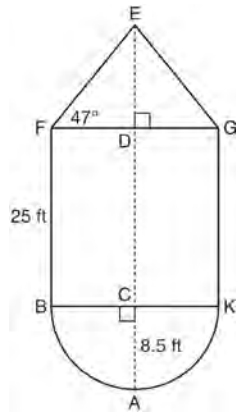
If $AC = 8.5$ feet, $BF = 25$ feet, and m$\angle EFD = 47°$, determine and state, to the *nearest cubic foot*, the volume of the water tower. The water tower was constructed to hold a maximum of 400,000 pounds of water. If water weighs 62.4 pounds per cubic foot, can the water tower be filled to 85% of its volume and *not* exceed the weight limit? Justify your answer.

36 In the coordinate plane, the vertices of $\triangle RST$ are $R(6,-1)$, $S(1,-4)$, and $T(-5,6)$. Prove that $\triangle RST$ is a right triangle. State the coordinates of point P such that quadrilateral $RSTP$ is a rectangle. Prove that your quadrilateral $RSTP$ is a rectangle. [The use of the set of axes below is optional.]
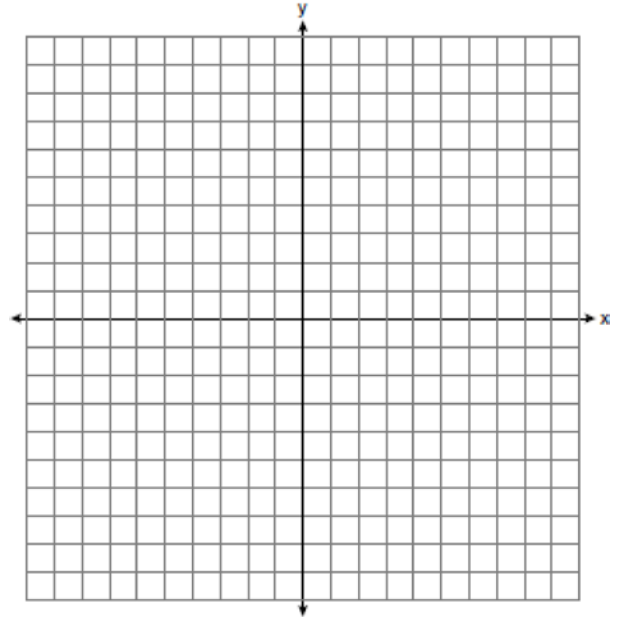
0815geo

1 A parallelogram must be a rectangle when its
1) diagonals are perpendicular
2) diagonals are congruent
3) opposite sides are parallel
4) opposite sides are congruent

2 If $\triangle A'B'C'$ is the image of $\triangle ABC$, under which transformation will the triangles *not* be congruent?
1) reflection over the *x*-axis
2) translation to the left 5 and down 4
3) dilation centered at the origin with scale factor 2
4) rotation of 270° counterclockwise about the origin

3 If the rectangle below is continuously rotated about side *w*, which solid figure is formed?

1) pyramid
2) rectangular prism
3) cone
4) cylinder

4 Which expression is always equivalent to $\sin x$ when $0° < x < 90°$?
1) $\cos(90° - x)$
2) $\cos(45° - x)$
3) $\cos(2x)$
4) $\cos x$

5 In the diagram below, a square is graphed in the coordinate plane.
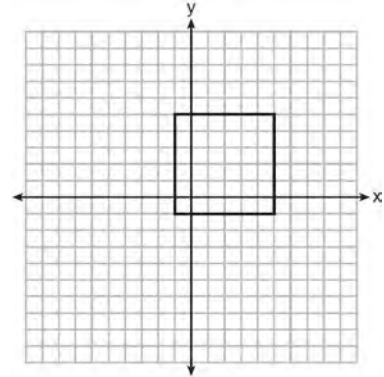
A reflection over which line does *not* carry the square onto itself?
1) $x = 5$
2) $y = 2$
3) $y = x$
4) $x + y = 4$

6 The image of $\triangle ABC$ after a dilation of scale factor k centered at point A is $\triangle ADE$, as shown in the diagram below.
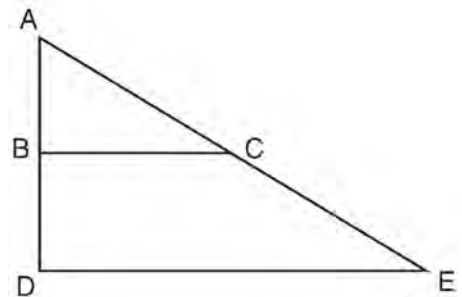
Which statement is always true?
1) $2AB = AD$
2) $\overline{AD} \perp \overline{DE}$
3) $AC = CE$
4) $\overline{BC} \parallel \overline{DE}$

7 A sequence of transformations maps rectangle *ABCD* onto rectangle *A"B"C"D"*, as shown in the diagram below.
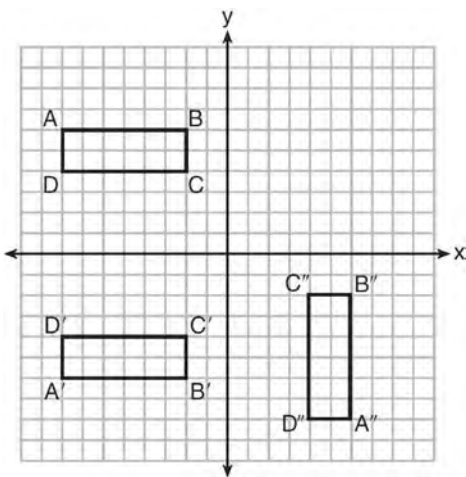
Which sequence of transformations maps *ABCD* onto *A'B'C'D'* and then maps *A'B'C'D'* onto *A"B"C"D"*?
1) a reflection followed by a rotation
2) a reflection followed by a translation
3) a translation followed by a rotation
4) a translation followed by a reflection

8 In the diagram of parallelogram *FRED* shown below, $\overline{ED}$ is extended to *A*, and $\overline{AF}$ is drawn such that $\overline{AF} \cong \overline{DF}$.
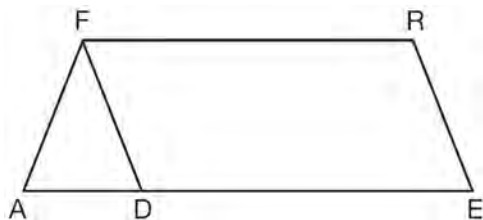
If m∠*R* = 124°, what is m∠*AFD*?
1) 124°
2) 112°
3) 68°
4) 56°

9 If $x^2 + 4x + y^2 - 6y - 12 = 0$ is the equation of a circle, the length of the radius is
1) 25
2) 16
3) 5
4) 4

10 Given $\overline{MN}$ shown below, with $M(-6,1)$ and $N(3,-5)$, what is an equation of the line that passes through point $P(6,1)$ and is parallel to $\overline{MN}$?
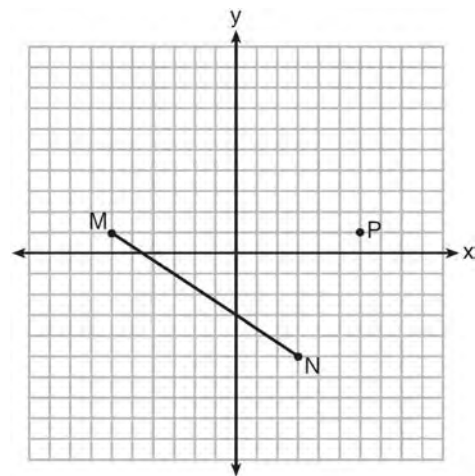
1) $y = -\frac{2}{3}x + 5$

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

3) $y = \frac{3}{2}x + 7$

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

11 Linda is designing a circular piece of stained glass with a diameter of 7 inches. She is going to sketch a square inside the circular region. To the *nearest tenth of an inch*, the largest possible length of a side of the square is
1) 3.5
2) 4.9
3) 5.0
4) 6.9

2

12 In the diagram shown below, $\overline{AC}$ is tangent to circle O at A and to circle P at C, $\overline{OP}$ intersects $\overline{AC}$ at B, $OA = 4$, $AB = 5$, and $PC = 10$.
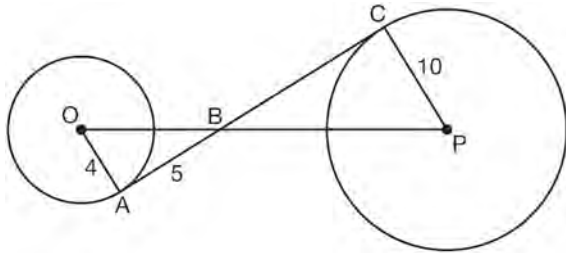
What is the length of $\overline{BC}$?
1)   6.4
2)   8
3)   12.5
4)   16

13 In the diagram below, which single transformation was used to map triangle A onto triangle B?
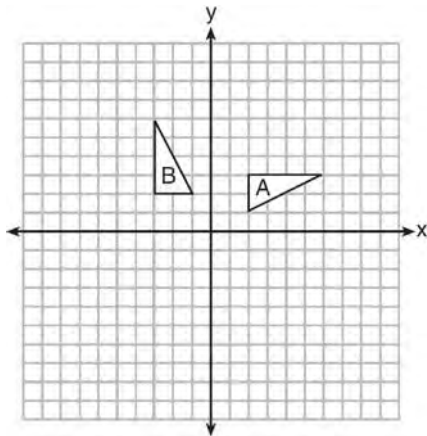
1)   line reflection
2)   rotation
3)   dilation
4)   translation

14 In the diagram below, $\triangle DEF$ is the image of $\triangle ABC$ after a clockwise rotation of $180°$ and a dilation where $AB = 3$, $BC = 5.5$, $AC = 4.5$, $DE = 6$, $FD = 9$, and $EF = 11$.
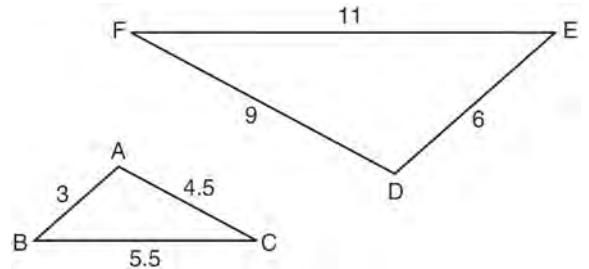
Which relationship must always be true?
1) $\dfrac{m\angle A}{m\angle D} = \dfrac{1}{2}$

2) $\dfrac{m\angle C}{m\angle F} = \dfrac{2}{1}$

3) $\dfrac{m\angle A}{m\angle C} = \dfrac{m\angle F}{m\angle D}$

4) $\dfrac{m\angle B}{m\angle E} = \dfrac{m\angle C}{m\angle F}$

15 In the diagram below, quadrilateral $ABCD$ is inscribed in circle P.
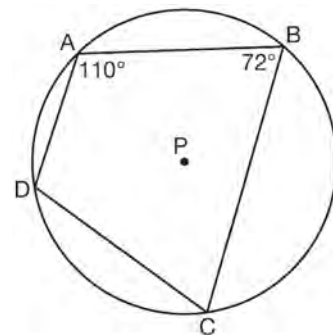
What is $m\angle ADC$?
1)   70°
2)   72°
3)   108°
4)   110°

3

16 A hemispherical tank is filled with water and has a diameter of 10 feet. If water weighs 62.4 pounds per cubic foot, what is the total weight of the water in a full tank, to the *nearest pound*?
1)   16,336
2)   32,673
3)   130,690
4)   261,381

17 In the diagram below, $\triangle ABC \sim \triangle ADE$.
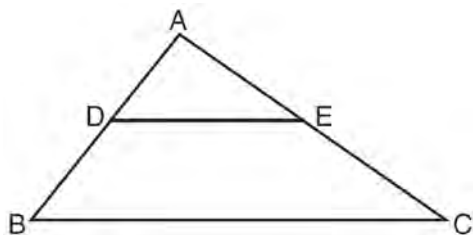
Which measurements are justified by this similarity?
1) $AD = 3$, $AB = 6$, $AE = 4$, and $AC = 12$
2) $AD = 5$, $AB = 8$, $AE = 7$, and $AC = 10$
3) $AD = 3$, $AB = 9$, $AE = 5$, and $AC = 10$
4) $AD = 2$, $AB = 6$, $AE = 5$, and $AC = 15$

18 Triangle *FGH* is inscribed in circle *O*, the length of radius $\overline{OH}$ is 6, and $\overline{FH} \cong \overline{OG}$.
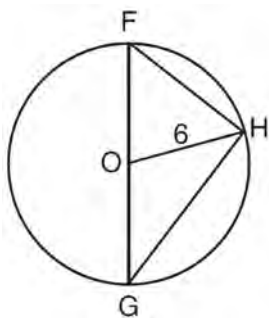
What is the area of the sector formed by angle *FOH*?
1) 2π
2) $\dfrac{3}{2}\pi$
3) 6π
4) 24π

19 As shown in the diagram below, $\overline{AB}$ and $\overline{CD}$ intersect at *E*, and $\overline{AC} \parallel \overline{BD}$.
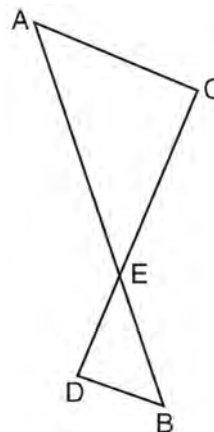
Given $\triangle AEC \sim \triangle BED$, which equation is true?
1) $\dfrac{CE}{DE} = \dfrac{EB}{EA}$
2) $\dfrac{AE}{BE} = \dfrac{AC}{BD}$
3) $\dfrac{EC}{AE} = \dfrac{BE}{ED}$
4) $\dfrac{ED}{EC} = \dfrac{AC}{BD}$

20 A triangle is dilated by a scale factor of 3 with the center of dilation at the origin. Which statement is true?
1)   The area of the image is nine times the area of the original triangle.
2)   The perimeter of the image is nine times the perimeter of the original triangle.
3)   The slope of any side of the image is three times the slope of the corresponding side of the original triangle.
4)   The measure of each angle in the image is three times the measure of the corresponding angle of the original triangle.

4

21 The Great Pyramid of Giza was constructed as a regular pyramid with a square base. It was built with an approximate volume of 2,592,276 cubic meters and a height of 146.5 meters. What was the length of one side of its base, to the *nearest meter*?
1) 73
2) 77
3) 133
4) 230

22 A quadrilateral has vertices with coordinates $(-3,1)$, $(0,3)$, $(5,2)$, and $(-1,-2)$. Which type of quadrilateral is this?
1) rhombus
2) rectangle
3) square
4) trapezoid

23 In the diagram below, $\triangle ABE$ is the image of $\triangle ACD$ after a dilation centered at the origin. The coordinates of the vertices are $A(0,0)$, $B(3,0)$, $C(4.5,0)$, $D(0,6)$, and $E(0,4)$.
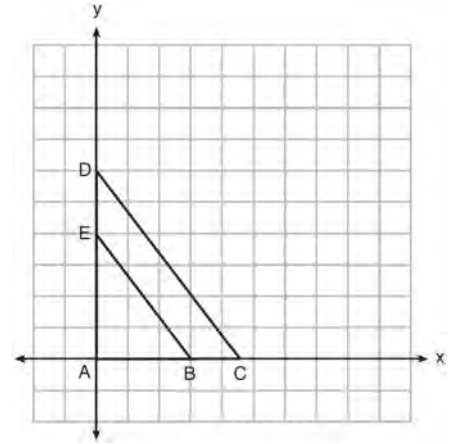
The ratio of the lengths of $\overline{BE}$ to $\overline{CD}$ is
1) $\dfrac{2}{3}$
2) $\dfrac{3}{2}$
3) $\dfrac{3}{4}$
4) $\dfrac{4}{3}$

24 Line $y = 3x - 1$ is transformed by a dilation with a scale factor of 2 and centered at $(3,8)$. The line's image is
1) $y = 3x - 8$
2) $y = 3x - 4$
3) $y = 3x - 2$
4) $y = 3x - 1$

5

25 A wooden cube has an edge length of 6 centimeters and a mass of 137.8 grams. Determine the density of the cube, to the *nearest thousandth*. State which type of wood the cube is made of, using the density table below.

Type of Wood	Density (g/cm³)
Pine	0.373
Hemlock	0.431
Elm	0.554
Birch	0.601
Ash	0.638
Maple	0.676
Oak	0.711

26 Construct an equilateral triangle inscribed in circle *T* shown below. [Leave all construction marks.]

27 To find the distance across a pond from point *B* to point *C*, a surveyor drew the diagram below. The measurements he made are indicated on his diagram.
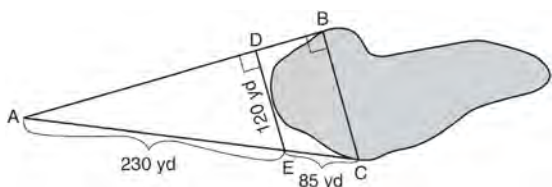
Use the surveyor's information to determine and state the distance from point *B* to point *C*, to the *nearest yard*.

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

Prove: $\angle ACD \cong \angle CAB$

29 Triangles *RST* and *XYZ* are drawn below. If $RS = 6$, $ST = 14$, $XY = 9$, $YZ = 21$, and $\angle S \cong \angle Y$, is $\triangle RST$ similar to $\triangle XYZ$? Justify your answer.
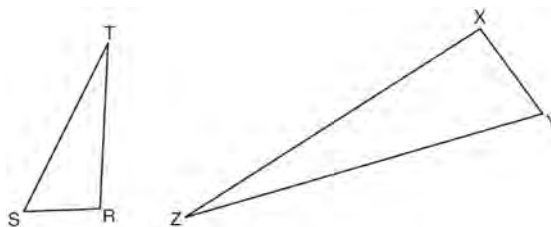
30 In the diagram below, $\triangle ABC$ and $\triangle XYZ$ are graphed.
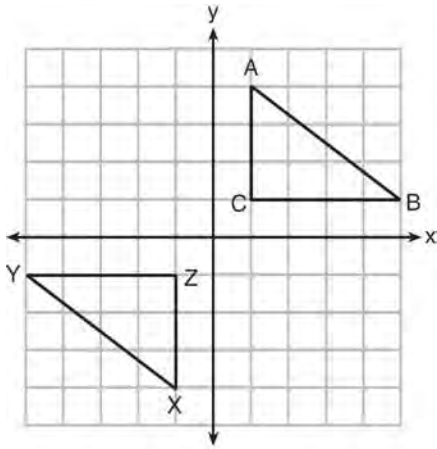
Use the properties of rigid motions to explain why $\triangle ABC \cong \triangle XYZ$.

31 The endpoints of $\overline{DEF}$ are $D(1,4)$ and $F(16,14)$. Determine and state the coordinates of point E, if $DE:EF = 2:3$.

32 As shown in the diagram below, a ship is heading directly toward a lighthouse whose beacon is 125 feet above sea level. At the first sighting, point A, the angle of elevation from the ship to the light was $7°$. A short time later, at point D, the angle of elevation was $16°$.
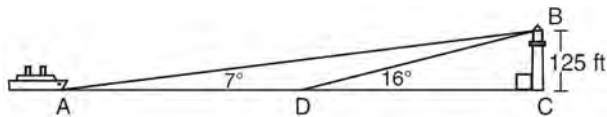
To the *nearest foot*, determine and state how far the ship traveled from point A to point D.

33 Triangle ABC has vertices with $A(x,3)$, $B(-3,-1)$, and $C(-1,-4)$. Determine and state a value of x that would make triangle ABC a right triangle. Justify why $\triangle ABC$ is a right triangle. [The use of the set of axes below is optional.]
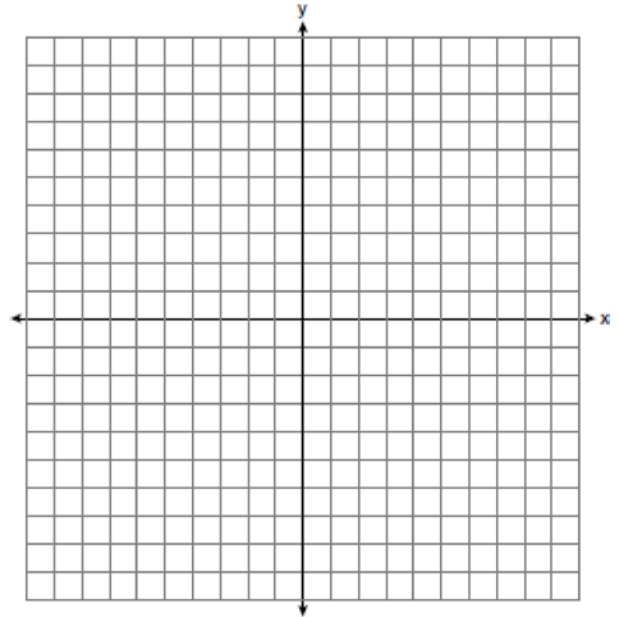
34 In the diagram below, $\overline{AC} \cong \overline{DF}$ and points A, C, D, and F are collinear on line ℓ.
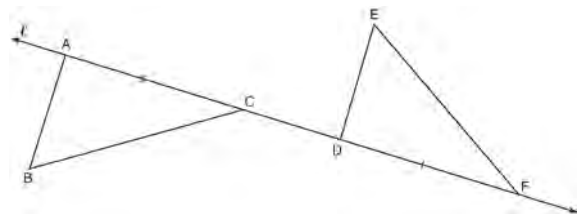
Let $\triangle D'E'F'$ be the image of $\triangle DEF$ after a translation along ℓ, such that point D is mapped onto point A. Determine and state the location of F'. Explain your answer. Let $\triangle D''E''F''$ be the image of $\triangle D'E'F'$ after a reflection across line ℓ. Suppose that E'' is located at B. Is $\triangle DEF$ congruent to $\triangle ABC$? Explain your answer.

7

35 In the diagram of parallelogram $ABCD$ below,
$\overline{BE} \perp \overline{CED}$, $\overline{DF} \perp \overline{BFC}$, $\overline{CE} \cong \overline{CF}$.
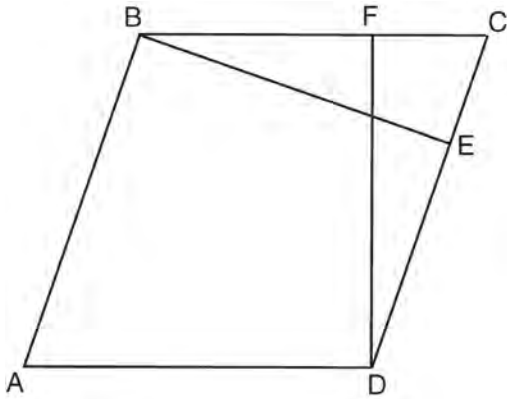
Prove *ABCD* is a rhombus.

36 Walter wants to make 100 candles in the shape of a
cone for his new candle business. The mold shown
below will be used to make the candles. Each mold
will have a height of 8 inches and a diameter of 3
inches. To the *nearest cubic inch*, what will be the
total volume of 100 candles?
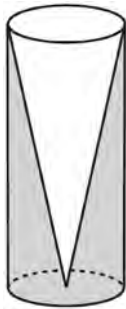
Walter goes to a hobby store to buy the wax for his
candles. The wax costs $0.10 per ounce. If the
weight of the wax is 0.52 ounce per cubic inch,
how much will it cost Walter to buy the wax for
100 candles? If Walter spent a total of $37.83 for
the molds and charges $1.95 for each candle, what
is Walter's profit after selling 100 candles?

0116geo

1 William is drawing pictures of cross sections of the right circular cone below.
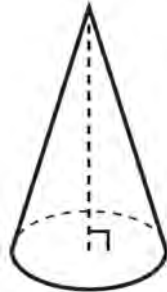
Which drawing can *not* be a cross section of a cone?

1)

2)

3)

4)

2 An equation of a line perpendicular to the line represented by the equation $y = -\frac{1}{2}x - 5$ and passing through $(6, -4)$ is

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

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

3) $y = 2x + 14$

4) $y = 2x - 16$

3 In parallelogram $QRST$ shown below, diagonal $\overline{TR}$ is drawn, U and V are points on $\overline{TS}$ and $\overline{QR}$, respectively, and $\overline{UV}$ intersects $\overline{TR}$ at W.
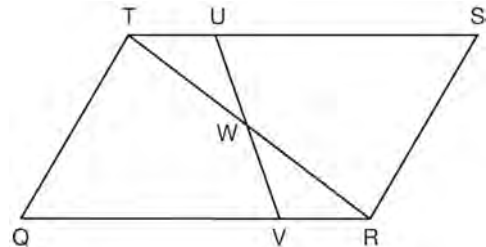
If $m\angle S = 60°$, $m\angle SRT = 83°$, and $m\angle TWU = 35°$, what is $m\angle WVQ$?

1) 37°
2) 60°
3) 72°
4) 83°

4 A fish tank in the shape of a rectangular prism has dimensions of 14 inches, 16 inches, and 10 inches. The tank contains 1680 cubic inches of water. What percent of the fish tank is empty?

1) 10
2) 25
3) 50
4) 75

5 Which transformation would result in the perimeter of a triangle being different from the perimeter of its image?

1) $(x, y) \rightarrow (y, x)$
2) $(x, y) \rightarrow (x, -y)$
3) $(x, y) \rightarrow (4x, 4y)$
4) $(x, y) \rightarrow (x + 2, y - 5)$

6 In the diagram below, $\overleftrightarrow{FE}$ bisects $\overline{AC}$ at B, and $\overleftrightarrow{GE}$ bisects $\overline{BD}$ at C.
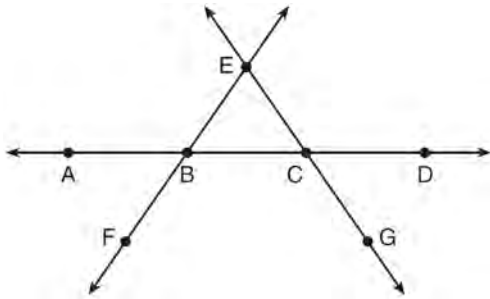
Which statement is always true?
1) $\overline{AB} \cong \overline{DC}$
2) $\overline{FB} \cong \overline{EB}$
3) $\overleftrightarrow{BD}$ bisects $\overline{GE}$ at C.
4) $\overleftrightarrow{AC}$ bisects $\overline{FE}$ at B.

7 As shown in the diagram below, a regular pyramid has a square base whose side measures 6 inches.

6 in
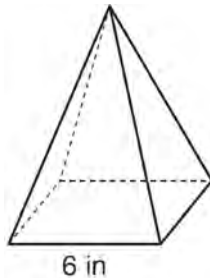
If the altitude of the pyramid measures 12 inches, its volume, in cubic inches, is
1) 72
2) 144
3) 288
4) 432

8 Triangle ABC and triangle DEF are graphed on the set of axes below.
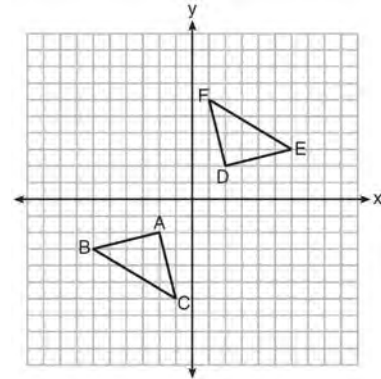
Which sequence of transformations maps triangle ABC onto triangle DEF?
1) a reflection over the x-axis followed by a reflection over the y-axis
2) a 180° rotation about the origin followed by a reflection over the line $y = x$
3) a 90° clockwise rotation about the origin followed by a reflection over the y-axis
4) a translation 8 units to the right and 1 unit up followed by a 90° counterclockwise rotation about the origin

9 In $\triangle ABC$, the complement of $\angle B$ is $\angle A$. Which statement is always true?
1) $\tan \angle A = \tan \angle B$
2) $\sin \angle A = \sin \angle B$
3) $\cos \angle A = \tan \angle B$
4) $\sin \angle A = \cos \angle B$

10 A line that passes through the points whose coordinates are $(1,1)$ and $(5,7)$ is dilated by a scale factor of 3 and centered at the origin. The image of the line
1) is perpendicular to the original line
2) is parallel to the original line
3) passes through the origin
4) is the original line

2

11 Quadrilateral *ABCD* is graphed on the set of axes below.
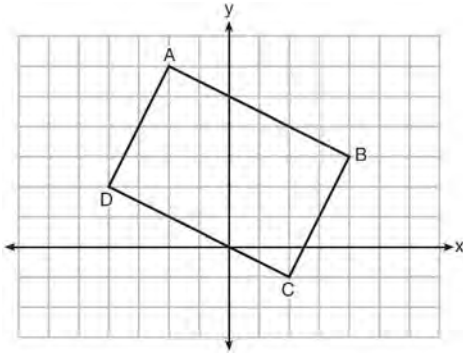
When *ABCD* is rotated 90° in a counterclockwise direction about the origin, its image is quadrilateral *A'B'C'D'*. Is distance preserved under this rotation, and which coordinates are correct for the given vertex?
1) no and $C'(1,2)$
2) no and $D'(2,4)$
3) yes and $A'(6,2)$
4) yes and $B'(-3,4)$

12 In the diagram below of circle *O*, the area of the shaded sector *LOM* is 2π cm².
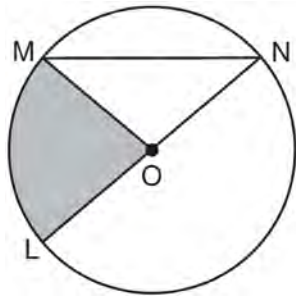
If the length of $\overline{NL}$ is 6 cm, what is m∠*N* ?
1) 10°
2) 20°
3) 40°
4) 80°

13 In the diagram below, $\triangle ABC \sim \triangle DEF$.
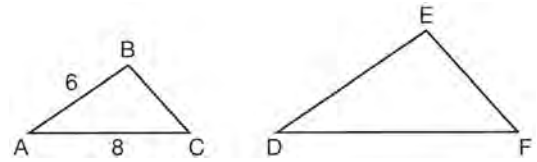
If *AB* = 6 and *AC* = 8, which statement will justify similarity by SAS?
1) *DE* = 9, *DF* = 12, and ∠*A* ≅ ∠*D*
2) *DE* = 8, *DF* = 10, and ∠*A* ≅ ∠*D*
3) *DE* = 36, *DF* = 64, and ∠*C* ≅ ∠*F*
4) *DE* = 15, *DF* = 20, and ∠*C* ≅ ∠*F*

14 The diameter of a basketball is approximately 9.5 inches and the diameter of a tennis ball is approximately 2.5 inches. The volume of the basketball is about how many times greater than the volume of the tennis ball?
1) 3591
2) 65
3) 55
4) 4

15 The endpoints of one side of a regular pentagon are $(-1,4)$ and $(2,3)$. What is the perimeter of the pentagon?
1) $\sqrt{10}$
2) $5\sqrt{10}$
3) $5\sqrt{2}$
4) $25\sqrt{2}$

16 In the diagram of right triangle ABC shown below, $AB = 14$ and $AC = 9$.
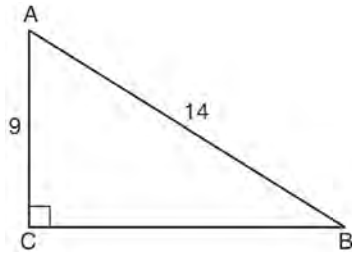
What is the measure of $\angle A$, to the *nearest degree*?
1) 33
2) 40
3) 50
4) 57

17 What are the coordinates of the center and length of the radius of the circle whose equation is $x^2 + 6x + y^2 - 4y = 23$?
1) $(3, -2)$ and 36
2) $(3, -2)$ and 6
3) $(-3, 2)$ and 36
4) $(-3, 2)$ and 6

18 The coordinates of the vertices of $\triangle RST$ are $R(-2, -3)$, $S(8, 2)$, and $T(4, 5)$. Which type of triangle is $\triangle RST$?
1) right
2) acute
3) obtuse
4) equiangular

19 Molly wishes to make a lawn ornament in the form of a solid sphere. The clay being used to make the sphere weighs .075 pound per cubic inch. If the sphere's radius is 4 inches, what is the weight of the sphere, to the *nearest pound*?
1) 34
2) 20
3) 15
4) 4

20 The ratio of similarity of $\triangle BOY$ to $\triangle GRL$ is $1:2$. If $BO = x + 3$ and $GR = 3x - 1$, then the length of $\overline{GR}$ is
1) 5
2) 7
3) 10
4) 20

21 In the diagram below, $\overline{DC}$, $\overline{AC}$, $\overline{DOB}$, $\overline{CB}$, and $\overline{AB}$ are chords of circle O, $\overleftrightarrow{FDE}$ is tangent at point D, and radius $\overline{AO}$ is drawn. Sam decides to apply this theorem to the diagram: "An angle inscribed in a semi-circle is a right angle."
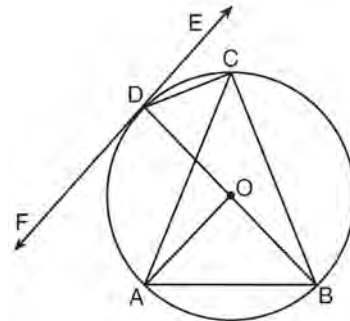
Which angle is Sam referring to?
1) $\angle AOB$
2) $\angle BAC$
3) $\angle DCB$
4) $\angle FDB$

22 In the diagram below, $\overline{CD}$ is the altitude drawn to the hypotenuse $\overline{AB}$ of right triangle ABC.
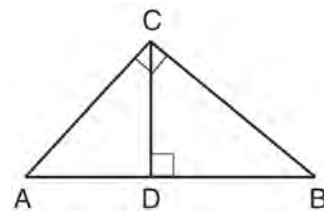
Which lengths would *not* produce an altitude that measures $6\sqrt{2}$?
1) $AD = 2$ and $DB = 36$
2) $AD = 3$ and $AB = 24$
3) $AD = 6$ and $DB = 12$
4) $AD = 8$ and $AB = 17$

23 A designer needs to create perfectly circular necklaces. The necklaces each need to have a radius of 10 cm. What is the largest number of necklaces that can be made from 1000 cm of wire?
1) 15
2) 16
3) 31
4) 32

24 In $\triangle SCU$ shown below, points T and O are on $\overline{SU}$ and $\overline{CU}$, respectively. Segment OT is drawn so that $\angle C \cong \angle OTU$.
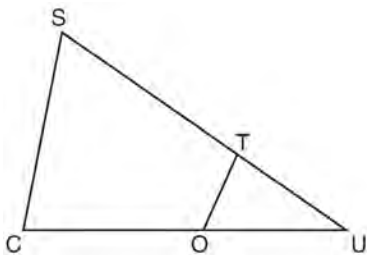
If $TU = 4$, $OU = 5$, and $OC = 7$, what is the length of $\overline{ST}$?
1) 5.6
2) 8.75
3) 11
4) 15

25 Triangle ABC is graphed on the set of axes below. Graph and label $\triangle A'B'C'$, the image of $\triangle ABC$ after a reflection over the line $x = 1$.
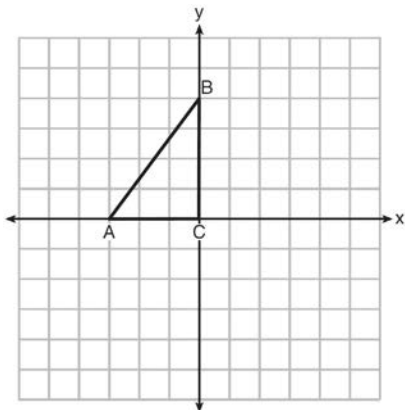
26 In the diagram below of circle O with diameter $\overline{BC}$ and radius $\overline{OA}$, chord $\overline{DC}$ is parallel to chord $\overline{BA}$.
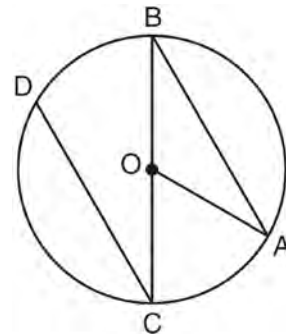
If m$\angle BCD = 30°$, determine and state m$\angle AOB$.

27 Directed line segment PT has endpoints whose coordinates are $P(-2,1)$ and $T(4,7)$. Determine the coordinates of point J that divides the segment in the ratio 2 to 1. [The use of the set of axes below is optional.]

5
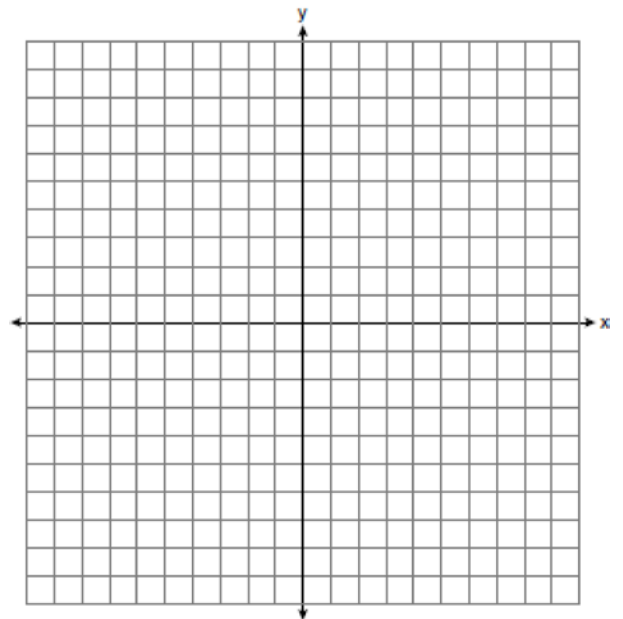
28 As graphed on the set of axes below, $\triangle A'B'C'$ is the image of $\triangle ABC$ after a sequence of transformations.
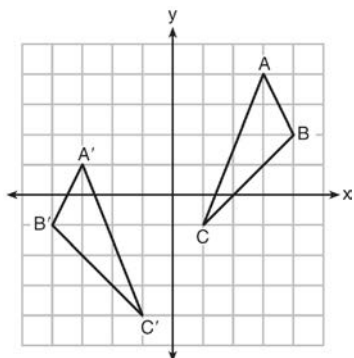
Is $\triangle A'B'C'$ congruent to $\triangle ABC$? Use the properties of rigid motion to explain your answer.

29 A carpenter leans an extension ladder against a house to reach the bottom of a window 30 feet above the ground. As shown in the diagram below, the ladder makes a 70° angle with the ground. To the *nearest foot*, determine and state the length of the ladder.
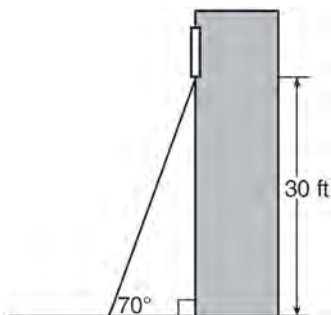
30 During an experiment, the same type of bacteria is grown in two petri dishes. Petri dish *A* has a diameter of 51 mm and has approximately 40,000 bacteria after 1 hour. Petri dish *B* has a diameter of 75 mm and has approximately 72,000 bacteria after 1 hour.
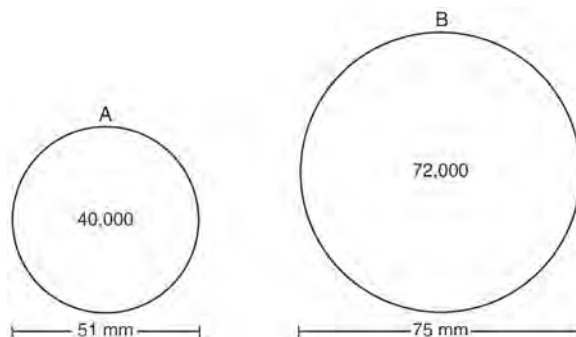
Determine and state which petri dish has the greater population density of bacteria at the end of the first hour.

31 Line ℓ is mapped onto line *m* by a dilation centered at the origin with a scale factor of 2. The equation of line ℓ is $3x - y = 4$. Determine and state an equation for line *m*.

32 The aspect ratio (the ratio of screen width to height) of a rectangular flat-screen television is 16:9. The length of the diagonal of the screen is the television's screen size. Determine and state, to the *nearest inch*, the screen size (diagonal) of this flat-screen television with a screen height of 20.6 inches.

6

33 Given the theorem, "The sum of the measures of the interior angles of a triangle is 180°," complete the proof for this theorem.
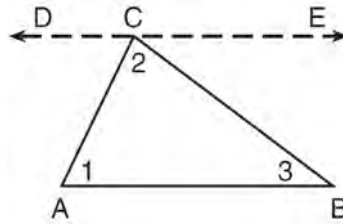
Given: $\triangle ABC$

Prove: $m\angle 1 + m\angle 2 + m\angle 3 = 180°$

Fill in the missing reasons below.

Statements	Reasons
(1) $\triangle ABC$	(1) Given
(2) Through point C, draw $\overleftrightarrow{DCE}$ parallel to $\overline{AB}$.	(2) _____
(3) $m\angle 1 = m\angle ACD$, $m\angle 3 = m\angle BCE$	(3) _____
(4) $m\angle ACD + m\angle 2 + m\angle BCE = 180°$	(4) _____
(5) $m\angle 1 + m\angle 2 + m\angle 3 = 180°$	(5) _____

34 Triangle *XYZ* is shown below. Using a compass and straightedge, on the line below, construct and label △*ABC*, such that △*ABC* ≅ △*XYZ*. [Leave all construction marks.] Based on your construction, state the theorem that justifies why △*ABC* is congruent to △*XYZ*.

36 Cathy wants to determine the height of the flagpole shown in the diagram below. She uses a survey instrument to measure the angle of elevation to the top of the flagpole, and determines it to be 34.9°. She walks 8 meters closer and determines the new measure of the angle of elevation to be 52.8°. At each measurement, the survey instrument is 1.7 meters above the ground.

Determine and state, to the *nearest tenth of a meter*, the height of the flagpole.

35 Given: Parallelogram *ANDR* with $\overline{AW}$ and $\overline{DE}$ bisecting $\overline{NWD}$ and $\overline{REA}$ at points *W* and *E*, respectively
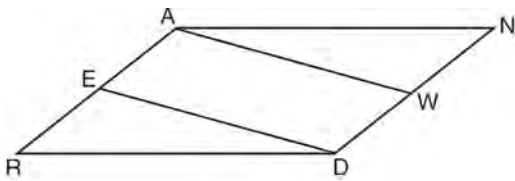
Prove that △*ANW* ≅ △*DRE*. Prove that quadrilateral *AWDE* is a parallelogram.

0616geo

1 A student has a rectangular postcard that he folds in half lengthwise. Next, he rotates it continuously about the folded edge. Which three-dimensional object below is generated by this rotation?

1)

2)

3)

4)
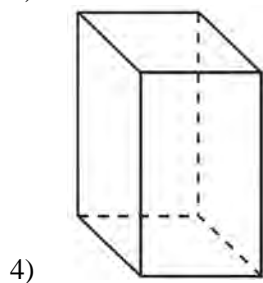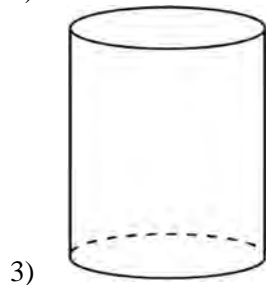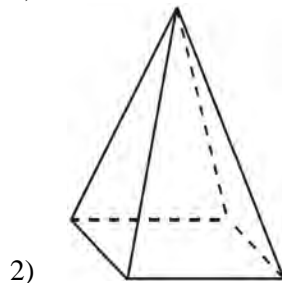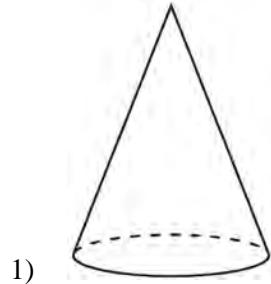
2 A three-inch line segment is dilated by a scale factor of 6 and centered at its midpoint. What is the length of its image?
1)   9 inches
2)   2 inches
3)   15 inches
4)   18 inches

3 Kevin's work for deriving the equation of a circle is shown below.
$$x^2 + 4x = -(y^2 - 20)$$
$$\text{STEP 1} \quad x^2 + 4x = -y^2 + 20$$
$$\text{STEP 2} \quad x^2 + 4x + 4 = -y^2 + 20 - 4$$
$$\text{STEP 3} \quad (x+2)^2 = -y^2 + 20 - 4$$
$$\text{STEP 4} \quad (x+2)^2 + y^2 = 16$$
In which step did he make an error in his work?
1)   Step 1
2)   Step 2
3)   Step 3
4)   Step 4

1

4 Which transformation of $\overline{OA}$ would result in an image parallel to $\overline{OA}$?
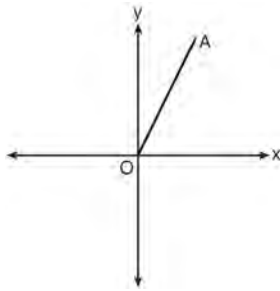
1) a translation of two units down
2) a reflection over the *x*-axis
3) a reflection over the *y*-axis
4) a clockwise rotation of 90° about the origin

5 Using the information given below, which set of triangles can *not* be proven similar?

1)

2)

3)

4)

6 A company is creating an object from a wooden cube with an edge length of 8.5 cm. A right circular cone with a diameter of 8 cm and an altitude of 8 cm will be cut out of the cube. Which expression represents the volume of the remaining wood?

1) $(8.5)^3 - \pi(8)^2(8)$

2) $(8.5)^3 - \pi(4)^2(8)$

3) $(8.5)^3 - \dfrac{1}{3}\pi(8)^2(8)$

4) $(8.5)^3 - \dfrac{1}{3}\pi(4)^2(8)$

7 Two right triangles must be congruent if
1) an acute angle in each triangle is congruent
2) the lengths of the hypotenuses are equal
3) the corresponding legs are congruent
4) the areas are equal

8 Which sequence of transformations will map $\triangle ABC$ onto $\triangle A'B'C'$?
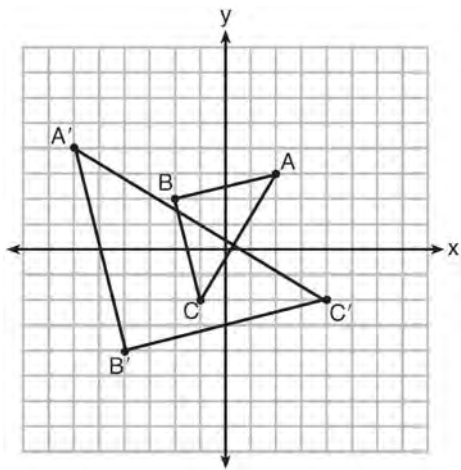
1) reflection and translation
2) rotation and reflection
3) translation and dilation
4) dilation and rotation

9 In parallelogram $ABCD$, diagonals $\overline{AC}$ and $\overline{BD}$ intersect at E. Which statement does *not* prove parallelogram $ABCD$ is a rhombus?

1) $\overline{AC} \cong \overline{DB}$

2) $\overline{AB} \cong \overline{BC}$

3) $\overline{AC} \perp \overline{DB}$

4) $\overline{AC}$ bisects $\angle DCB$

10 In the diagram below of circle O, $\overline{OB}$ and $\overline{OC}$ are radii, and chords $\overline{AB}$, $\overline{BC}$, and $\overline{AC}$ are drawn.
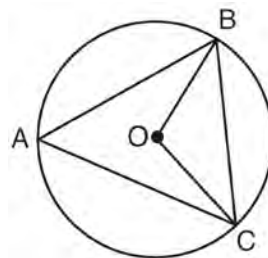
Which statement must always be true?
1) $\angle BAC \cong \angle BOC$

2) $m\angle BAC = \dfrac{1}{2}m\angle BOC$

3) $\triangle BAC$ and $\triangle BOC$ are isosceles.
4) The area of $\triangle BAC$ is twice the area of $\triangle BOC$.

11 A 20-foot support post leans against a wall, making a 70° angle with the ground. To the *nearest tenth of a foot*, how far up the wall will the support post reach?
1) 6.8
2) 6.9
3) 18.7
4) 18.8

3

12 Line segment NY has endpoints $N(-11,5)$ and $Y(5,-7)$. What is the equation of the perpendicular bisector of $\overline{NY}$?

1) $y+1 = \frac{4}{3}(x+3)$

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

3) $y-6 = \frac{4}{3}(x-8)$

4) $y-6 = -\frac{3}{4}(x-8)$

13 In $\triangle RST$ shown below, altitude $\overline{SU}$ is drawn to $\overline{RT}$ at U.
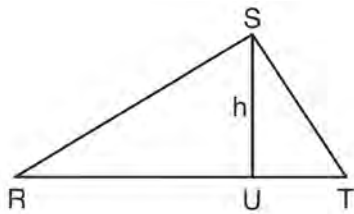
If $SU = h$, $UT = 12$, and $RT = 42$, which value of h will make $\triangle RST$ a right triangle with $\angle RST$ as a right angle?

1) $6\sqrt{3}$

2) $6\sqrt{10}$

3) $6\sqrt{14}$

4) $6\sqrt{35}$

14 In the diagram below, $\triangle ABC$ has vertices $A(4,5)$, $B(2,1)$, and $C(7,3)$.
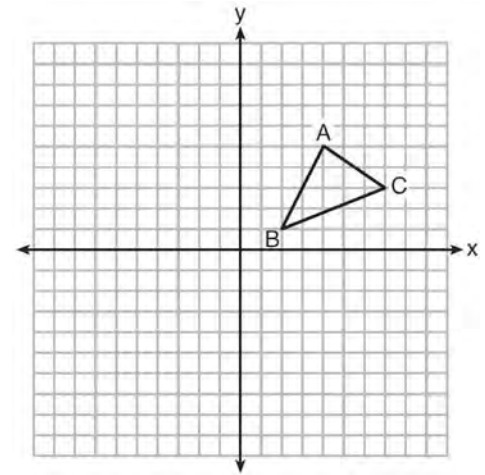
What is the slope of the altitude drawn from A to $\overline{BC}$?

1) $\frac{2}{5}$

2) $\frac{3}{2}$

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

4) $-\frac{5}{2}$

15 In the diagram below, $\triangle ERM \sim \triangle JTM$.
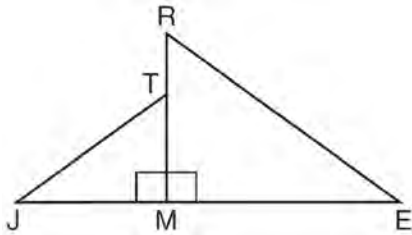
Which statement is always true?

1) $\cos J = \dfrac{RM}{RE}$

2) $\cos R = \dfrac{JM}{JT}$

3) $\tan T = \dfrac{RM}{EM}$

4) $\tan E = \dfrac{TM}{JM}$

16 On the set of axes below, rectangle *ABCD* can be proven congruent to rectangle *KLMN* using which transformation?
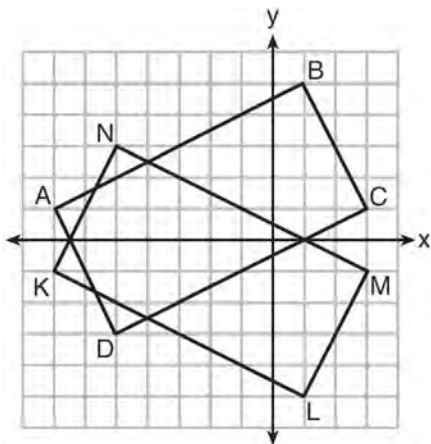
1) rotation
2) translation
3) reflection over the *x*-axis
4) reflection over the *y*-axis

17 In the diagram below, $\overline{DB}$ and $\overline{AF}$ intersect at point *C*, and $\overline{AD}$ and $\overline{FBE}$ are drawn.
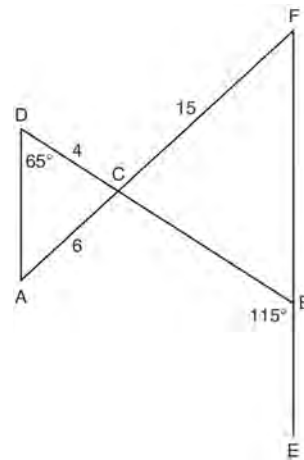
If $AC = 6$, $DC = 4$, $FC = 15$, $m\angle D = 65°$, and $m\angle CBE = 115°$, what is the length of $\overline{CB}$?

1) 10
2) 12
3) 17
4) 22.5

18 Seawater contains approximately 1.2 ounces of salt per liter on average. How many gallons of seawater, to the *nearest tenth of a gallon*, would contain 1 pound of salt?

1) 3.3
2) 3.5
3) 4.7
4) 13.3

19 Line segment *EA* is the perpendicular bisector of $\overline{ZT}$, and $\overline{ZE}$ and $\overline{TE}$ are drawn.
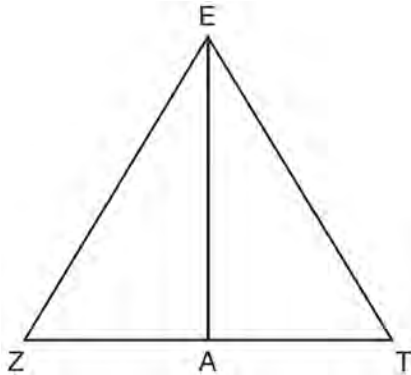
Which conclusion can *not* be proven?

1) $\overline{EA}$ bisects angle *ZET*.
2) Triangle *EZT* is equilateral.
3) $\overline{EA}$ is a median of triangle *EZT*.
4) Angle *Z* is congruent to angle *T*.

20 A hemispherical water tank has an inside diameter of 10 feet. If water has a density of 62.4 pounds per cubic foot, what is the weight of the water in a full tank, to the *nearest pound*?

1) 16,336
2) 32,673
3) 130,690
4) 261,381

21 In the diagram of $\triangle ABC$, points *D* and *E* are on $\overline{AB}$ and $\overline{CB}$, respectively, such that $\overline{AC} \parallel \overline{DE}$.
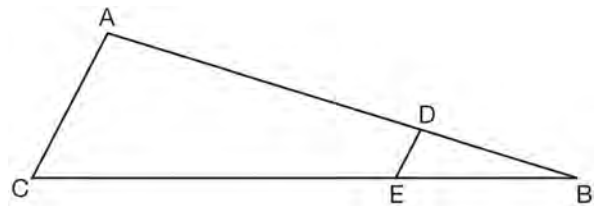
If $AD = 24$, $DB = 12$, and $DE = 4$, what is the length of $\overline{AC}$?

1) 8
2) 12
3) 16
4) 72

22 Triangle *RST* is graphed on the set of axes below.
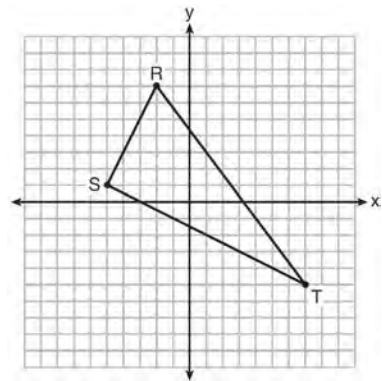
How many square units are in the area of $\triangle RST$?

1) $9\sqrt{3} + 15$
2) $9\sqrt{5} + 15$
3) 45
4) 90

23 The graph below shows $\overline{AB}$, which is a chord of circle O. The coordinates of the endpoints of $\overline{AB}$ are $A(3,3)$ and $B(3,-7)$. The distance from the midpoint of $\overline{AB}$ to the center of circle O is 2 units.
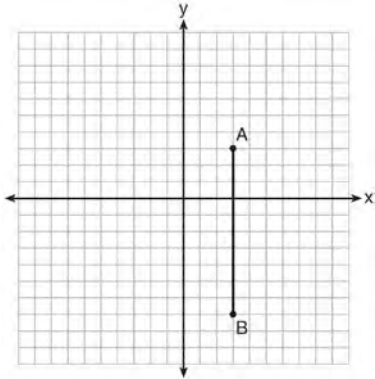
What could be a correct equation for circle O?

1) $(x-1)^2 + (y+2)^2 = 29$
2) $(x+5)^2 + (y-2)^2 = 29$
3) $(x-1)^2 + (y-2)^2 = 25$
4) $(x-5)^2 + (y+2)^2 = 25$

24 What is the area of a sector of a circle with a radius of 8 inches and formed by a central angle that measures $60°$?

1) $\dfrac{8\pi}{3}$

2) $\dfrac{16\pi}{3}$

3) $\dfrac{32\pi}{3}$

4) $\dfrac{64\pi}{3}$

25 Describe a sequence of transformations that will map $\triangle ABC$ onto $\triangle DEF$ as shown below.
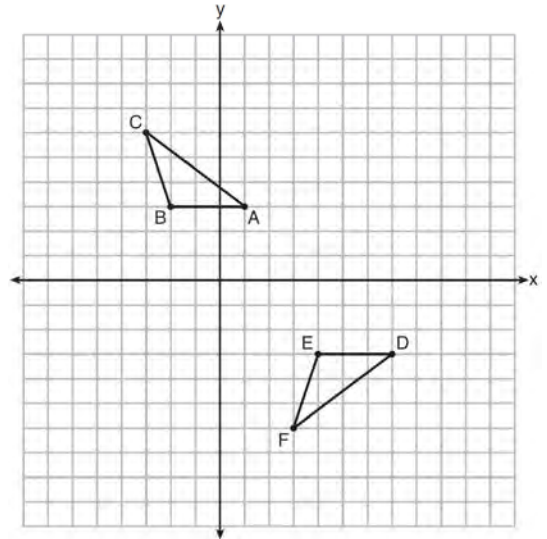
26 Point P is on segment AB such that $AP:PB$ is $4:5$. If A has coordinates $(4,2)$, and B has coordinates $(22,2)$, determine and state the coordinates of P.

27 In $\triangle CED$ as shown below, points A and B are located on sides $\overline{CE}$ and $\overline{ED}$, respectively. Line segment AB is drawn such that $AE = 3.75$, $AC = 5$, $EB = 4.5$, and $BD = 6$.
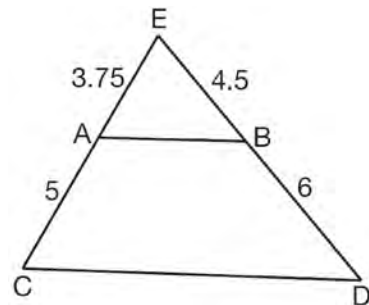
Explain why $\overline{AB}$ is parallel to $\overline{CD}$.

28 Find the value of R that will make the equation $\sin 73° = \cos R$ true when $0° < R < 90°$. Explain your answer.

29 In the diagram below, Circle 1 has radius 4, while Circle 2 has radius 6.5. Angle A intercepts an arc of length π, and angle B intercepts an arc of length $\dfrac{13\pi}{8}$.
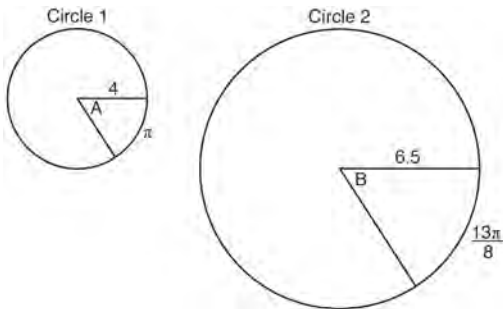
Dominic thinks that angles A and B have the same radian measure. State whether Dominic is correct or not. Explain why.

30 A ladder leans against a building. The top of the ladder touches the building 10 feet above the ground. The foot of the ladder is 4 feet from the building. Find, to the *nearest degree*, the angle that the ladder makes with the level ground.

31 In the diagram below, radius $\overline{OA}$ is drawn in circle O. Using a compass and a straightedge, construct a line tangent to circle O at point A. [Leave all construction marks.]
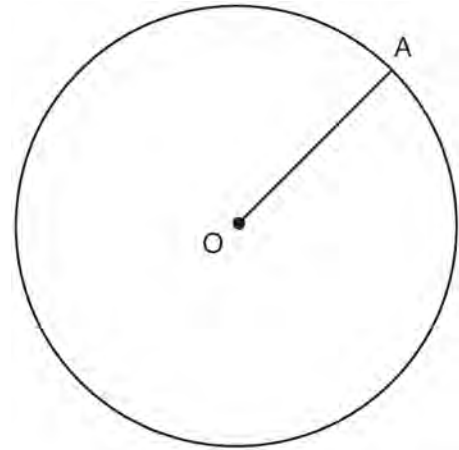
32 A barrel of fuel oil is a right circular cylinder where the inside measurements of the barrel are a diameter of 22.5 inches and a height of 33.5 inches. There are 231 cubic inches in a liquid gallon. Determine and state, to the *nearest tenth*, the gallons of fuel that are in a barrel of fuel oil.

8

33 Given: Parallelogram $ABCD$, $\overline{EFG}$, and diagonal $\overline{DFB}$
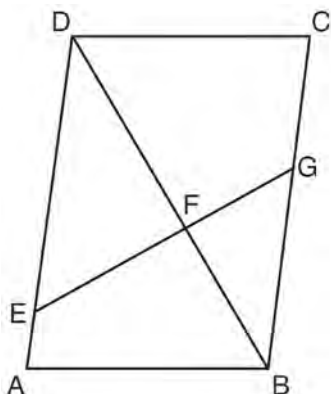
Prove: $\triangle DEF \sim \triangle BGF$

34 In the diagram below, $\triangle A'B'C'$ is the image of $\triangle ABC$ after a transformation.
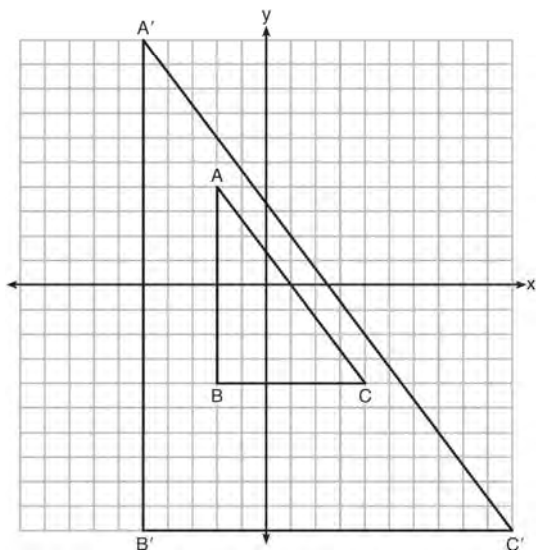
Describe the transformation that was performed. Explain why $\triangle A'B'C' \sim \triangle ABC$.

35 Given: Quadrilateral $ABCD$ with diagonals $\overline{AC}$ and $\overline{BD}$ that bisect each other, and $\angle 1 \cong \angle 2$
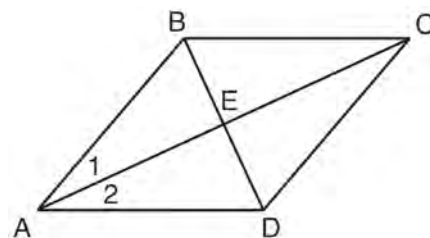
Prove: $\triangle ACD$ is an isosceles triangle and $\triangle AEB$ is a right triangle

36 A water glass can be modeled by a truncated right cone (a cone which is cut parallel to its base) as shown below.
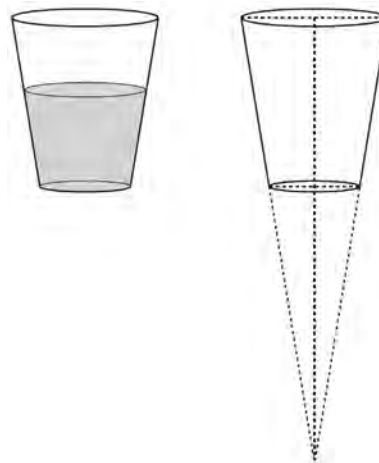
The diameter of the top of the glass is 3 inches, the diameter at the bottom of the glass is 2 inches, and the height of the glass is 5 inches. The base with a diameter of 2 inches must be parallel to the base with a diameter of 3 inches in order to find the height of the cone. Explain why. Determine and state, in inches, the height of the larger cone. Determine and state, to the *nearest tenth of a cubic inch*, the volume of the water glass.

0816geo

1   In the diagram below, lines ℓ, m, n, and p intersect line r.
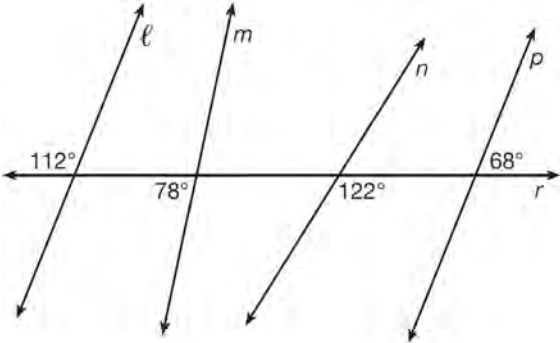
Which statement is true?
1) $\ell \parallel n$
2) $\ell \parallel p$
3) $m \parallel p$
4) $m \parallel n$

2   Which transformation would *not* always produce an image that would be congruent to the original figure?
1)   translation
2)   dilation
3)   rotation
4)   reflection

3   If an equilateral triangle is continuously rotated around one of its medians, which 3-dimensional object is generated?
1)   cone
2)   pyramid
3)   prism
4)   sphere

4   In the diagram below, m$\angle BDC = 100°$, m$\angle A = 50°$, and m$\angle DBC = 30°$.
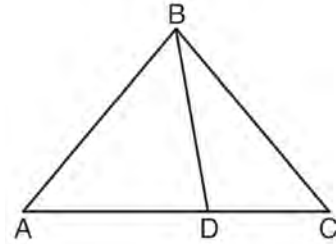
Which statement is true?
1) $\triangle ABD$ is obtuse.
2) $\triangle ABC$ is isosceles.
3)   m$\angle ABD = 80°$
4) $\triangle ABD$ is scalene.

5   Which point shown in the graph below is the image of point P after a counterclockwise rotation of $90°$ about the origin?

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

1
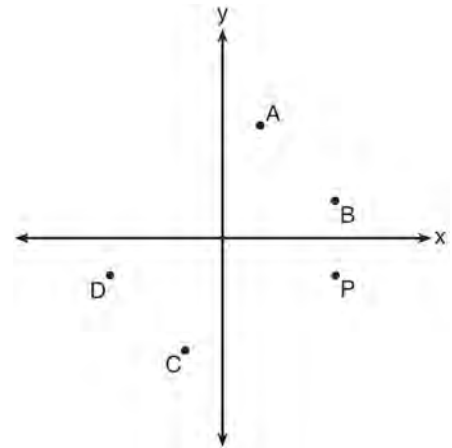
6 In $\triangle ABC$, where $\angle C$ is a right angle, $\cos A = \dfrac{\sqrt{21}}{5}$. What is $\sin B$?

1) $\dfrac{\sqrt{21}}{5}$

2) $\dfrac{\sqrt{21}}{2}$

3) $\dfrac{2}{5}$

4) $\dfrac{5}{\sqrt{21}}$

7 Quadrilateral $ABCD$ with diagonals $\overline{AC}$ and $\overline{BD}$ is shown in the diagram below.
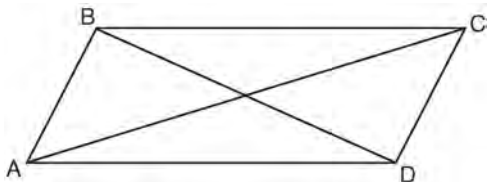
Which information is *not* enough to prove $ABCD$ is a parallelogram?
1) $\overline{AB} \cong \overline{CD}$ and $\overline{AB} \parallel \overline{DC}$
2) $\overline{AB} \cong \overline{CD}$ and $\overline{BC} \cong \overline{DA}$
3) $\overline{AB} \cong \overline{CD}$ and $\overline{BC} \parallel \overline{AD}$
4) $\overline{AB} \parallel \overline{DC}$ and $\overline{BC} \parallel \overline{AD}$

8 An equilateral triangle has sides of length 20. To the *nearest tenth*, what is the height of the equilateral triangle?
1) 10.0
2) 11.5
3) 17.3
4) 23.1

9 Given: $\triangle AEC$, $\triangle DEF$, and $\overline{FE} \perp \overline{CE}$
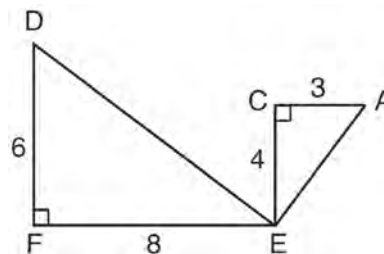
What is a correct sequence of similarity transformations that shows $\triangle AEC \sim \triangle DEF$?
1) a rotation of 180 degrees about point E followed by a horizontal translation
2) a counterclockwise rotation of 90 degrees about point E followed by a horizontal translation
3) a rotation of 180 degrees about point E followed by a dilation with a scale factor of 2 centered at point E
4) a counterclockwise rotation of 90 degrees about point E followed by a dilation with a scale factor of 2 centered at point E

10 In the diagram of right triangle ABC, $\overline{CD}$ intersects hypotenuse $\overline{AB}$ at D.
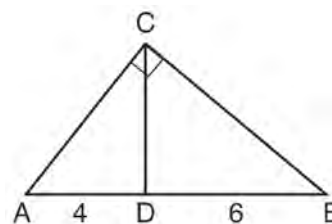
If $AD = 4$ and $DB = 6$, which length of $\overline{AC}$ makes $\overline{CD} \perp \overline{AB}$?
1) $2\sqrt{6}$
2) $2\sqrt{10}$
3) $2\sqrt{15}$
4) $4\sqrt{2}$

11 Segment CD is the perpendicular bisector of $\overline{AB}$ at E. Which pair of segments does *not* have to be congruent?
1) $\overline{AD}, \overline{BD}$
2) $\overline{AC}, \overline{BC}$
3) $\overline{AE}, \overline{BE}$
4) $\overline{DE}, \overline{CE}$

12 In triangle CHR, O is on $\overline{HR}$, and D is on $\overline{CR}$ so that $\angle H \cong \angle RDO$.
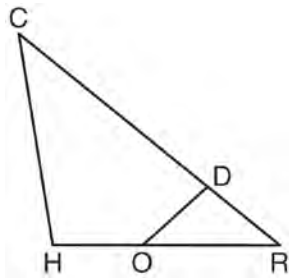
If $RD = 4$, $RO = 6$, and $OH = 4$, what is the length of $\overline{CD}$?
1) $2\dfrac{2}{3}$
2) $6\dfrac{2}{3}$
3) 11
4) 15

13 The cross section of a regular pyramid contains the altitude of the pyramid. The shape of this cross section is a
1) circle
2) square
3) triangle
4) rectangle

14 The diagonals of rhombus $TEAM$ intersect at $P(2,1)$. If the equation of the line that contains diagonal $\overline{TA}$ is $y = -x + 3$, what is the equation of a line that contains diagonal EM?
1) $y = x - 1$
2) $y = x - 3$
3) $y = -x - 1$
4) $y = -x - 3$

15 The coordinates of vertices A and B of $\triangle ABC$ are $A(3,4)$ and $B(3,12)$. If the area of $\triangle ABC$ is 24 square units, what could be the coordinates of point C?
1) $(3,6)$
2) $(8,-3)$
3) $(-3,8)$
4) $(6,3)$

16 What are the coordinates of the center and the length of the radius of the circle represented by the equation $x^2 + y^2 - 4x + 8y + 11 = 0$?
1) center $(2,-4)$ and radius 3
2) center $(-2,4)$ and radius 3
3) center $(2,-4)$ and radius 9
4) center $(-2,4)$ and radius 9

17 The density of the American white oak tree is 752 kilograms per cubic meter. If the trunk of an American white oak tree has a circumference of 4.5 meters and the height of the trunk is 8 meters, what is the approximate number of kilograms of the trunk?
1) 13
2) 9694
3) 13,536
4) 30,456

18 Point *P* is on the directed line segment from point *X*(−6,−2) to point *Y*(6,7) and divides the segment in the ratio 1:5. What are the coordinates of point *P*?

1) $\left(4, 5\frac{1}{2}\right)$

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

3) $\left(-4\frac{1}{2}, 0\right)$

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

19 In circle *O*, diameter $\overline{AB}$, chord $\overline{BC}$, and radius $\overline{OC}$ are drawn, and the measure of arc *BC* is 108°.
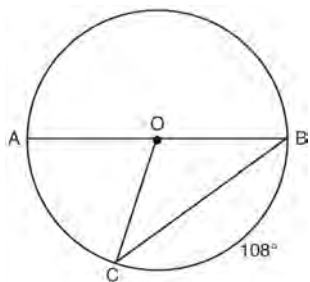
Some students wrote these formulas to find the area of sector *COB*:

Amy $\quad \frac{3}{10} \cdot \pi \cdot (BC)^2$

Beth $\quad \frac{108}{360} \cdot \pi \cdot (OC)^2$

Carl $\quad \frac{3}{10} \cdot \pi \cdot (\frac{1}{2}AB)^2$

Dex $\quad \frac{108}{360} \cdot \pi \cdot \frac{1}{2}(AB)^2$

Which students wrote correct formulas?
1) Amy and Dex
2) Beth and Carl
3) Carl and Amy
4) Dex and Beth

20 Tennis balls are sold in cylindrical cans with the balls stacked one on top of the other. A tennis ball has a diameter of 6.7 cm. To the *nearest cubic centimeter*, what is the minimum volume of the can that holds a stack of 4 tennis balls?
1) 236
2) 282
3) 564
4) 945

21 Line segment *A'B'*, whose endpoints are (4,−2) and (16,14), is the image of $\overline{AB}$ after a dilation of $\frac{1}{2}$ centered at the origin. What is the length of $\overline{AB}$?
1) 5
2) 10
3) 20
4) 40

22 Given: $\triangle ABE$ and $\triangle CBD$ shown in the diagram below with $\overline{DB} \cong \overline{BE}$
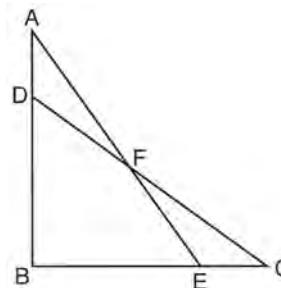
Which statement is needed to prove $\triangle ABE \cong \triangle CBD$ using only SAS ≅ SAS?
1) $\angle CDB \cong \angle AEB$
2) $\angle AFD \cong \angle EFC$
3) $\overline{AD} \cong \overline{CE}$
4) $\overline{AE} \cong \overline{CD}$

4

23 In the diagram below, $\overline{BC}$ is the diameter of circle A.
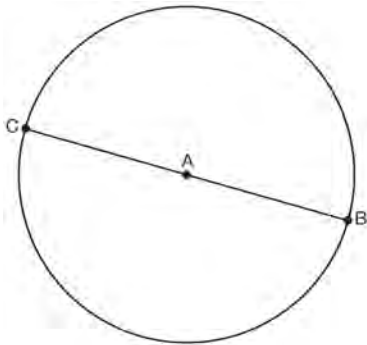
Point D, which is unique from points B and C, is plotted on circle A. Which statement must always be true?
1) $\triangle BCD$ is a right triangle.
2) $\triangle BCD$ is an isosceles triangle.
3) $\triangle BAD$ and $\triangle CBD$ are similar triangles.
4) $\triangle BAD$ and $\triangle CAD$ are congruent triangles.

24 In the diagram below, $ABCD$ is a parallelogram, $\overline{AB}$ is extended through B to E, and $\overline{CE}$ is drawn.
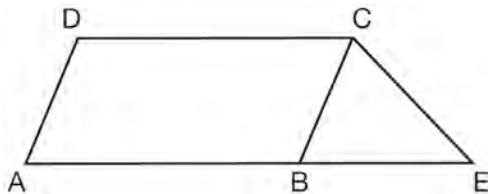
If $\overline{CE} \cong \overline{BE}$ and m$\angle D = 112°$, what is m$\angle E$?
1) 44°
2) 56°
3) 68°
4) 112°

25 Lines AE and BD are tangent to circles O and P at A, E, B, and D, as shown in the diagram below. If $AC:CE = 5:3$, and $BD = 56$, determine and state the length of $\overline{CD}$.
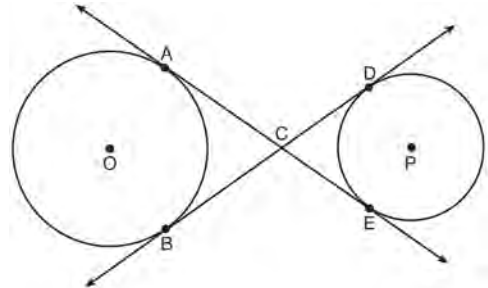
26 In the diagram below, $\triangle ABC$ has coordinates $A(1,1)$, $B(4,1)$, and $C(4,5)$. Graph and label $\triangle A''B''C''$, the image of $\triangle ABC$ after the translation five units to the right and two units up followed by the reflection over the line $y = 0$.
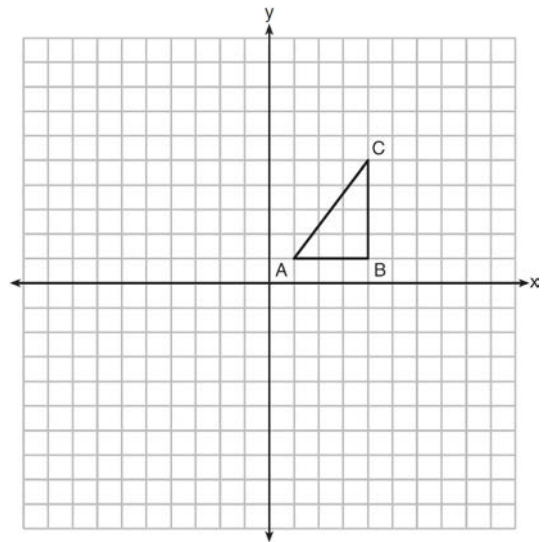
27 A regular hexagon is rotated in a counterclockwise direction about its center. Determine and state the minimum number of degrees in the rotation such that the hexagon will coincide with itself.

5

28 In the diagram of $\triangle ABC$ shown below, use a compass and straightedge to construct the median to $\overline{AB}$. [Leave all construction marks.]

31 In the diagram below, a window of a house is 15 feet above the ground. A ladder is placed against the house with its base at an angle of 75° with the ground. Determine and state the length of the ladder to the *nearest tenth of a foot*.
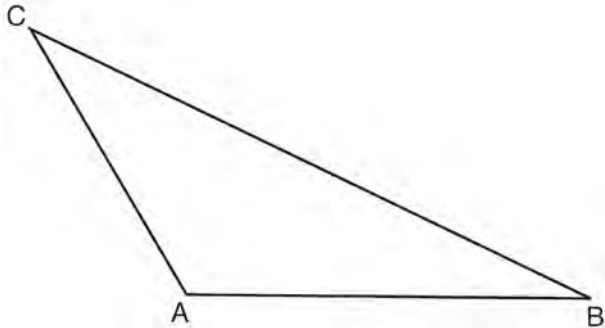
29 Triangle *MNP* is the image of triangle *JKL* after a 120° counterclockwise rotation about point *Q*. If the measure of angle *L* is 47° and the measure of angle *N* is 57°, determine the measure of angle *M*. Explain how you arrived at your answer.
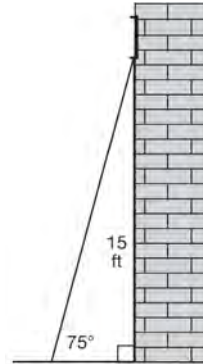
32 Using a compass and straightedge, construct and label $\triangle A'B'C'$, the image of $\triangle ABC$ after a dilation with a scale factor of 2 and centered at *B*. [Leave all construction marks.] Describe the relationship between the lengths of $\overline{AC}$ and $\overline{A'C'}$.

30 A circle has a center at $(1,-2)$ and radius of 4. Does the point $(3.4, 1.2)$ lie on the circle? Justify your answer.

6
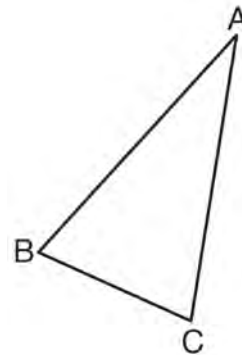
33 The grid below shows $\triangle ABC$ and $\triangle DEF$.
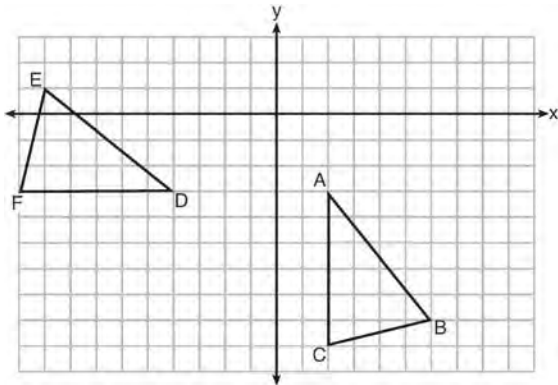
Let $\triangle A'B'C'$ be the image of $\triangle ABC$ after a rotation about point A. Determine and state the location of B' if the location of point C' is $(8,-3)$. Explain your answer. Is $\triangle DEF$ congruent to $\triangle A'B'C'$? Explain your answer.

34 As modeled below, a movie is projected onto a large outdoor screen. The bottom of the 60-foot-tall screen is 12 feet off the ground. The projector sits on the ground at a horizontal distance of 75 feet from the screen.
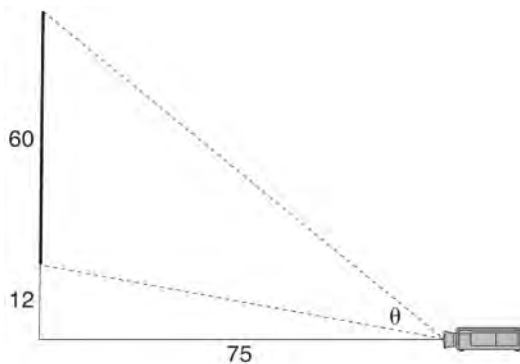
Determine and state, to the *nearest tenth of a degree*, the measure of θ, the projection angle.

35 Given: Circle O, chords $\overline{AB}$ and $\overline{CD}$ intersect at E
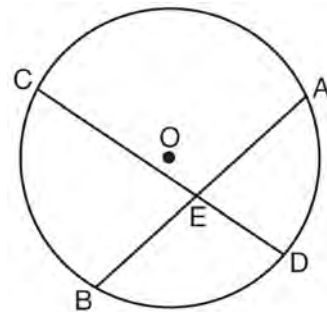
Theorem: If two chords intersect in a circle, the product of the lengths of the segments of one chord is equal to the product of the lengths of the segments of the other chord. Prove this theorem by proving $AE \cdot EB = CE \cdot ED$.

36 A snow cone consists of a paper cone completely filled with shaved ice and topped with a hemisphere of shaved ice, as shown in the diagram below. The inside diameter of both the cone and the hemisphere is 8.3 centimeters. The height of the cone is 10.2 centimeters.
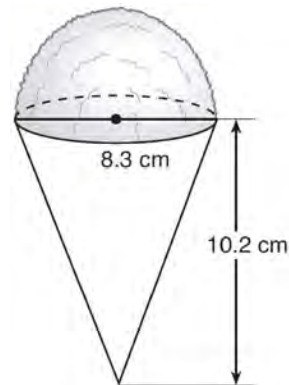
The desired density of the shaved ice is 0.697 g/cm^3, and the cost, per kilogram, of ice is $3.83. Determine and state the cost of the ice needed to make 50 snow cones.

7

0117geo

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

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

2) $y = -2x - 3$

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

4) $y = -2x + 3$

2 In the diagram below, $\triangle ADE$ is the image of $\triangle ABC$ after a reflection over the line AC followed by a dilation of scale factor $\frac{AE}{AC}$ centered at point A.
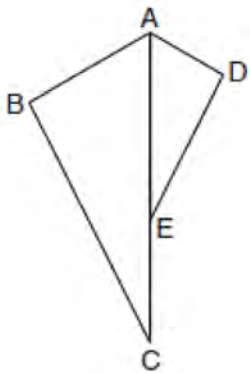
Which statement must be true?
1) $m\angle BAC \cong m\angle AED$
2) $m\angle ABC \cong m\angle ADE$
3) $m\angle DAE \cong \frac{1}{2}m\angle BAC$
4) $m\angle ACB \cong \frac{1}{2}m\angle DAB$

3 Given $\triangle ABC \cong \triangle DEF$, which statement is *not* always true?
1) $\overline{BC} \cong \overline{DF}$
2) $m\angle A = m\angle D$
3) area of $\triangle ABC =$ area of $\triangle DEF$
4) perimeter of $\triangle ABC =$ perimeter of $\triangle DEF$

4 In the diagram below, $\overline{DE}$, $\overline{DF}$, and $\overline{EF}$ are midsegments of $\triangle ABC$.
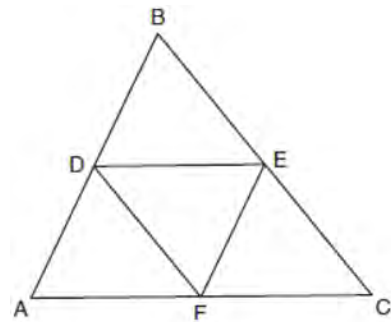
The perimeter of quadrilateral $ADEF$ is equivalent to
1) $AB + BC + AC$
2) $\frac{1}{2}AB + \frac{1}{2}AC$
3) $2AB + 2AC$
4) $AB + AC$

5 In the diagram below, if $\triangle ABE \cong \triangle CDF$ and $\overline{AEFC}$ is drawn, then it could be proven that quadrilateral $ABCD$ is a
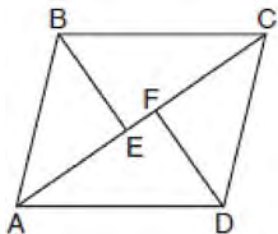
1) square
2) rhombus
3) rectangle
4) parallelogram

6 Under which transformation would $\triangle A'B'C'$, the image of $\triangle ABC$, *not* be congruent to $\triangle ABC$?
1) reflection over the *y*-axis
2) rotation of 90° clockwise about the origin
3) translation of 3 units right and 2 units down
4) dilation with a scale factor of 2 centered at the origin

7 The diagram below shows two similar triangles.
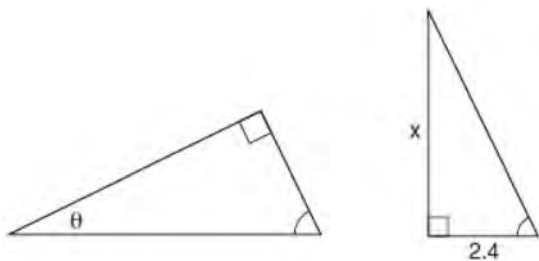
If $\tan \theta = \dfrac{3}{7}$, what is the value of *x*, to the *nearest tenth*?
1) 1.2
2) 5.6
3) 7.6
4) 8.8

8 A farmer has 64 feet of fence to enclose a rectangular vegetable garden. Which dimensions would result in the biggest area for this garden?
1) the length and the width are equal
2) the length is 2 more than the width
3) the length is 4 more than the width
4) the length is 6 more than the width

9 The diagram shows rectangle $ABCD$, with diagonal $\overline{BD}$.
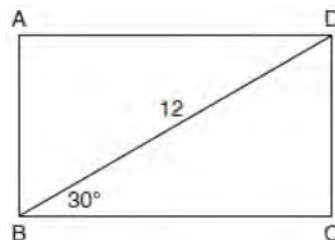
What is the perimeter of rectangle $ABCD$, to the *nearest tenth*?
1) 28.4
2) 32.8
3) 48.0
4) 62.4

10 Identify which sequence of transformations could map pentagon $ABCDE$ onto pentagon $A"B"C"D"E"$, as shown below.
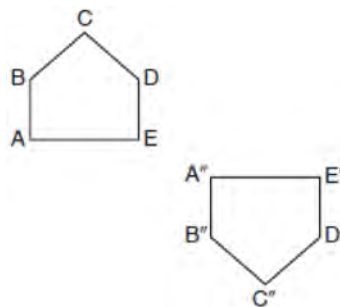
1) dilation followed by a rotation
2) translation followed by a rotation
3) line reflection followed by a translation
4) line reflection followed by a line reflection

2

11 A solid metal prism has a rectangular base with sides of 4 inches and 6 inches, and a height of 4 inches. A hole in the shape of a cylinder, with a radius of 1 inch, is drilled through the entire length of the rectangular prism.
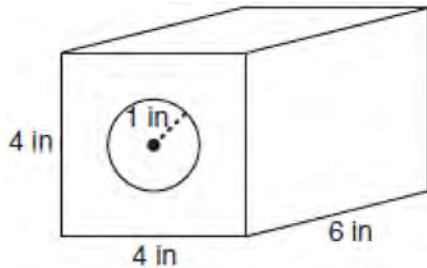
What is the approximate volume of the remaining solid, in cubic inches?
1) 19
2) 77
3) 93
4) 96

12 Given the right triangle in the diagram below, what is the value of x, to the *nearest foot*?
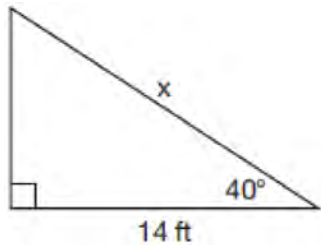
1) 11
2) 17
3) 18
4) 22

13 On the graph below, point $A(3,4)$ and $\overline{BC}$ with coordinates $B(4,3)$ and $C(2,1)$ are graphed.
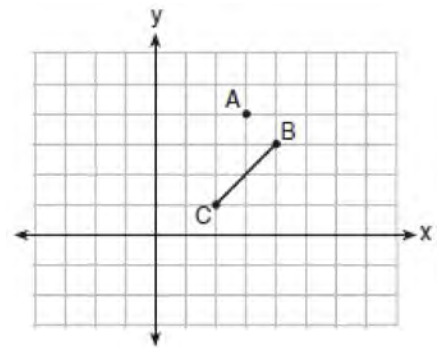
What are the coordinates of B' and C' after $\overline{BC}$ undergoes a dilation centered at point A with a scale factor of 2?
1) $B'(5,2)$ and $C'(1,-2)$
2) $B'(6,1)$ and $C'(0,-1)$
3) $B'(5,0)$ and $C'(1,-2)$
4) $B'(5,2)$ and $C'(3,0)$

14 In the diagram of right triangle ADE below, $\overline{BC} \parallel \overline{DE}$.
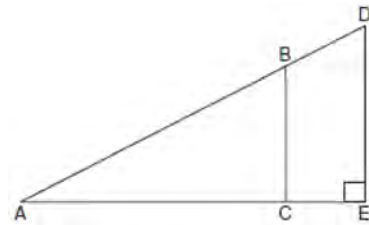
Which ratio is always equivalent to the sine of $\angle A$?
1) $\dfrac{AD}{DE}$
2) $\dfrac{AE}{AD}$
3) $\dfrac{BC}{AB}$
4) $\dfrac{AB}{AC}$

3

15 In circle O, secants $\overline{ADB}$ and $\overline{AEC}$ are drawn from external point A such that points D, B, E, and C are on circle O. If $AD = 8$, $AE = 6$, and EC is 12 more than BD, the length of $\overline{BD}$ is
1) 6
2) 22
3) 36
4) 48

16 A parallelogram is always a rectangle if
1) the diagonals are congruent
2) the diagonals bisect each other
3) the diagonals intersect at right angles
4) the opposite angles are congruent

17 Which rotation about its center will carry a regular decagon onto itself?
1) 54°
2) 162°
3) 198°
4) 252°

18 The equation of a circle is $x^2 + y^2 - 6y + 1 = 0$. What are the coordinates of the center and the length of the radius of this circle?
1) center $(0,3)$ and radius $= 2\sqrt{2}$
2) center $(0,-3)$ and radius $= 2\sqrt{2}$
3) center $(0,6)$ and radius $= \sqrt{35}$
4) center $(0,-6)$ and radius $= \sqrt{35}$

19 Parallelogram $ABCD$ has coordinates $A(0,7)$ and $C(2,1)$. Which statement would prove that $ABCD$ is a rhombus?
1) The midpoint of $\overline{AC}$ is $(1,4)$.
2) The length of $\overline{BD}$ is $\sqrt{40}$.
3) The slope of $\overline{BD}$ is $\frac{1}{3}$.
4) The slope of $\overline{AB}$ is $\frac{1}{3}$.

20 Point Q is on $\overline{MN}$ such that $MQ:QN = 2:3$. If M has coordinates $(3,5)$ and N has coordinates $(8,-5)$, the coordinates of Q are
1) $(5,1)$
2) $(5,0)$
3) $(6,-1)$
4) $(6,0)$

21 In the diagram below of circle O, $GO = 8$ and $m\angle GOJ = 60°$.
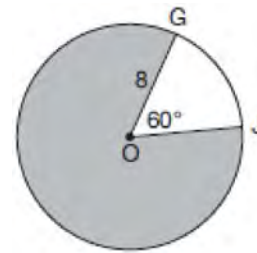
What is the area, in terms of π, of the shaded region?
1) $\dfrac{4\pi}{3}$
2) $\dfrac{20\pi}{3}$
3) $\dfrac{32\pi}{3}$
4) $\dfrac{160\pi}{3}$

22 A circle whose center is the origin passes through the point $(-5,12)$. Which point also lies on this circle?
1) $(10,3)$
2) $(-12,13)$
3) $(11,2\sqrt{12})$
4) $(-8,5\sqrt{21})$

23 A plane intersects a hexagonal prism. The plane is perpendicular to the base of the prism. Which two-dimensional figure is the cross section of the plane intersecting the prism?
1) triangle
2) trapezoid
3) hexagon
4) rectangle

24 A water cup in the shape of a cone has a height of 4 inches and a maximum diameter of 3 inches. What is the volume of the water in the cup, to the *nearest tenth of a cubic inch*, when the cup is filled to half its height?
1) 1.2
2) 3.5
3) 4.7
4) 14.1

25 Using a compass and straightedge, construct the line of reflection over which triangle *RST* reflects onto triangle R'S'T'. [Leave all construction marks.]
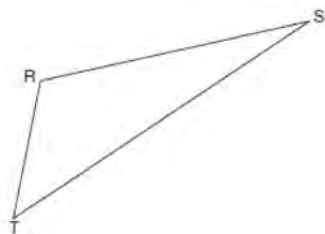
26 The graph below shows △*ABC* and its image, △*A"B"C"*.
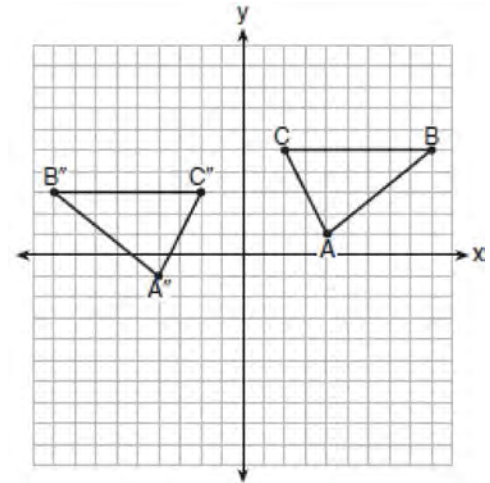
Describe a sequence of rigid motions which would map △*ABC* onto △*A"B"C"*.

27 When instructed to find the length of $\overline{HJ}$ in right triangle *HJG*, Alex wrote the equation $\sin 28° = \dfrac{HJ}{20}$ while Marlene wrote $\cos 62° = \dfrac{HJ}{20}$.
Are both students' equations correct? Explain why.
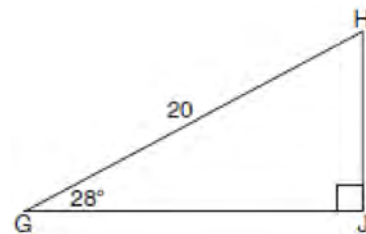
28 In the diagram below, tangent $\overline{DA}$ and secant $\overline{DBC}$ are drawn to circle O from external point D, such that $\overset{\frown}{AC} \cong \overset{\frown}{BC}$.
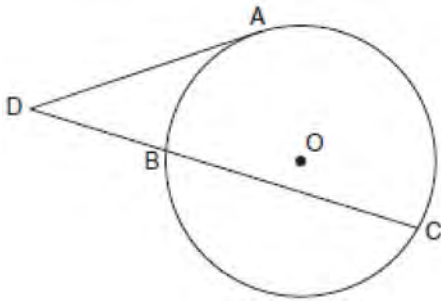
If $m\overset{\frown}{BC} = 152°$, determine and state $m\angle D$.

29 In the diagram below, $\overline{GI}$ is parallel to $\overline{NT}$, and $\overline{IN}$ intersects $\overline{GT}$ at A.
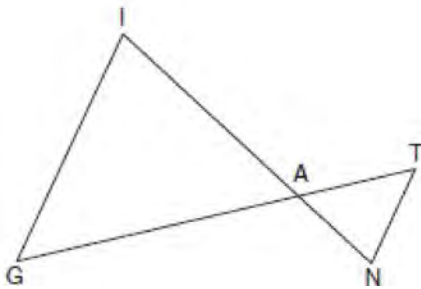
Prove: $\triangle GIA \sim \triangle TNA$

30 In the diagram below of isosceles triangle ABC, $\overline{AB} \cong \overline{CB}$ and angle bisectors $\overline{AD}$, $\overline{BF}$, and $\overline{CE}$ are drawn and intersect at X.
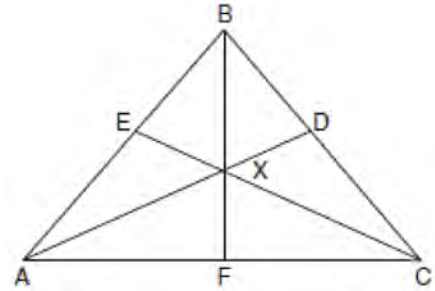
If $m\angle BAC = 50°$, find $m\angle AXC$.

31 In square $GEOM$, the coordinates of G are $(2,-2)$ and the coordinates of O are $(-4,2)$. Determine and state the coordinates of vertices E and M. [The use of the set of axes below is optional.]
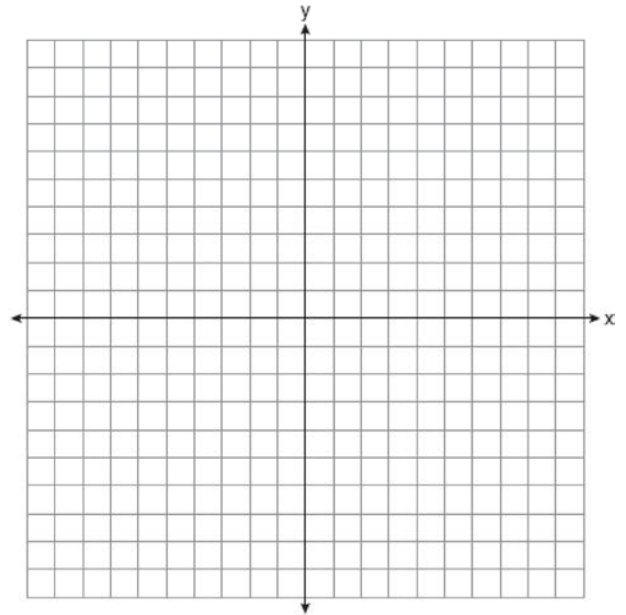
32 Triangle *QRS* is graphed on the set of axes below.
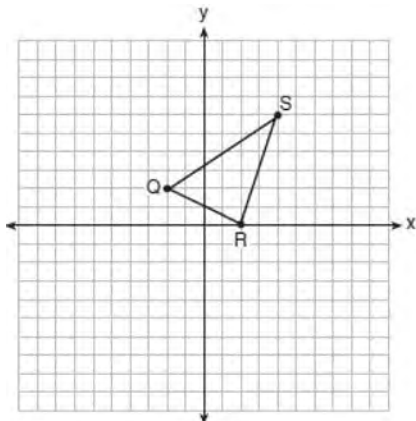
On the same set of axes, graph and label $\triangle Q'R'S'$, the image of $\triangle QRS$ after a dilation with a scale factor of $\frac{3}{2}$ centered at the origin. Use slopes to explain why $Q'R' \parallel QR$.

33 Using a compass and straightedge, construct a regular hexagon inscribed in circle *O* below. Label it *ABCDEF*. [Leave all construction marks.]
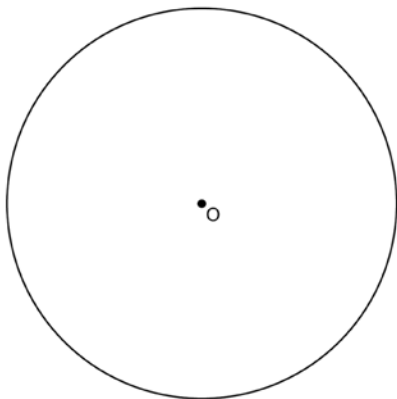
If chords $\overline{FB}$ and $\overline{FC}$ are drawn, which type of triangle, according to its angles, would $\triangle FBC$ be? Explain your answer.

34 A candle maker uses a mold to make candles like the one shown below.
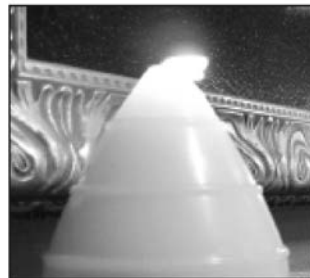
The height of the candle is 13 cm and the circumference of the candle at its widest measure is 31.416 cm. Use modeling to approximate how much wax, to the *nearest cubic centimeter*, is needed to make this candle. Justify your answer.

35 In quadrilateral *ABCD*, $\overline{AB} \cong \overline{CD}$, $\overline{AB} \parallel \overline{CD}$, and $\overline{BF}$ and $\overline{DE}$ are perpendicular to diagonal $\overline{AC}$ at points *F* and *E*.
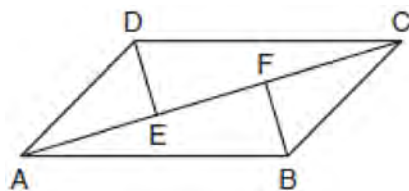
Prove: $\overline{AE} \cong \overline{CF}$

36 New streetlights will be installed along a section of the highway. The posts for the streetlights will be 7.5 m tall and made of aluminum. The city can choose to buy the posts shaped like cylinders or the posts shaped like rectangular prisms. The cylindrical posts have a hollow core, with aluminum 2.5 cm thick, and an outer diameter of 53.4 cm. The rectangular-prism posts have a hollow core, with aluminum 2.5 cm thick, and a square base that measures 40 cm on each side. The density of aluminum is 2.7 g/cm3, and the cost of aluminum is $0.38 per kilogram. If all posts must be the same shape, which post design will cost the town less? How much money will be saved per streetlight post with the less expensive design?

7

0617geo

1   In the diagram below, $\triangle ABC \cong \triangle DEF$.
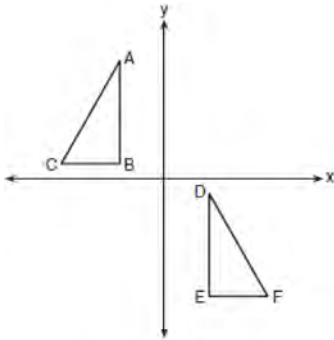
Which sequence of transformations maps $\triangle ABC$ onto $\triangle DEF$?
1) a reflection over the x-axis followed by a translation
2) a reflection over the y-axis followed by a translation
3) a rotation of $180°$ about the origin followed by a translation
4) a counterclockwise rotation of $90°$ about the origin followed by a translation

2   On the set of axes below, the vertices of $\triangle PQR$ have coordinates $P(-6, 7)$, $Q(2, 1)$, and $R(-1, -3)$.
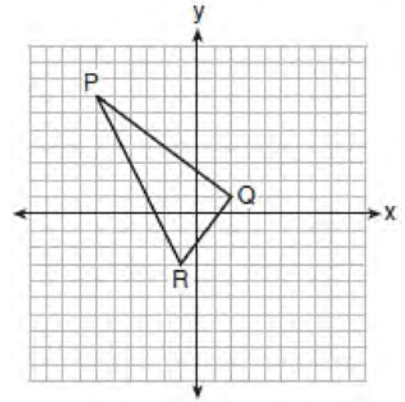
What is the area of $\triangle PQR$?
1) 10
2) 20
3) 25
4) 50

3   In right triangle ABC, $m\angle C = 90°$. If $\cos B = \dfrac{5}{13}$, which function also equals $\dfrac{5}{13}$?
1) $\tan A$
2) $\tan B$
3) $\sin A$
4) $\sin B$

1

4 In the diagram below, m$\overset{\frown}{ABC}$ = 268°.
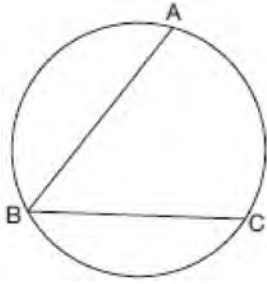
What is the number of degrees in the measure of ∠ABC?
1) 134°
2) 92°
3) 68°
4) 46°

5 Given △MRO shown below, with trapezoid PTRO, MR = 9, MP = 2, and PO = 4.
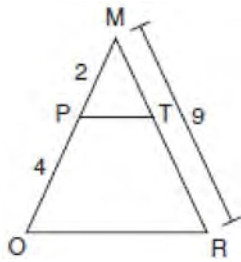
What is the length of $\overline{TR}$?
1) 4.5
2) 5
3) 3
4) 6

6 A line segment is dilated by a scale factor of 2 centered at a point not on the line segment. Which statement regarding the relationship between the given line segment and its image is true?
1) The line segments are perpendicular, and the image is one-half of the length of the given line segment.
2) The line segments are perpendicular, and the image is twice the length of the given line segment.
3) The line segments are parallel, and the image is twice the length of the given line segment.
4) The line segments are parallel, and the image is one-half of the length of the given line segment.

7 Which figure always has exactly four lines of reflection that map the figure onto itself?
1) square
2) rectangle
3) regular octagon
4) equilateral triangle

8 In the diagram below of circle O, chord $\overline{DF}$ bisects chord $\overline{BC}$ at E.
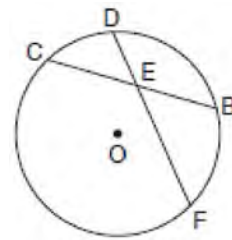
If BC = 12 and FE is 5 more than DE, then FE is
1) 13
2) 9
3) 6
4) 4

2

9 Kelly is completing a proof based on the figure below.
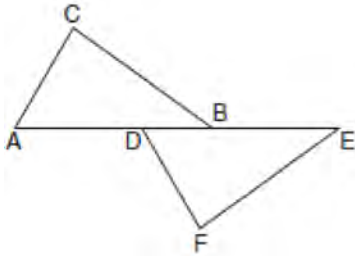
She was given that $\angle A \cong \angle EDF$, and has already proven $\overline{AB} \cong \overline{DE}$. Which pair of corresponding parts and triangle congruency method would *not* prove $\triangle ABC \cong \triangle DEF$?
1) $\overline{AC} \cong \overline{DF}$ and SAS
2) $\overline{BC} \cong \overline{EF}$ and SAS
3) $\angle C \cong \angle F$ and AAS
4) $\angle CBA \cong \angle FED$ and ASA

10 In the diagram below, $\overline{DE}$ divides $\overline{AB}$ and $\overline{AC}$ proportionally, m$\angle C = 26°$, m$\angle A = 82°$, and $\overline{DF}$ bisects $\angle BDE$.
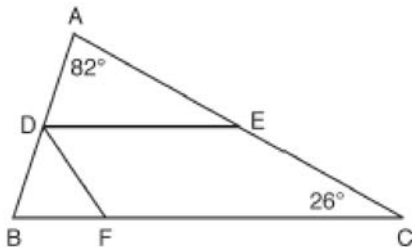
The measure of angle *DFB* is
1) 36°
2) 54°
3) 72°
4) 82°

11 Which set of statements would describe a parallelogram that can always be classified as a rhombus?
    I. Diagonals are perpendicular bisectors of each other.
    II. Diagonals bisect the angles from which they are drawn.
    III. Diagonals form four congruent isosceles right triangles.
1) I and II
2) I and III
3) II and III
4) I, II, and III

12 The equation of a circle is $x^2 + y^2 - 12y + 20 = 0$. What are the coordinates of the center and the length of the radius of the circle?
1) center $(0,6)$ and radius 4
2) center $(0,-6)$ and radius 4
3) center $(0,6)$ and radius 16
4) center $(0,-6)$ and radius 16

13 In the diagram of $\triangle RST$ below, m$\angle T = 90°$, $RS = 65$, and $ST = 60$.
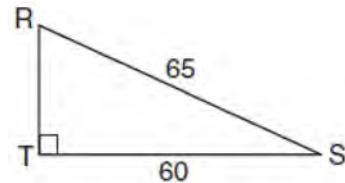
What is the measure of $\angle S$, to the *nearest degree*?
1) 23°
2) 43°
3) 47°
4) 67°

3

14 Triangle $A'B'C'$ is the image of $\triangle ABC$ after a dilation followed by a translation. Which statement(s) would always be true with respect to this sequence of transformations?

    I. $\triangle ABC \cong \triangle A'B'C'$

    II. $\triangle ABC \sim \triangle A'B'C'$

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

    IV. $AA' = BB'$

1) II, only
2) I and II
3) II and III
4) II, III, and IV

15 Line segment RW has endpoints $R(-4,5)$ and $W(6,20)$. Point P is on $\overline{RW}$ such that $RP:PW$ is 2:3. What are the coordinates of point P?

1) $(2,9)$
2) $(0,11)$
3) $(2,14)$
4) $(10,2)$

16 The pyramid shown below has a square base, a height of 7, and a volume of 84.
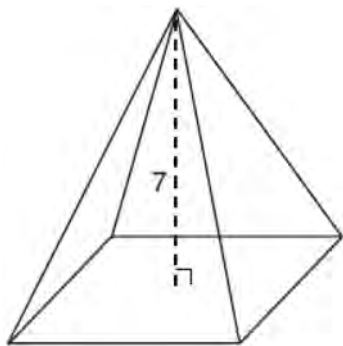
What is the length of the side of the base?

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

17 In the diagram below of triangle MNO, $\angle M$ and $\angle O$ are bisected by $\overline{MS}$ and $\overline{OR}$, respectively. Segments MS and OR intersect at T, and m$\angle N = 40°$.
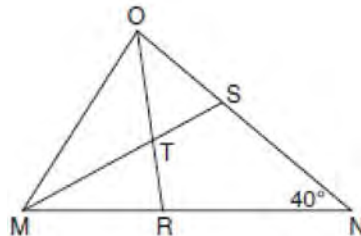
If m$\angle TMR = 28°$, the measure of angle OTS is

1) 40°
2) 50°
3) 60°
4) 70°

18 In the diagram below, right triangle ABC has legs whose lengths are 4 and 6.
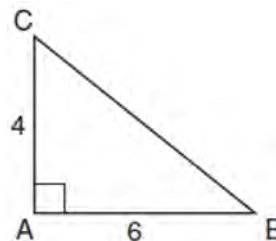
What is the volume of the three-dimensional object formed by continuously rotating the right triangle around $\overline{AB}$?

1) 32π
2) 48π
3) 96π
4) 144π

19 What is an equation of a line that is perpendicular to the line whose equation is $2y = 3x - 10$ and passes through $(-6, 1)$?

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

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

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

4) $y = \frac{2}{3}x + 10$

20 In quadrilateral *BLUE* shown below, $\overline{BE} \cong \overline{UL}$.
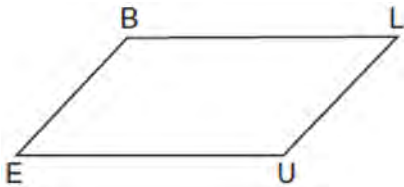
Which information would be sufficient to prove quadrilateral *BLUE* is a parallelogram?

1) $\overline{BL} \parallel \overline{EU}$

2) $\overline{LU} \parallel \overline{BE}$

3) $\overline{BE} \cong \overline{BL}$

4) $\overline{LU} \cong \overline{EU}$

21 A ladder 20 feet long leans against a building, forming an angle of 71° with the level ground. To the *nearest foot*, how high up the wall of the building does the ladder touch the building?

1) 15
2) 16
3) 18
4) 19

22 In the two distinct acute triangles *ABC* and *DEF*, $\angle B \cong \angle E$. Triangles *ABC* and *DEF* are congruent when there is a sequence of rigid motions that maps

1) $\angle A$ onto $\angle D$, and $\angle C$ onto $\angle F$
2) $\overline{AC}$ onto $\overline{DF}$, and $\overline{BC}$ onto $\overline{EF}$
3) $\angle C$ onto $\angle F$, and $\overline{BC}$ onto $\overline{EF}$
4) point *A* onto point *D*, and $\overline{AB}$ onto $\overline{DE}$

23 A fabricator is hired to make a 27-foot-long solid metal railing for the stairs at the local library. The railing is modeled by the diagram below. The railing is 2.5 inches high and 2.5 inches wide and is comprised of a rectangular prism and a half-cylinder.
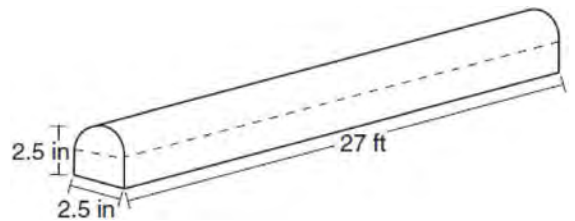
How much metal, to the *nearest cubic inch*, will the railing contain?

1) 151
2) 795
3) 1808
4) 2025

5

24 In the diagram below, $AC = 7.2$ and $CE = 2.4$.
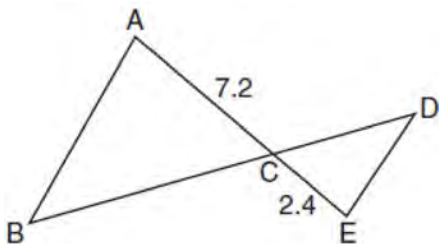
Which statement is *not* sufficient to prove
$\triangle ABC \sim \triangle EDC$?
1) $\overline{AB} \parallel \overline{ED}$
2) $DE = 2.7$ and $AB = 8.1$
3) $CD = 3.6$ and $BC = 10.8$
4) $DE = 3.0$, $AB = 9.0$, $CD = 2.9$, and $BC = 8.7$

25 Given: Trapezoid $JKLM$ with $\overline{JK} \parallel \overline{ML}$
Using a compass and straightedge, construct the
altitude from vertex J to $\overline{ML}$. [Leave all
construction marks.]
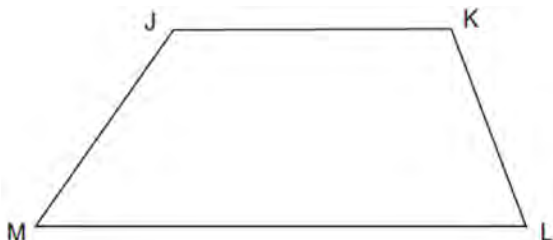
26 Determine and state, in terms of π, the area of a
sector that intercepts a 40° arc of a circle with a
radius of 4.5.

27 The diagram below shows two figures. Figure A is
a right triangular prism and figure B is an oblique
triangular prism. The base of figure A has a height
of 5 and a length of 8 and the height of prism A is
14. The base of figure B has a height of 8 and a
length of 5 and the height of prism B is 14.
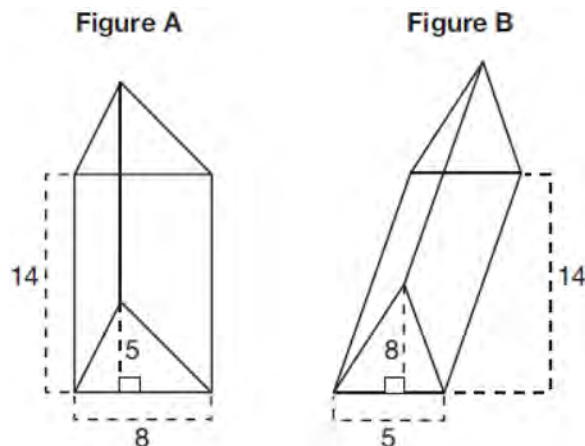
Use Cavalieri's Principle to explain why the
volumes of these two triangular prisms are equal.

28 When volleyballs are purchased, they are not fully
inflated. A partially inflated volleyball can be
modeled by a sphere whose volume is
approximately 180 in³. After being fully inflated,
its volume is approximately 294 in³. To the *nearest
tenth of an inch*, how much does the radius increase
when the volleyball is fully inflated?

29 In right triangle ABC shown below, altitude $\overline{CD}$ is
drawn to hypotenuse $\overline{AB}$. Explain why
$\triangle ABC \sim \triangle ACD$.
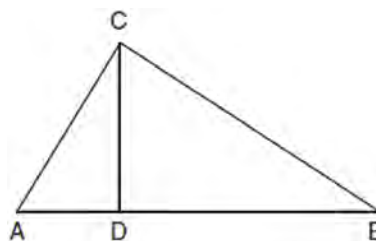
30 Triangle *ABC* and triangle *DEF* are drawn below.
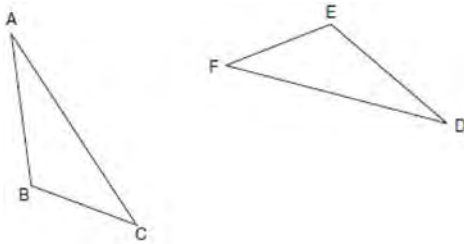
If $\overline{AB} \cong \overline{DE}$, $\overline{AC} \cong \overline{DF}$, and $\angle A \cong \angle D$, write a sequence of transformations that maps triangle *ABC* onto triangle *DEF*.

31 Line *n* is represented by the equation $3x + 4y = 20$. Determine and state the equation of line *p*, the image of line *n*, after a dilation of scale factor $\frac{1}{3}$ centered at the point $(4, 2)$. [The use of the set of axes below is optional.] Explain your answer.
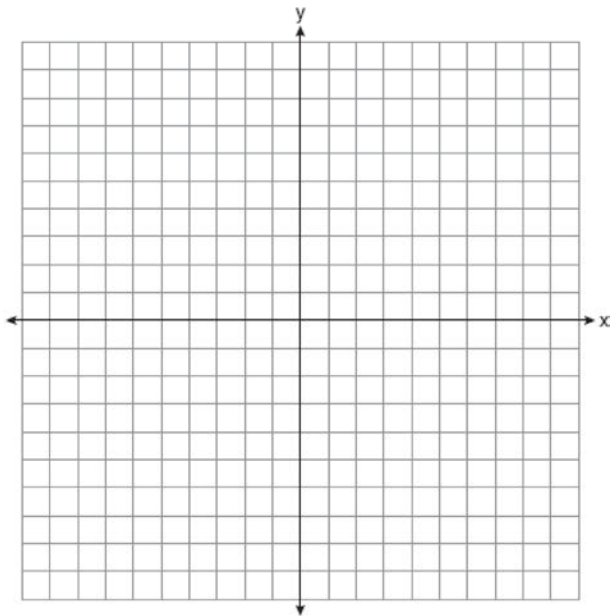
32 Triangle *ABC* has vertices at $A(-5, 2)$, $B(-4, 7)$, and $C(-2, 7)$, and triangle *DEF* has vertices at $D(3, 2)$, $E(2, 7)$, and $F(0, 7)$. Graph and label $\triangle ABC$ and $\triangle DEF$ on the set of axes below. Determine and state the single transformation where $\triangle DEF$ is the image of $\triangle ABC$. Use your transformation to explain why $\triangle ABC \cong \triangle DEF$.
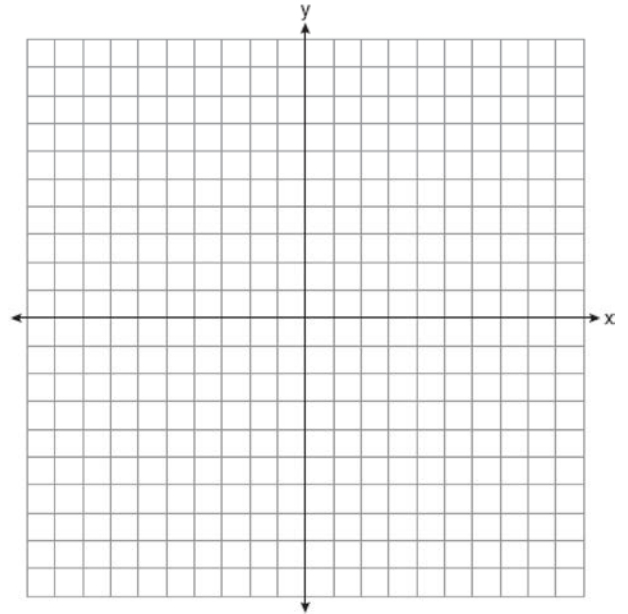
33 Given: $\overline{RS}$ and $\overline{TV}$ bisect each other at point *X*
     $\overline{TR}$ and $\overline{SV}$ are drawn

Prove: $\overline{TR} \parallel \overline{SV}$

7
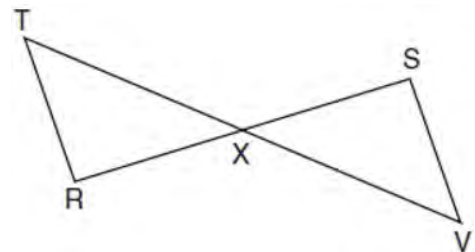
34 A gas station has a cylindrical fueling tank that holds the gasoline for its pumps, as modeled below. The tank holds a maximum of 20,000 gallons of gasoline and has a length of 34.5 feet.
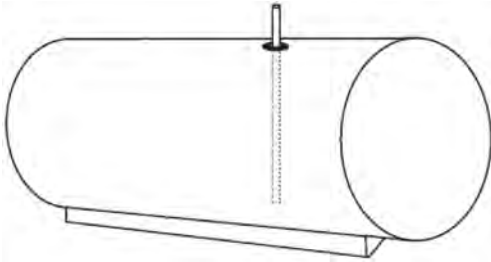
A metal pole is used to measure how much gas is in the tank. To the *nearest tenth of a foot*, how long does the pole need to be in order to reach the bottom of the tank and still extend one foot outside the tank? Justify your answer. [1 ft³=7.48 gallons]

35 Quadrilateral *PQRS* has vertices *P*(−2,3), *Q*(3,8), *R*(4,1), and *S*(−1,−4). Prove that *PQRS* is a rhombus. Prove that *PQRS* is *not* a square. [The use of the set of axes below is optional.]
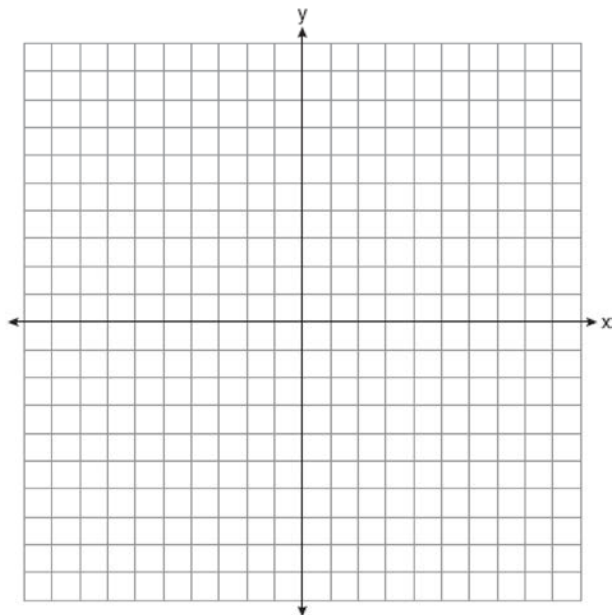
36 Freda, who is training to use a radar system, detects an airplane flying at a constant speed and heading in a straight line to pass directly over her location. She sees the airplane at an angle of elevation of 15° and notes that it is maintaining a constant altitude of 6250 feet. One minute later, she sees the airplane at an angle of elevation of 52°. How far has the airplane traveled, to the *nearest foot*? Determine and state the speed of the airplane, to the *nearest mile per hour*.

8

0817geo

1 A two-dimensional cross section is taken of a three-dimensional object. If this cross section is a triangle, what can *not* be the three-dimensional object?
   1) cone
   2) cylinder
   3) pyramid
   4) rectangular prism

2 The image of $\triangle DEF$ is $\triangle D'E'F'$. Under which transformation will he triangles *not* be congruent?
   1) a reflection through the origin
   2) a reflection over the line $y = x$
   3) a dilation with a scale factor of 1 centered at $(2,3)$
   4) a dilation with a scale factor of $\frac{3}{2}$ centered at the origin

3 The vertices of square *RSTV* have coordinates $R(-1,5)$, $S(-3,1)$, $T(-7,3)$, and $V(-5,7)$. What is the perimeter of *RSTV*?
   1) $\sqrt{20}$
   2) $\sqrt{40}$
   3) $4\sqrt{20}$
   4) $4\sqrt{40}$

4 In the diagram below of circle O, chord $\overline{CD}$ is parallel to diameter $\overline{AOB}$ and $m\overset{\frown}{CD} = 130$.
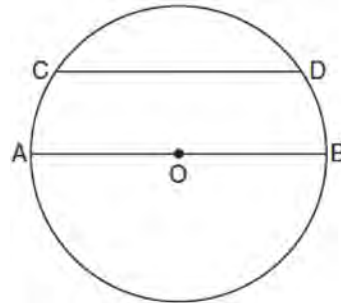
What is $m\overset{\frown}{AC}$?
   1) 25
   2) 50
   3) 65
   4) 115

5 In the diagram below, $\overline{AD}$ intersects $\overline{BE}$ at C, and $\overline{AB}\|\overline{DE}$.
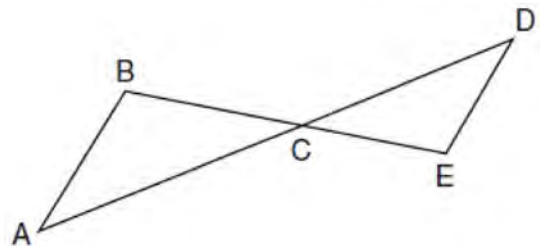
If $CD = 6.6$ cm, $DE = 3.4$ cm, $CE = 4.2$ cm, and $BC = 5.25$ cm, what is the length of $\overline{AC}$, to the *nearest hundredth of a centimeter*?
   1) 2.70
   2) 3.34
   3) 5.28
   4) 8.25

6   As shown in the graph below, the quadrilateral is a rectangle.
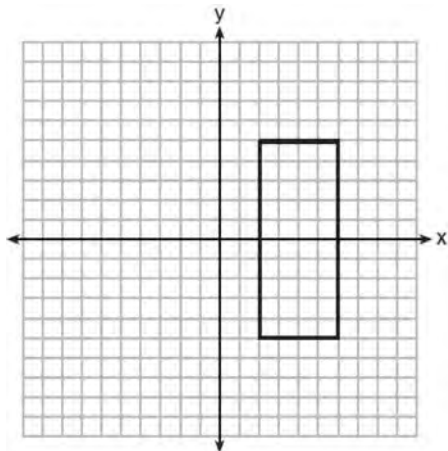
Which transformation would *not* map the rectangle onto itself?
1)   a reflection over the *x*-axis
2)   a reflection over the line $x = 4$
3)   a rotation of 180° about the origin
4)   a rotation of 180° about the point (4,0)

7   In the diagram below, triangle *ACD* has points *B* and *E* on sides $\overline{AC}$ and $\overline{AD}$, respectively, such that $\overline{BE} \parallel \overline{CD}$, $AB = 1$, $BC = 3.5$, and $AD = 18$.
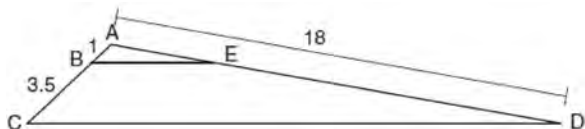
What is the length of $\overline{AE}$, to the *nearest tenth*?
1)   14.0
2)   5.1
3)   3.3
4)   4.0

8   In the diagram below of parallelogram *ROCK*, $m\angle C$ is 70° and $m\angle ROS$ is 65°.
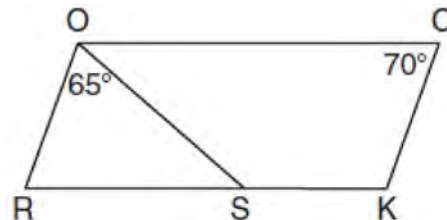
What is $m\angle KSO$?
1)   45°
2)   110°
3)   115°
4)   135°

9   In the diagram below, $\angle GRS \cong \angle ART$, $GR = 36$, $SR = 45$, $AR = 15$, and $RT = 18$.
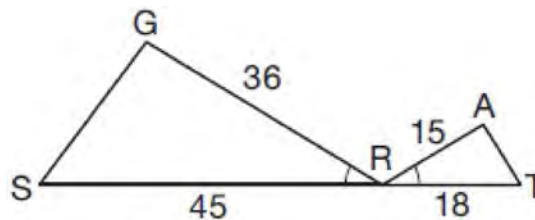
Which triangle similarity statement is correct?
1) $\triangle GRS \sim \triangle ART$ by AA.
2) $\triangle GRS \sim \triangle ART$ by SAS.
3) $\triangle GRS \sim \triangle ART$ by SSS.
4) $\triangle GRS$ is not similar to $\triangle ART$.

10   The line represented by the equation $4y = 3x + 7$ is transformed by a dilation centered at the origin. Which linear equation could represent its image?
1) $3x - 4y = 9$
2) $3x + 4y = 9$
3) $4x - 3y = 9$
4) $4x + 3y = 9$

11 Given $\triangle ABC$ with m$\angle B = 62°$ and side $\overline{AC}$ extended to D, as shown below.
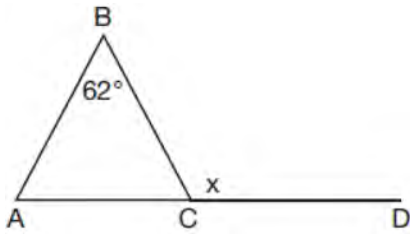
Which value of x makes $\overline{AB} \cong \overline{CB}$?
1) 59°
2) 62°
3) 118°
4) 121°

12 In the diagram shown below, $\overline{PA}$ is tangent to circle T at A, and secant $\overline{PBC}$ is drawn where point B is on circle T.
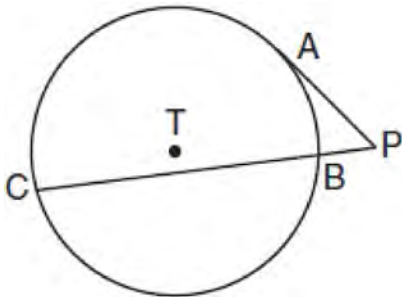
If $PB = 3$ and $BC = 15$, what is the length of $\overline{PA}$?
1) $3\sqrt{5}$
2) $3\sqrt{6}$
3) 3
4) 9

13 A rectangle whose length and width are 10 and 6, respectively, is shown below. The rectangle is continuously rotated around a straight line to form an object whose volume is 150π.
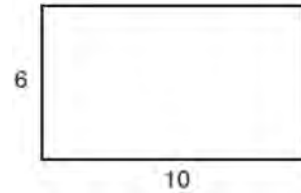
Which line could the rectangle be rotated around?
1) a long side
2) a short side
3) the vertical line of symmetry
4) the horizontal line of symmetry

14 If $ABCD$ is a parallelogram, which statement would prove that $ABCD$ is a rhombus?
1) $\angle ABC \cong \angle CDA$
2) $\overline{AC} \cong \overline{BD}$
3) $\overline{AC} \perp \overline{BD}$
4) $\overline{AB} \perp \overline{CD}$

15 To build a handicapped-access ramp, the building code states that for every 1 inch of vertical rise in height, the ramp must extend out 12 inches horizontally, as shown in the diagram below.
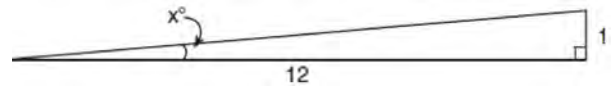
What is the angle of inclination, x, of this ramp, to the *nearest hundredth of a degree*?
1) 4.76
2) 4.78
3) 85.22
4) 85.24

3

16 In the diagram below of $\triangle ABC$, D, E, and F are the midpoints of $\overline{AB}$, $\overline{BC}$, and $\overline{CA}$, respectively.
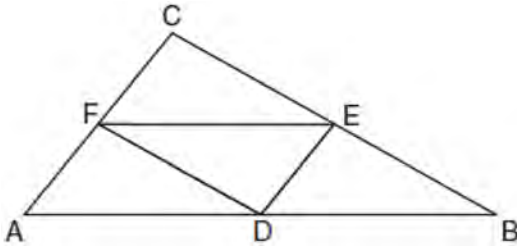
What is the ratio of the area of $\triangle CFE$ to the area of $\triangle CAB$?
1) 1:1
2) 1:2
3) 1:3
4) 1:4

17 The coordinates of the endpoints of $\overline{AB}$ are $A(-8,-2)$ and $B(16,6)$. Point P is on $\overline{AB}$. What are the coordinates of point P, such that $AP:PB$ is 3:5?
1) $(1,1)$
2) $(7,3)$
3) $(9.6,3.6)$
4) $(6.4,2.8)$

18 Kirstie is testing values that would make triangle KLM a right triangle when $\overline{LN}$ is an altitude, and $KM = 16$, as shown below.
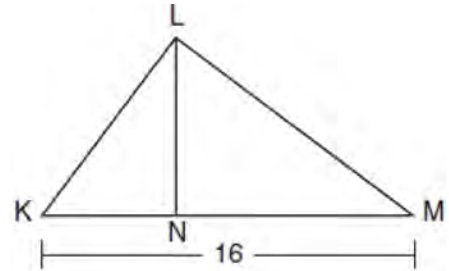
Which lengths would make triangle KLM a right triangle?
1) $LM = 13$ and $KN = 6$
2) $LM = 12$ and $NM = 9$
3) $KL = 11$ and $KN = 7$
4) $LN = 8$ and $NM = 10$

19 In right triangle ABC, m$\angle A = 32°$, m$\angle B = 90°$, and $AE = 6.2$ cm. What is the length of $\overline{BC}$, to the *nearest tenth of a centimeter*?
1) 3.3
2) 3.9
3) 5.3
4) 11.7

20 The 2010 U.S. Census populations and population densities are shown in the table below.

State	Population Density $\left(\dfrac{\text{people}}{\text{mi}^2}\right)$	Population in 2010
Florida	350.6	18,801,310
Illinois	231.1	12,830,632
New York	411.2	19,378,102
Pennsylvania	283.9	12,702,379

Based on the table above, which list has the states' areas, in square miles, in order from largest to smallest?
1) Illinois, Florida, New York, Pennsylvania
2) New York, Florida, Illinois, Pennsylvania
3) New York, Florida, Pennsylvania, Illinois
4) Pennsylvania, New York, Florida, Illinois

21 In a right triangle, $\sin(40 - x)° = \cos(3x)°$. What is the value of x?
1) 10
2) 15
3) 20
4) 25

22 A regular decagon is rotated n degrees about its center, carrying the decagon onto itself. The value of n could be
1) 10°
2) 150°
3) 225°
4) 252°

23 In a circle with a diameter of 32, the area of a sector is $\dfrac{512\pi}{3}$. The measure of the angle of the sector, in radians, is
1) $\dfrac{\pi}{3}$
2) $\dfrac{4\pi}{3}$
3) $\dfrac{16\pi}{3}$
4) $\dfrac{64\pi}{3}$

24 What is an equation of the perpendicular bisector of the line segment shown in the diagram below?
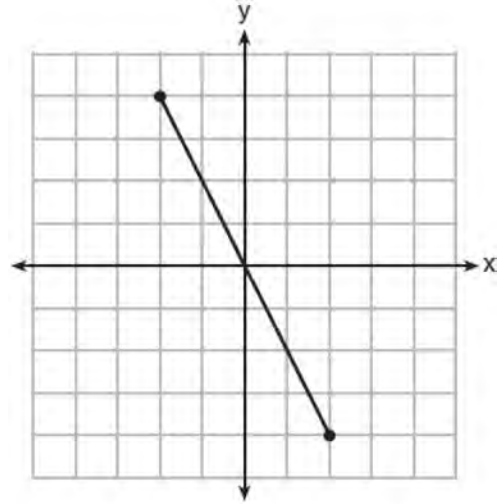
1) $y + 2x = 0$
2) $y - 2x = 0$
3) $2y + x = 0$
4) $2y - x = 0$

25 Sue believes that the two cylinders shown in the diagram below have equal volumes.
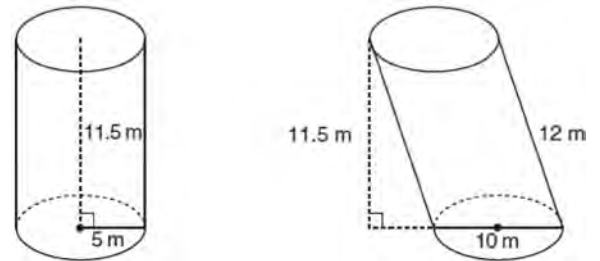
Is Sue correct? Explain why.

26 In the diagram of rhombus $PQRS$ below, the diagonals $\overline{PR}$ and $\overline{QS}$ intersect at point T, $PR = 16$, and $QS = 30$. Determine and state the perimeter of $PQRS$.

28 Using a compass and straightedge, construct a regular hexagon inscribed in circle O. [Leave all construction marks.]
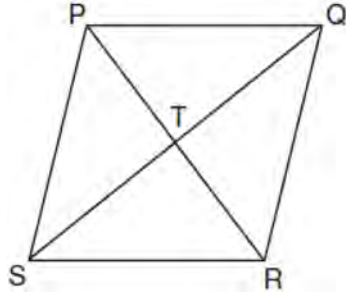
27 Quadrilateral $MATH$ and its image $M''A''T''H''$ are graphed on the set of axes below.
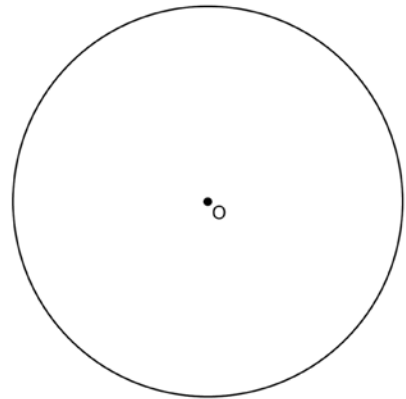
29 The coordinates of the endpoints of $\overline{AB}$ are $A(2,3)$ and $B(5,-1)$. Determine the length of $\overline{A'B'}$, the image of $\overline{AB}$, after a dilation of $\frac{1}{2}$ centered at the origin. [The use of the set of axes below is optional.]

Describe a sequence of transformations that maps quadrilateral $MATH$ onto quadrilateral $M''A''T''H''$.
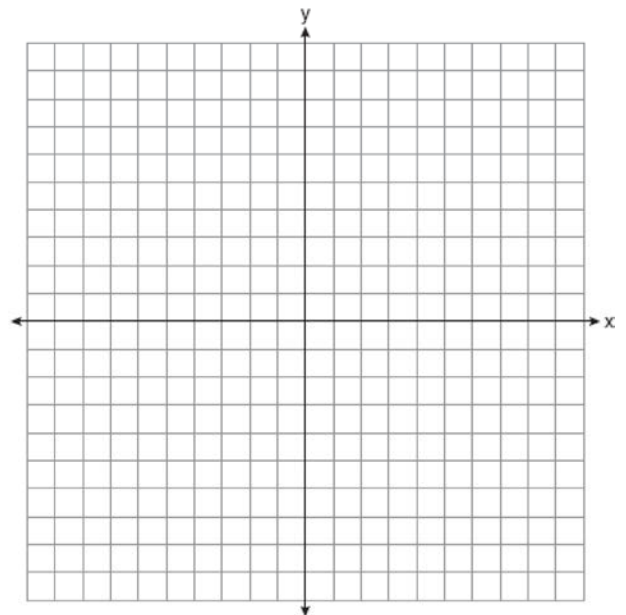
30 In the diagram below of $\triangle ABC$ and $\triangle XYZ$, a sequence of rigid motions maps $\angle A$ onto $\angle X$, $\angle C$ onto $\angle Z$, and $\overline{AC}$ onto $\overline{XZ}$.
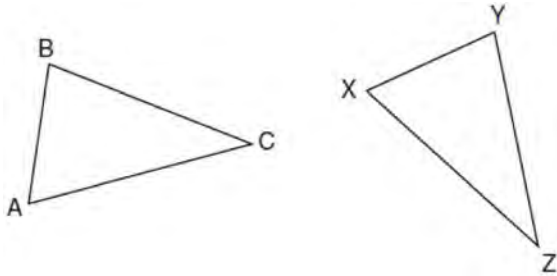
Determine and state whether $\overline{BC} \cong \overline{YZ}$. Explain why.

31 Determine and state the coordinates of the center and the length of the radius of a circle whose equation is $x^2 + y^2 - 6x = 56 - 8y$.

32 Triangle PQR has vertices $P(-3,-1)$, $Q(-1,7)$, and $R(3,3)$, and points A and B are midpoints of $\overline{PQ}$ and $\overline{RQ}$, respectively. Use coordinate geometry to prove that $\overline{AB}$ is parallel to $\overline{PR}$ and is half the length of $\overline{PR}$. [The use of the set of axes below is optional.]
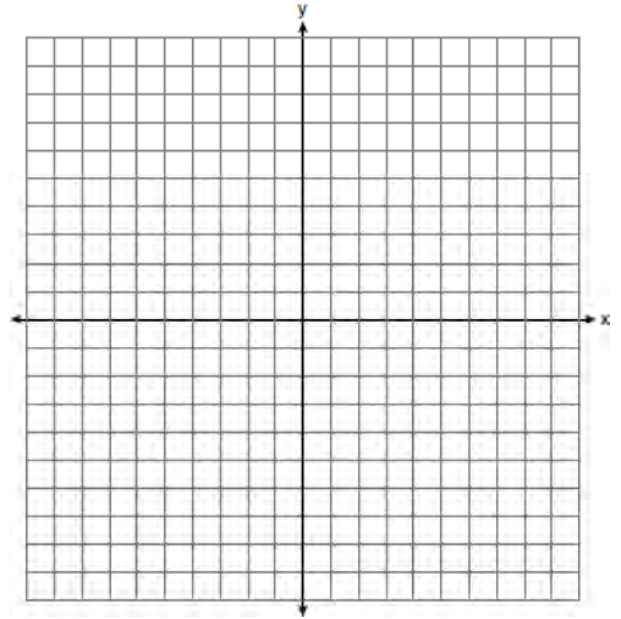
33 In the diagram below of circle O, tangent $\overleftrightarrow{EC}$ is drawn to diameter $\overline{AC}$. Chord $\overline{BC}$ is parallel to secant $\overline{ADE}$, and chord $\overline{AB}$ is drawn.

Prove: $\dfrac{BC}{CA} = \dfrac{AB}{EC}$

7
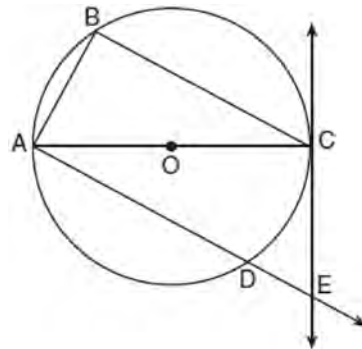
34 Keira has a square poster that she is framing and placing on her wall. The poster has a diagonal 58 cm long and fits exactly inside the frame. The width of the frame around the picture is 4 cm.
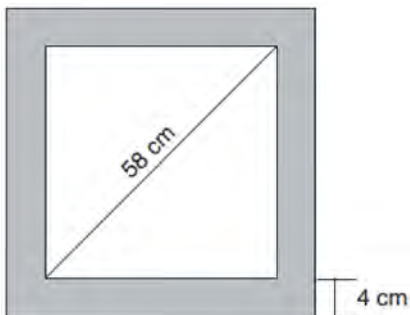
Determine and state the total area of the poster and frame to the *nearest tenth of a square centimeter*.

35 Isosceles trapezoid *ABCD* has bases $\overline{DC}$ and $\overline{AB}$ with nonparallel legs $\overline{AD}$ and $\overline{BC}$. Segments *AE*, *BE*, *CE*, and *DE* are drawn in trapezoid *ABCD* such that $\angle CDE \cong \angle DCE$, $\overline{AE} \perp \overline{DE}$, and $\overline{BE} \perp \overline{CE}$.
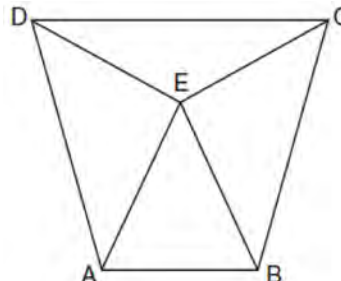
Prove $\triangle ADE \cong \triangle BCE$ and prove $\triangle AEB$ is an isosceles triangle.

36 A rectangular in-ground pool is modeled by the prism below. The inside of the pool is 16 feet wide and 35 feet long. The pool has a shallow end and a deep end, with a sloped floor connecting the two ends. Without water, the shallow end is 9 feet long and 4.5 feet deep, and the deep end of the pool is 12.5 feet long.
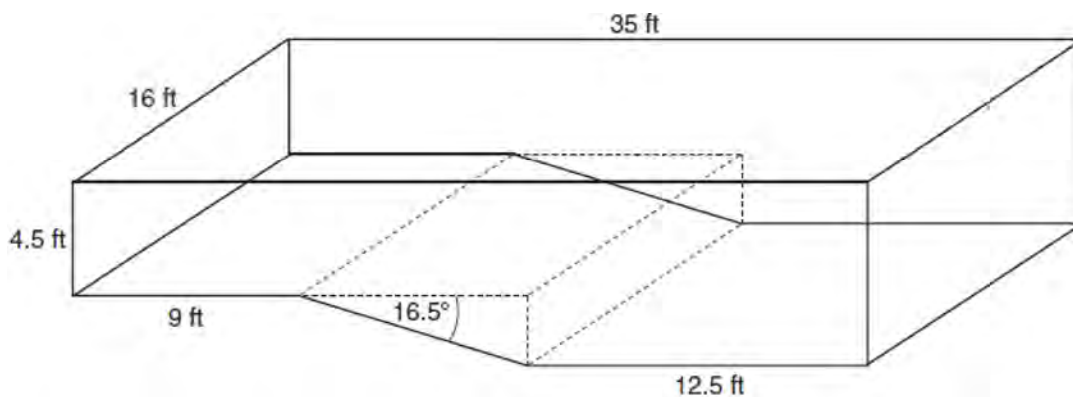
If the sloped floor has an angle of depression of 16.5 degrees, what is the depth of the pool at the deep end, to the *nearest tenth of a foot*? Find the volume of the inside of the pool to the *nearest cubic foot*. A garden hose is used to fill the pool. Water comes out of the hose at a rate of 10 .5 gallons per minute. How much time, to the *nearest hour*, will it take to fill the pool 6 inches from the top? [1 ft³=7.48 gallons]

8

2014 Geometry Common Core State Standards Sample Items
Answer Section

1 ANS: 4

$$-5 + \frac{3}{5}(5 - -5) \quad -4 + \frac{3}{5}(1 - -4)$$

$$-5 + \frac{3}{5}(10) \qquad -4 + \frac{3}{5}(5)$$

$$-5 + 6 \qquad\quad -4 + 3$$

$$1 \qquad\qquad -1$$

PTS: 2   REF: spr1401geo   NAT: G.GPE.B.6   TOP: Directed Line Segments

2 ANS: 2

Segments drawn from the center of the regular pentagon bisect each angle of the pentagon, and create five isosceles triangles as shown in the diagram below. Since each exterior angle equals the angles formed by the segments drawn from the center of the regular pentagon, the minimum degrees necessary to carry a regular polygon onto itself are equal to the measure of an exterior angle of the regular polygon.
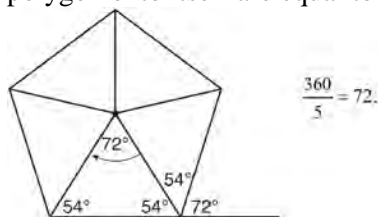
PTS: 2   REF: spr1402geo   NAT: G.CO.A.3   TOP: Mapping a Polygon onto Itself

3 ANS: 2

The given line h, $2x + y = 1$, does not pass through the center of dilation, the origin, because the y-intercept is at $(0,1)$. The slope of the dilated line, m, will remain the same as the slope of line h, -2. All points on line h, such as $(0,1)$, the y-intercept, are dilated by a scale factor of 4; therefore, the y-intercept of the dilated line is $(0,4)$ because the center of dilation is the origin, resulting in the dilated line represented by the equation $y = -2x + 4$.

PTS: 2   REF: spr1403geo   NAT: G.SRT.A.1   TOP: Line Dilations

4 ANS:

Circle A can be mapped onto circle B by first translating circle A along vector $\overline{AB}$ such that A maps onto B, and then dilating circle A, centered at A, by a scale factor of $\frac{5}{3}$. Since there exists a sequence of transformations that maps circle A onto circle B, circle A is similar to circle B.

PTS: 2   REF: spr1404geo   NAT: G.C.A.1   TOP: Similarity Proofs

5 ANS:

Each quarter in both stacks has the same base area. Therefore, each corresponding cross-section of the stacks will have the same area. Since the two stacks of quarters have the same height of 23 quarters, the two volumes must be the same.

PTS: 2   REF: spr1405geo   NAT: G.GMD.A.1   TOP: Volume

6 ANS:

Triangle $X'Y'Z'$ is the image of $\triangle XYZ$ after a rotation about point Z such that $\overline{ZX}$ coincides with $\overline{ZU}$. Since rotations preserve angle measure, $\overline{ZY}$ coincides with $\overline{ZV}$, and corresponding angles X and Y, after the rotation, remain congruent, so $\overline{XY} \parallel \overline{UV}$. Then, dilate $\triangle X'Y'Z'$ by a scale factor of $\dfrac{ZU}{ZX}$ with its center at point Z. Since dilations preserve parallelism, $\overline{XY}$ maps onto $\overline{UV}$. Therefore, $\triangle XYZ \sim \triangle UVZ$.

PTS: 2   REF: spr1406geo   NAT: G.SRT.A.2   TOP: Compositions of Transformations
KEY: grids

7 ANS:

The acute angles in a right triangle are always complementary. The sine of any acute angle is equal to the cosine of its complement.

PTS: 2   REF: spr1407geo   NAT: G.SRT.C.7   TOP: Cofunctions

8 ANS:

$\overline{LA} \cong \overline{DN}$, $\overline{CA} \cong \overline{CN}$, and $\overline{DAC} \perp \overline{LCN}$ (Given). $\angle LCA$ and $\angle DCN$ are right angles (Definition of perpendicular lines). $\triangle LAC$ and $\triangle DNC$ are right triangles (Definition of a right triangle). $\triangle LAC \cong \triangle DNC$ (HL). $\triangle LAC$ will map onto $\triangle DNC$ after rotating $\triangle LAC$ counterclockwise 90° about point C such that point L maps onto point D.

PTS: 4   REF: spr1408geo   NAT: G.CO.B.8   TOP: Triangle Congruency

9 ANS:

x represents the distance between the lighthouse and the canoe at 5:00; y represents the distance between the lighthouse and the canoe at 5:05. $\tan 6 = \dfrac{112 - 1.5}{x}$ $\tan(49 + 6) = \dfrac{112 - 1.5}{y}$ $\dfrac{1051.3 - 77.4}{5} \approx 195$

$x \approx 1051.3$ $\qquad\qquad y \approx 77.4$

PTS: 4   REF: spr1409geo   NAT: G.SRT.C.8   TOP: Using Trigonometry to Find a Side
KEY: advanced

10 ANS:

$$\dfrac{\left(\dfrac{180 - 20}{2}\right)}{360} \times \pi(6)^2 = \dfrac{80}{360} \times 36\pi = 8\pi$$

PTS: 4   REF: spr1410geo   NAT: G.C.B.5   TOP: Sectors

11 ANS:
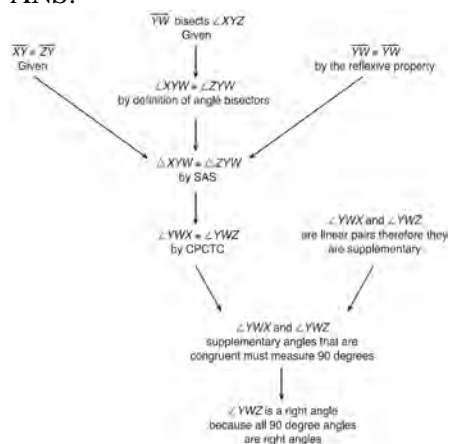
$\triangle XYZ$, $\overline{XY} \cong \overline{ZY}$, and $\overline{YW}$ bisects $\angle XYZ$ (Given). $\triangle XYZ$ is isosceles (Definition of isosceles triangle). $\overline{YW}$ is an altitude of $\triangle XYZ$ (The angle bisector of the vertex of an isosceles triangle is also the altitude of that triangle). $\overline{YW} \perp \overline{XZ}$ (Definition of altitude). $\angle YWZ$ is a right angle (Definition of perpendicular lines).

PTS: 4   REF: spr1411geo   NAT: G.CO.C.10   TOP: Triangle Proofs

12 ANS:

$$r = 25 \text{ cm} \left(\frac{1 \text{ m}}{100 \text{ cm}} \right) = 0.25 \text{ m} \quad V = \pi (0.25 \text{ m})^2 (10 \text{ m}) = 0.625 \pi \text{ m}^3 \quad W = 0.625 \pi \text{ m}^3 \left(\frac{380 \text{ K}}{1 \text{ m}^3} \right) \approx 746.1 \, K$$

$$n = \frac{\$50{,}000}{\left(\dfrac{\$4.75}{\text{K}} \right)(746.1 \text{ K})} = 14.1 \quad 15 \text{ trees}$$

PTS: 4   REF: spr1412geo   NAT: G.MG.A.2   TOP: Density

13 ANS:

Circle O, secant $\overline{ACD}$, tangent $\overline{AB}$ (Given). Chords $\overline{BC}$ and $\overline{BD}$ are drawn (Auxiliary lines). $\angle A \cong \angle A$, $\overparen{BC} \cong \overparen{BC}$ (Reflexive property). $\text{m}\angle BDC = \frac{1}{2} \, \text{m}\overparen{BC}$ (The measure of an inscribed angle is half the measure of the intercepted arc). $\text{m}\angle CBA = \frac{1}{2} \, \text{m}\overparen{BC}$ (The measure of an angle formed by a tangent and a chord is half the measure of the intercepted arc). $\angle BDC \cong \angle CBA$ (Angles equal to half of the same arc are congruent). $\triangle ABC \sim \triangle ADB$ (AA). $\frac{AB}{AC} = \frac{AD}{AB}$ (Corresponding sides of similar triangles are proportional). $AC \cdot AD = AB^2$ (In a proportion, the product of the means equals the product of the extremes).

PTS: 6   REF: spr1413geo   NAT: G.SRT.B.5   TOP: Circle Proofs

14 ANS:

It is given that point *D* is the image of point *A* after a reflection in line *CH*. It is given that $\overleftrightarrow{CH}$ is the perpendicular bisector of $\overline{BCE}$ at point *C*. Since a bisector divides a segment into two congruent segments at its midpoint, $\overline{BC} \cong \overline{EC}$. Point *E* is the image of point *B* after a reflection over the line *CH*, since points *B* and *E* are equidistant from point *C* and it is given that $\overleftrightarrow{CH}$ is perpendicular to $\overline{BE}$. Point *C* is on $\overleftrightarrow{CH}$, and therefore, point *C* maps to itself after the reflection over $\overleftrightarrow{CH}$. Since all three vertices of triangle *ABC* map to all three vertices of triangle *DEC* under the same line reflection, then $\triangle ABC \cong \triangle DEC$ because a line reflection is a rigid motion and triangles are congruent when one can be mapped onto the other using a sequence of rigid motions.

PTS: 6   REF: spr1414geo   NAT: G.CO.B.7   TOP: Triangle Congruency

15 ANS: 1
The man's height, 69 inches, is opposite to the angle of elevation, and the shadow length, 102 inches, is adjacent to the angle of elevation. Therefore, tangent must be used to find the angle of elevation. $\tan x = \dfrac{69}{102}$

$$x \approx 34.1$$

PTS: 2   REF: fall1401geo   NAT: G.SRT.C.8   TOP: Using Trigonometry to Find an Angle

16 ANS: 4
The measures of the angles of a triangle remain the same after all rotations because rotations are rigid motions which preserve angle measure.

PTS: 2   REF: fall1402geo   NAT: G.CO.B.6   TOP: Properties of Transformations
KEY: graphics

17 ANS: 2
The line $y = 2x - 4$ does not pass through the center of dilation, so the dilated line will be distinct from $y = 2x - 4$. Since a dilation preserves parallelism, the line $y = 2x - 4$ and its image will be parallel, with slopes of 2. To obtain the *y*-intercept of the dilated line, the scale factor of the dilation, $\dfrac{3}{2}$, can be applied to the *y*-intercept,

$(0,-4)$. Therefore, $\left(0 \cdot \dfrac{3}{2}, -4 \cdot \dfrac{3}{2}\right) \rightarrow (0,-6)$. So the equation of the dilated line is $y = 2x - 6$.

PTS: 2   REF: fall1403geo   NAT: G.SRT.A.1   TOP: Line Dilations

18 ANS: 3
$$\theta = \frac{s}{r} = \frac{2\pi}{10} = \frac{\pi}{5}$$

PTS: 2   REF: fall1404geo   NAT: G.C.B.5   TOP: Arc Length
KEY: angle

19 ANS:
$\triangle MNO$ is congruent to $\triangle PNO$ by SAS. Since $\triangle MNO \cong \triangle PNO$, then $\overline{MO} \cong \overline{PO}$ by CPCTC. So $\overline{NO}$ must divide $\overline{MP}$ in half, and $MO = 8$.

PTS: 2   REF: fall1405geo   NAT: G.SRT.B.5   TOP: Isosceles Triangle Theorem

20 ANS:

No, the weight of the bricks is greater than 900 kg. $500 \times (5.1 \text{ cm} \times 10.2 \text{ cm} \times 20.3 \text{ cm}) = 528,003 \text{ cm}^3$.

$528,003 \text{ cm}^3 \times \dfrac{1 \text{ m}^3}{100 \text{ cm}^3} = 0.528003 \text{ m}^3$. $\dfrac{1920 \text{ kg}}{\text{m}^3} \times 0.528003 \text{ m}^3 \approx 1013 \text{ kg}$.

PTS: 2   REF: fall1406geo   NAT: G.MG.A.2   TOP: Density

21 ANS:

$4x - .07 = 2x + .01$ $\operatorname{Sin} A$ is the ratio of the opposite side and the hypotenuse while $\cos B$ is the ratio of the adjacent

$\quad 2x = 0.8$

$\quad\; x = 0.4$

side and the hypotenuse. The side opposite angle A is the same side as the side adjacent to angle B. Therefore, $\sin A = \cos B$.

PTS: 2   REF: fall1407geo   NAT: G.SRT.C.7   TOP: Cofunctions

22 ANS:

Translate $\triangle ABC$ along $\overline{CF}$ such that point C maps onto point F, resulting in image $\triangle A'B'C'$. Then reflect $\triangle A'B'C'$ over $\overline{DF}$ such that $\triangle A'B'C'$ maps onto $\triangle DEF$.

or

Reflect $\triangle ABC$ over the perpendicular bisector of $\overline{EB}$ such that $\triangle ABC$ maps onto $\triangle DEF$.

PTS: 2   REF: fall1408geo   NAT: G.CO.B.7   TOP: Triangle Congruency

23 ANS:
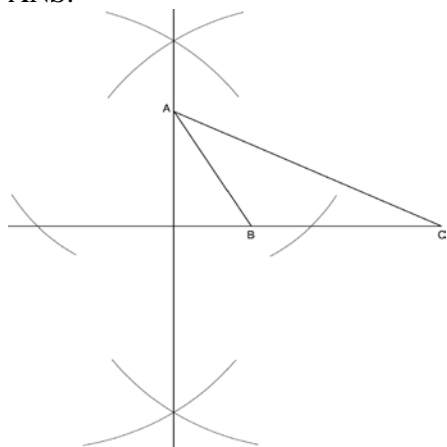
PTS: 2   REF: fall1409geo   NAT: G.CO.D.12   TOP: Constructions

KEY: parallel and perpendicular lines

24 ANS:

As the sum of the measures of the angles of a triangle is 180°, m$\angle ABC$ + m$\angle BCA$ + m$\angle CAB$ = 180°. Each interior angle of the triangle and its exterior angle form a linear pair. Linear pairs are supplementary, so m$\angle ABC$ + m$\angle FBC$ = 180°, m$\angle BCA$ + m$\angle DCA$ = 180°, and m$\angle CAB$ + m$\angle EAB$ = 180°. By addition, the sum of these linear pairs is 540°. When the angle measures of the triangle are subtracted from this sum, the result is 360°, the sum of the exterior angles of the triangle.

PTS: 4   REF: fall1410geo   NAT: G.CO.C.10   TOP: Triangle Proofs

25 ANS:

$M\left(\dfrac{4+0}{2},\dfrac{6-1}{2}\right)=M\left(2,\dfrac{5}{2}\right)$ $m=\dfrac{6--1}{4-0}=\dfrac{7}{4}$ $m_\perp=-\dfrac{4}{7}$ $y-2.5=-\dfrac{4}{7}(x-2)$ The diagonals, $\overline{MT}$ and $\overline{AH}$, of

rhombus *MATH* are perpendicular bisectors of each other.

PTS: 4 REF: fall1411geo NAT: G.GPE.B.4 TOP: Quadrilaterals in the Coordinate Plane
KEY: grids

26 ANS:
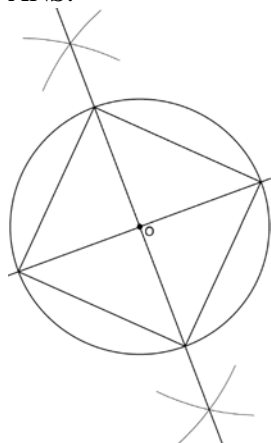
Since the square is inscribed, each vertex of the square is on the circle and the diagonals of the square are diameters of the circle. Therefore, each angle of the square is an inscribed angle in the circle that intercepts the circle at the endpoints of the diameters. Each angle of the square, which is an inscribed angle, measures 90 degrees. Therefore, the measure of the arc intercepted by two adjacent sides of the square is 180 degrees because it is twice the measure of its inscribed angle.

PTS: 4 REF: fall1412geo NAT: G.CO.D.13 TOP: Constructions

27 ANS:
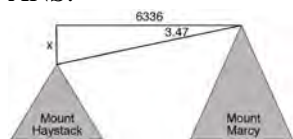
$\tan 3.47=\dfrac{M}{6336}$

$M\approx 384$

$4960+384=5344$
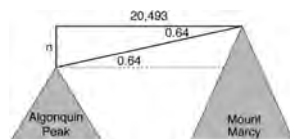
$\tan 0.64=\dfrac{A}{20,493}$

$A\approx 229$

$5344-229=5115$

PTS: 6 REF: fall1413geo NAT: G.SRT.C.8 TOP: Using Trigonometry to Find a Side
KEY: advanced

0615geo
Answer Section

1 ANS: 4   PTS: 2   REF: 061501geo   NAT: G.GMD.B.4
   TOP: Rotations of Two-Dimensional Objects
2 ANS: 4   PTS: 2   REF: 061502geo   NAT: G.CO.A.2
   TOP: Identifying Transformations   KEY: basic
3 ANS: 3

$$r = \sqrt{(7-3)^2 + (1--2)^2} = \sqrt{16+9} = 5$$

   PTS: 2   REF: 061503geo   NAT: G.GPE.B.4   TOP: Circles in the Coordinate Plane
4 ANS: 4   PTS: 2   REF: 061504geo   NAT: G.CO.A.5
   TOP: Compositions of Transformations   KEY: identify
5 ANS: 3

$$\tan 34 = \frac{T}{20}$$

$$T \approx 13.5$$

   PTS: 2   REF: 061505geo   NAT: G.SRT.C.8   TOP: Using Trigonometry to Find a Side
   KEY: graphics
6 ANS: 2   PTS: 2   REF: 061506geo   NAT: G.GMD.B.4
   TOP: Cross-Sections of Three-Dimensional Objects
7 ANS: 3
   $V = 12 \cdot 8.5 \cdot 4 = 408$

   $W = 408 \cdot 0.25 = 102$

   PTS: 2   REF: 061507geo   NAT: G.MG.A.2   TOP: Density
8 ANS: 1   PTS: 2   REF: 061508geo   NAT: G.C.A.2
   TOP: Chords, Secants and Tangents   KEY: inscribed
9 ANS: 1

$$m = \frac{-A}{B} = \frac{-2}{-1} = 2$$

$$m_\perp = -\frac{1}{2}$$

   PTS: 2   REF: 061509geo   NAT: G.GPE.B.5   TOP: Parallel and Perpendicular Lines
   KEY: identify perpendicular lines
10 ANS: 1

$$\frac{360°}{45°} = 8$$

   PTS: 2   REF: 061510geo   NAT: G.CO.A.3   TOP: Mapping a Polygon onto Itself

11 ANS: 3

$$\frac{9}{5} = \frac{9.2}{x} \quad 5.1 + 9.2 = 14.3$$

$9x = 46$

$x \approx 5.1$

PTS: 2   REF: 061511geo   NAT: G.SRT.B.5   TOP: Side Splitter Theorem
12 ANS: 4   PTS: 2   REF: 061512geo   NAT: G.SRT.C.7
TOP: Cofunctions
13 ANS: 4   PTS: 2   REF: 061513geo   NAT: G.CO.C.11
TOP: Parallelograms
14 ANS: 2

$x^2 + y^2 + 6y + 9 = 7 + 9$

$x^2 + (y + 3)^2 = 16$

PTS: 2   REF: 061514geo   NAT: G.GPE.A.1   TOP: Equations of Circles
KEY: completing the square
15 ANS: 3

$$\frac{AB}{BC} = \frac{DE}{EF}$$

$$\frac{9}{15} = \frac{6}{10}$$

$90 = 90$

PTS: 2   REF: 061515geo   NAT: G.SRT.B.5   TOP: Similarity
KEY: basic
16 ANS: 2   PTS: 2   REF: 061516geo   NAT: G.SRT.A.2
TOP: Dilations
17 ANS: 1
Alternate interior angles

PTS: 2   REF: 061517geo   NAT: G.CO.C.9   TOP: Lines and Angles
18 ANS: 1   PTS: 2   REF: 061518geo   NAT: G.SRT.A.1
TOP: Line Dilations
19 ANS: 2

$SA = 6 \cdot 12^2 = 864$

$$\frac{864}{450} = 1.92$$

PTS: 2   REF: 061519geo   NAT: G.MG.A.3   TOP: Surface Area
20 ANS: 1   PTS: 2   REF: 061520geo   NAT: G.C.A.2
TOP: Chords, Secants and Tangents   KEY: mixed

21 ANS: 4

$$\frac{7}{12} \cdot 30 = 17.5$$

PTS: 2   REF: 061521geo   NAT: G.SRT.B.5   TOP: Similarity
KEY: perimeter and area

22 ANS: 1

The line $3y = -2x + 8$ does not pass through the center of dilation, so the dilated line will be distinct from $3y = -2x + 8$. Since a dilation preserves parallelism, the line $3y = -2x + 8$ and its image $2x + 3y = 5$ are parallel, with slopes of $-\frac{2}{3}$.

PTS: 2   REF: 061522geo   NAT: G.SRT.A.1   TOP: Line Dilations

23 ANS: 2

x is $\frac{1}{2}$ the circumference. $\frac{C}{2} = \frac{10\pi}{2} \approx 16$

PTS: 2   REF: 061523geo   NAT: G.GMD.A.1   TOP: Circumference

24 ANS: 3   PTS: 2   REF: 061524geo   NAT: G.CO.B.7
TOP: Triangle Congruency

25 ANS:
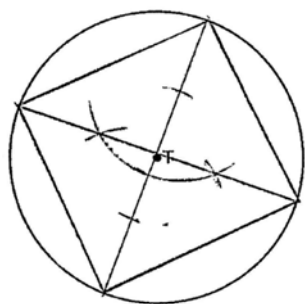
PTS: 2   REF: 061525geo   NAT: G.CO.D.13   TOP: Constructions

26 ANS:

Opposite angles in a parallelogram are congruent, so m$\angle O = 118°$. The interior angles of a triangle equal 180°. $180 - (118 + 22) = 40$.

PTS: 2   REF: 061526geo   NAT: G.CO.C.11   TOP: Interior and Exterior Angles of Polygons

27 ANS:
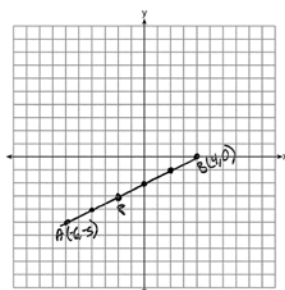
$-6 + \dfrac{2}{5}(4 - -6)$ $-5 + \dfrac{2}{5}(0 - -5)$ $(-2, -3)$

$-6 + \dfrac{2}{5}(10)$ $-5 + \dfrac{2}{5}(5)$

$-6 + 4$ $-5 + 2$

-2 -3

PTS: 2   REF: 061527geo   NAT: G.GPE.B.6   TOP: Directed Line Segments

28 ANS:

$\sin x = \dfrac{4.5}{11.75}$

$x \approx 23$

PTS: 2   REF: 061528geo   NAT: G.SRT.C.8   TOP: Using Trigonometry to Find an Angle

29 ANS:

$A = 6^2 \pi = 36\pi$ $36\pi \cdot \dfrac{x}{360} = 12\pi$

$x = 360 \cdot \dfrac{12}{36}$

$x = 120$

PTS: 2   REF: 061529geo   NAT: G.C.B.5   TOP: Sectors

30 ANS:

Reflections are rigid motions that preserve distance.

PTS: 2   REF: 061530geo   NAT: G.CO.B.7   TOP: Triangle Congruency

31 ANS:
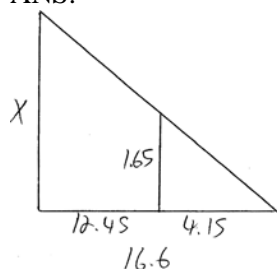
$$\frac{1.65}{4.15} = \frac{x}{16.6}$$

$$4.15x = 27.39$$

$$x = 6.6$$

PTS: 2   REF: 061531geo   NAT: G.SRT.B.5   TOP: Similarity
KEY: basic

32 ANS:

Since linear angles are supplementary, m$\angle GIH = 65°$. Since $\overline{GH} \cong \overline{IH}$, m$\angle GHI = 50°$ $(180 - (65 + 65))$. Since $\angle EGB \cong \angle GHI$, the corresponding angles formed by the transversal and lines are congruent and $\overline{AB} \parallel \overline{CD}$.

PTS: 4   REF: 061532geo   NAT: G.CO.C.9   TOP: Lines and Angles

33 ANS:

Quadrilateral *ABCD* is a parallelogram with diagonals $\overline{AC}$ and $\overline{BD}$ intersecting at *E* (Given). $\overline{AD} \cong \overline{BC}$ (Opposite sides of a parallelogram are congruent). $\angle AED \cong \angle CEB$ (Vertical angles are congruent). $\overline{BC} \parallel \overline{DA}$ (Definition of parallelogram). $\angle DBC \cong \angle BDA$ (Alternate interior angles are congruent). $\triangle AED \cong \triangle CEB$ (AAS). 180° rotation of $\triangle AED$ around point *E*.

PTS: 4   REF: 061533geo   NAT: G.SRT.B.5   TOP: Quadrilateral Proofs

34 ANS:

$x = \sqrt{.55^2 - .25^2} \cong 0.49$ No, $.49^2 = .25y$ $.9604 + .25 < 1.5$

$\qquad\qquad\qquad\qquad .9604 = y$

PTS: 4   REF: 061534geo   NAT: G.SRT.B.5   TOP: Similarity
KEY: leg

35 ANS:

$\tan 47 = \dfrac{x}{8.5}$ Cone: $V = \dfrac{1}{3} \pi(8.5)^2(9.115) \approx 689.6$ Cylinder: $V = \pi(8.5)^2(25) \approx 5674.5$ Hemisphere:

$\quad x \approx 9.115$

$V = \dfrac{1}{2}\left(\dfrac{4}{3} \pi(8.5)^3\right) \approx 1286.3$ $689.6 + 5674.5 + 1286.3 \approx 7650$ No, because $7650 \cdot 62.4 = 477,360$

$477,360 \cdot .85 = 405,756$, which is greater than 400,000.

PTS: 6   REF: 061535geo   NAT: G.MG.A.2   TOP: Density

36 ANS:

$m_{\overline{TS}} = \dfrac{-10}{6} = -\dfrac{5}{3}$ $m_{\overline{SR}} = \dfrac{3}{5}$ Since the slopes of $\overline{TS}$ and $\overline{SR}$ are opposite reciprocals, they are perpendicular and

form a right angle. $\triangle RST$ is a right triangle because $\angle S$ is a right angle. $P(0,9)$ $m_{\overline{RP}} = \dfrac{-10}{6} = -\dfrac{5}{3}$ $m_{\overline{PT}} = \dfrac{3}{5}$

Since the slopes of all four adjacent sides ($\overline{TS}$ and $\overline{SR}$, $\overline{SR}$ and $\overline{RP}$, $\overline{PT}$ and $\overline{TS}$, $\overline{RP}$ and $\overline{PT}$) are opposite reciprocals, they are perpendicular and form right angles. Quadrilateral $RSTP$ is a rectangle because it has four right angles.
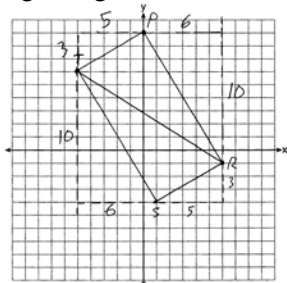
PTS: 6 REF: 061536geo NAT: G.GPE.B.4 TOP: Quadrilaterals in the Coordinate Plane
KEY: grids

0815geo
Answer Section

1 ANS: 2   PTS: 2   REF: 081501geo   NAT: G.CO.C.11
   TOP: Special Quadrilaterals
2 ANS: 3   PTS: 2   REF: 081502geo   NAT: G.CO.A.2
   TOP: Identifying Transformations   KEY: basic
3 ANS: 4   PTS: 2   REF: 081503geo   NAT: G.GMD.B.4
   TOP: Rotations of Two-Dimensional Objects
4 ANS: 1   PTS: 2   REF: 081504geo   NAT: G.SRT.C.7
   TOP: Cofunctions
5 ANS: 1   PTS: 2   REF: 081505geo   NAT: G.CO.A.3
   TOP: Mapping a Polygon onto Itself
6 ANS: 4   PTS: 2   REF: 081506geo   NAT: G.SRT.A.2
   TOP: Dilations
7 ANS: 1   PTS: 2   REF: 081507geo   NAT: G.CO.A.5
   TOP: Compositions of Transformations   KEY: identify
8 ANS: 3
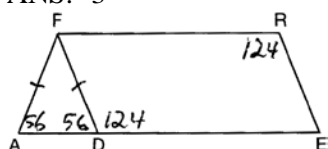
   PTS: 2   REF: 081508geo   NAT: G.CO.C.11   TOP: Interior and Exterior Angles of Polygons
9 ANS: 3
   $$x^2 + 4x + 4 + y^2 - 6y + 9 = 12 + 4 + 9$$
   $$(x + 2)^2 + (y - 3)^2 = 25$$

   PTS: 2   REF: 081509geo   NAT: G.GPE.A.1   TOP: Equations of Circles
   KEY: completing the square
10 ANS: 1
   $$m = -\frac{2}{3} \quad 1 = \left(-\frac{2}{3}\right)6 + b$$
   $$1 = -4 + b$$
   $$5 = b$$

   PTS: 2   REF: 081510geo   NAT: G.GPE.B.5   TOP: Parallel and Perpendicular Lines
   KEY: write equation of parallel line

1

11 ANS: 2

$$s^2 + s^2 = 7^2$$

$$2s^2 = 49$$

$$s^2 = 24.5$$

$$s \approx 4.9$$

PTS: 2   REF: 081511geo   NAT: G.SRT.C.8   TOP: Pythagorean Theorem

12 ANS: 3

$$5 \cdot \frac{10}{4} = \frac{50}{4} = 12.5$$

PTS: 2   REF: 081512geo   NAT: G.C.A.2   TOP: Chords, Secants and Tangents
KEY: common tangents

13 ANS: 2   PTS: 2   REF: 081513geo   NAT: G.CO.A.2
TOP: Identifying Transformations   KEY: graphics

14 ANS: 4   PTS: 2   REF: 081514geo   NAT: G.SRT.A.2
TOP: Compositions of Transformations KEY: grids

15 ANS: 3   PTS: 2   REF: 081515geo   NAT: G.C.A.3
TOP: Inscribed Quadrilaterals

16 ANS: 1

$$V = \frac{\frac{4}{3}\pi\left(\frac{10}{2}\right)^3}{2} \approx 261.8 \cdot 62.4 = 16,336$$

PTS: 2   REF: 081516geo   NAT: G.MG.A.2   TOP: Density

17 ANS: 4

$$\frac{2}{6} = \frac{5}{15}$$

PTS: 2   REF: 081517geo   NAT: G.SRT.B.5   TOP: Side Splitter Theorem

18 ANS: 3

$$\frac{60}{360} \cdot 6^2 \pi = 6\pi$$

PTS: 2   REF: 081518geo   NAT: G.C.B.5   TOP: Sectors

19 ANS: 2   PTS: 2   REF: 081519geo   NAT: G.SRT.B.5
TOP: Similarity   KEY: basic

20 ANS: 1

$$3^2 = 9$$

PTS: 2   REF: 081520geo   NAT: G.SRT.A.2   TOP: Dilations

21 ANS: 4

$$2592276 = \frac{1}{3} \cdot s^2 \cdot 146.5$$

$$230 \approx s$$

PTS: 2   REF: 081521geo   NAT: G.GMD.A.3   TOP: Volume
KEY: pyramids

22 ANS: 4

$$\frac{-2-1}{-1--3} = \frac{-3}{2} \quad \frac{3-2}{0-5} = \frac{1}{-5} \quad \frac{3-1}{0--3} = \frac{2}{3} \quad \frac{2--2}{5--1} = \frac{4}{6} = \frac{2}{3}$$

PTS: 2   REF: 081522geo   NAT: G.GPE.B.4   TOP: Quadrilaterals in the Coordinate Plane
KEY: general

23 ANS: 1

$$\frac{4}{6} = \frac{3}{4.5} = \frac{2}{3}$$

PTS: 2   REF: 081523geo   NAT: G.SRT.A.2   TOP: Dilations

24 ANS: 4
The line $y = 3x - 1$ passes through the center of dilation, so the dilated line is not distinct.

PTS: 2   REF: 081524geo   NAT: G.SRT.A.1   TOP: Line Dilations

25 ANS:

$$\frac{137.8}{6^3} \approx 0.638 \ \ Ash$$

PTS: 2   REF: 081525geo   NAT: G.MG.A.2   TOP: Density

26 ANS:
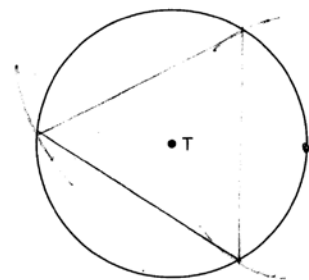
PTS: 2   REF: 081526geo   NAT: G.CO.D.13   TOP: Constructions

27 ANS:

$$\frac{120}{230} = \frac{x}{315}$$

$$x = 164$$

PTS: 2   REF: 081527geo   NAT: G.SRT.B.5   TOP: Similarity
KEY: basic

28 ANS:

Parallelogram *ABCD*, diagonals $\overline{AC}$ and $\overline{BD}$ intersect at *E* (given). $\overline{DC} \parallel \overline{AB}$; $\overline{DA} \parallel \overline{CB}$ (opposite sides of a parallelogram are parallel). $\angle ACD \cong \angle CAB$ (alternate interior angles formed by parallel lines and a transversal are congruent).

PTS: 2   REF: 081528geo   NAT: G.CO.C.11   TOP: Quadrilateral Proofs

29 ANS:

$\dfrac{6}{14} = \dfrac{9}{21}$ SAS

$126 = 126$

PTS: 2   REF: 081529geo   NAT: G.SRT.B.5   TOP: Similarity

KEY: basic

30 ANS:

The transformation is a rotation, which is a rigid motion.

PTS: 2   REF: 081530geo   NAT: G.CO.B.7   TOP: Triangle Congruency

31 ANS:

$\dfrac{2}{5} \cdot (16 - 1) = 6$ $\dfrac{2}{5} \cdot (14 - 4) = 4$ $(1 + 6, 4 + 4) = (7, 8)$

PTS: 2   REF: 081531geo   NAT: G.GPE.B.6   TOP: Directed Line Segments

32 ANS:

$\tan 7 = \dfrac{125}{x}$ $\tan 16 = \dfrac{125}{y}$ $1018 - 436 \approx 582$

$x \approx 1018$ $y \approx 436$

PTS: 4   REF: 081532geo   NAT: G.SRT.C.8   TOP: Using Trigonometry to Find a Side

KEY: advanced

33 ANS:

The slopes of perpendicular line are opposite reciprocals. Since the lines are perpendicular, they form right angles
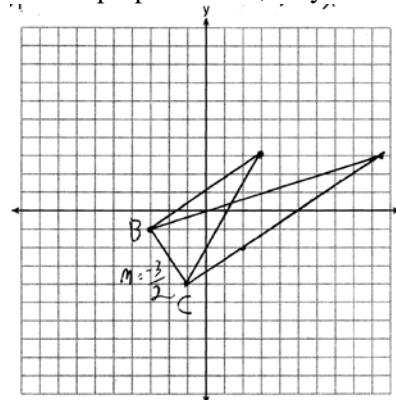
and a right triangle. $m_{\overline{BC}} = -\dfrac{3}{2}$ $-1 = \dfrac{2}{3}(-3) + b$ or $-4 = \dfrac{2}{3}(-1) + b$

$$m_\perp = \dfrac{2}{3}$$

$$-1 = -2 + b \qquad \dfrac{-12}{3} = \dfrac{-2}{3} + b$$

$$1 = b \qquad\qquad -\dfrac{10}{3} = b$$

$$3 = \dfrac{2}{3}x + 1$$

$$2 = \dfrac{2}{3}x \qquad\qquad 3 = \dfrac{2}{3}x - \dfrac{10}{3}$$

$$3 = x \qquad\qquad 9 = 2x - 10$$

$$19 = 2x$$

$$9.5 = x$$

PTS: 4   REF: 081533geo   NAT: G.GPE.B.4   TOP: Triangles in the Coordinate Plane

34 ANS:

Translations preserve distance. If point D is mapped onto point A, point F would map onto point C. $\triangle DEF \cong \triangle ABC$ as $\overline{AC} \cong \overline{DF}$ and points are collinear on line ℓ and a reflection preserves distance.

PTS: 4   REF: 081534geo   NAT: G.CO.B.7   TOP: Triangle Congruency

35 ANS:

Parallelogram $ABCD$, $\overline{BE} \perp \overline{CED}$, $\overline{DF} \perp \overline{BFC}$, $\overline{CE} \cong \overline{CF}$ (given). $\angle BEC \cong \angle DFC$ (perpendicular lines form right angles, which are congruent). $\angle FCD \cong \angle BCE$ (reflexive property). $\triangle BEC \cong \triangle DFC$ (ASA). $\overline{BC} \cong \overline{CD}$ (CPCTC). $ABCD$ is a rhombus (a parallelogram with consecutive congruent sides is a rhombus).

PTS: 6   REF: 081535geo   NAT: G.SRT.B.5   TOP: Quadrilateral Proofs

36 ANS:

$$V = \dfrac{1}{3}\pi\left(\dfrac{3}{2}\right)^2 \cdot 8 \approx 18.85 \cdot 100 = 1885 \quad 1885 \cdot 0.52 \cdot 0.10 = 98.02 \quad 1.95(100) - (37.83 + 98.02) = 59.15$$

PTS: 6   REF: 081536geo   NAT: G.MG.A.2   TOP: Density

5

0116geo
Answer Section

1 ANS: 1　　　　　　PTS: 2　　　　　　REF: 011601geo　　NAT: G.GMD.B.4
   TOP: Cross-Sections of Three-Dimensional Objects
2 ANS: 4

$$m = -\frac{1}{2} \quad -4 = 2(6) + b$$
$$m_{\perp} = 2 \quad -4 = 12 + b$$
$$-16 = b$$

   PTS: 2　　　　　　REF: 011602geo　　NAT: G.GPE.B.5　　TOP: Parallel and Perpendicular Lines
   KEY: write equation of perpendicular line
3 ANS: 3
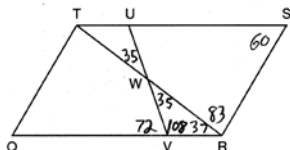
   PTS: 2　　　　　　REF: 011603geo　　NAT: G.CO.C.11　　TOP: Interior and Exterior Angles of Polygons
4 ANS: 2

$$14 \times 16 \times 10 = 2240 \quad \frac{2240 - 1680}{2240} = 0.25$$

   PTS: 2　　　　　　REF: 011604geo　　NAT: G.GMD.A.3　TOP: Volume
   KEY: prisms
5 ANS: 3　　　　　　PTS: 2　　　　　　REF: 011605geo　　NAT: G.CO.A.2
   TOP: Analytical Representations of Transformations　　　　　KEY: basic
6 ANS: 1　　　　　　PTS: 2　　　　　　REF: 011606geo　　NAT: G.CO.C.9
   TOP: Lines and Angles
7 ANS: 2

$$V = \frac{1}{3} \cdot 6^2 \cdot 12 = 144$$

   PTS: 2　　　　　　REF: 011607geo　　NAT: G.GMD.A.3　TOP: Volume
   KEY: pyramids
8 ANS: 1　　　　　　PTS: 2　　　　　　REF: 011608geo　　NAT: G.CO.A.5
   TOP: Compositions of Transformations　　KEY: identify
9 ANS: 4　　　　　　PTS: 2　　　　　　REF: 011609geo　　NAT: G.SRT.C.7
   TOP: Cofunctions
10 ANS: 2　　　　　　PTS: 2　　　　　　REF: 011610geo　　NAT: G.SRT.A.1
   TOP: Line Dilations
11 ANS: 4　　　　　　PTS: 2　　　　　　REF: 011611geo　　NAT: G.CO.B.6
   TOP: Properties of Transformations　　KEY: graphics

12 ANS: 3

$$\frac{x}{360} \cdot 3^2 \pi = 2\pi \quad 180 - 80 = 100$$

$$x = 80 \quad \frac{180 - 100}{2} = 40$$

PTS: 2 REF: 011612geo NAT: G.C.B.5 TOP: Sectors

13 ANS: 1

$$\frac{6}{8} = \frac{9}{12}$$

PTS: 2 REF: 011613geo NAT: G.SRT.B.5 TOP: Similarity
KEY: basic

14 ANS: 3

$$\frac{\frac{4}{3} \pi \left(\frac{9.5}{2}\right)^3}{\frac{4}{3} \pi \left(\frac{2.5}{2}\right)^3} \approx 55$$

PTS: 2 REF: 011614geo NAT: G.GMD.A.3 TOP: Volume
KEY: spheres

15 ANS: 2

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

PTS: 2 REF: 011615geo NAT: G.GPE.B.7 TOP: Polygons in the Coordinate Plane

16 ANS: 3

$$\cos A = \frac{9}{14}$$

$$A \approx 50°$$

PTS: 2 REF: 011616geo NAT: G.SRT.C.8 TOP: Using Trigonometry to Find an Angle

17 ANS: 4

$$x^2 + 6x + 9 + y^2 - 4y + 4 = 23 + 9 + 4$$

$$(x + 3)^2 + (y - 2)^2 = 36$$

PTS: 2 REF: 011617geo NAT: G.GPE.A.1 TOP: Equations of Circles
KEY: completing the square

18 ANS: 1

$$m_{\overline{RT}} = \frac{5 - -3}{4 - -2} = \frac{8}{6} = \frac{4}{3} \quad m_{\overline{ST}} = \frac{5 - 2}{4 - 8} = \frac{3}{-4} = -\frac{3}{4}$$ Slopes are opposite reciprocals, so lines form a right angle.

PTS: 2 REF: 011618geo NAT: G.GPE.B.4 TOP: Triangles in the Coordinate Plane

19 ANS: 2
$$\frac{4}{3}\pi \cdot 4^3 + 0.075 \approx 20$$

PTS: 2   REF: 011619geo   NAT: G.MG.A.2   TOP: Density

20 ANS: 4
$$\frac{1}{2} = \frac{x+3}{3x-1} \quad GR = 3(7) - 1 = 20$$
$$3x - 1 = 2x + 6$$
$$x = 7$$

PTS: 2   REF: 011620geo   NAT: G.SRT.B.5   TOP: Similarity
KEY: basic

21 ANS: 3   PTS: 2   REF: 011621geo   NAT: G.C.A.2
TOP: Chords, Secants and Tangents   KEY: inscribed

22 ANS: 2
$$\sqrt{3 \cdot 21} = \sqrt{63} = 3\sqrt{7}$$

PTS: 2   REF: 011622geo   NAT: G.SRT.B.5   TOP: Similarity
KEY: altitude

23 ANS: 1
$$\frac{1000}{20\pi} \approx 15.9$$

PTS: 2   REF: 011623geo   NAT: G.GMD.A.1   TOP: Circumference

24 ANS: 3
$$\frac{12}{4} = \frac{x}{5} \quad 15 - 4 = 11$$
$$x = 15$$

PTS: 2   REF: 011624geo   NAT: G.SRT.B.5   TOP: Similarity
KEY: basic

25 ANS:
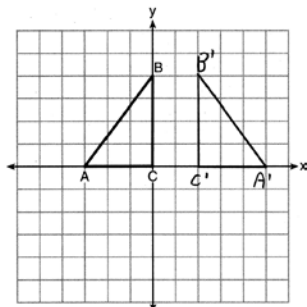
PTS: 2   REF: 011625geo   NAT: G.CO.A.5   TOP: Reflections
KEY: grids

26 ANS:
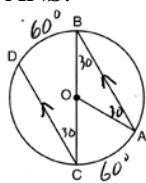
$180 - 2(30) = 120$

PTS: 2 REF: 011626geo NAT: G.C.A.2 TOP: Chords, Secants and Tangents
KEY: parallel lines

27 ANS:
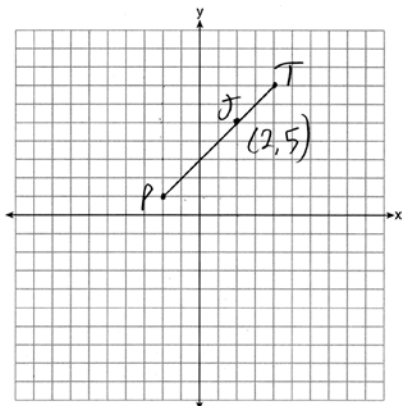
$x = \dfrac{2}{3}(4 - -2) = 4 \quad -2 + 4 = 2 \quad J(2,5)$

$y = \dfrac{2}{3}(7 - 1) = 4 \quad 1 + 4 = 5$

PTS: 2 REF: 011627geo NAT: G.GPE.B.6 TOP: Directed Line Segments

28 ANS:

Yes. The sequence of transformations consists of a reflection and a translation, which are isometries which preserve distance and congruency.

PTS: 2 REF: 011628geo NAT: G.CO.B.7 TOP: Triangle Congruency

29 ANS:

$\sin 70 = \dfrac{30}{L}$

$L \approx 32$

PTS: 2 REF: 011629geo NAT: G.SRT.C.8 TOP: Using Trigonometry to Find a Side
KEY: graphics

30 ANS:

$\dfrac{40000}{\pi\left(\dfrac{51}{2}\right)^2} \approx 19.6 \quad \dfrac{72000}{\pi\left(\dfrac{75}{2}\right)^2} \approx 16.3 \quad \text{Dish } A$

PTS: 2 REF: 011630geo NAT: G.MG.A.2 TOP: Density

31 ANS:

$\ell: y = 3x - 4$

$m: y = 3x - 8$

PTS: 2   REF: 011631geo   NAT: G.SRT.A.1   TOP: Line Dilations

32 ANS:

$\dfrac{16}{9} = \dfrac{x}{20.6}$ $D = \sqrt{36.6^2 + 20.6^2} \approx 42$

$x \approx 36.6$

PTS: 4   REF: 011632geo   NAT: G.SRT.C.8   TOP: Pythagorean Theorem
KEY: without graphics

33 ANS:

(2) Euclid's Parallel Postulate; (3) Alternate interior angles formed by parallel lines and a transversal are congruent; (4) Angles forming a line are supplementary; (5) Substitution

PTS: 4   REF: 011633geo   NAT: G.CO.C.10   TOP: Triangle Proofs

34 ANS:

$SAS \cong SAS$
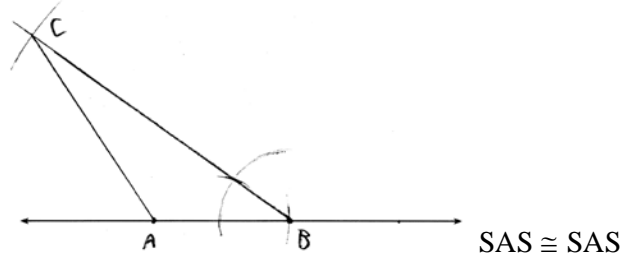
PTS: 4   REF: 011634geo   NAT: G.CO.D.12   TOP: Constructions
KEY: congruent and similar figures

35 ANS:

Parallelogram *ANDR* with $\overline{AW}$ and $\overline{DE}$ bisecting $\overline{NWD}$ and $\overline{REA}$ at points *W* and *E* (Given). $\overline{AN} \cong \overline{RD}$, $\overline{AR} \cong \overline{DN}$ (Opposite sides of a parallelogram are congruent). $AE = \dfrac{1}{2}AR$, $WD = \dfrac{1}{2}DN$, so $\overline{AE} \cong \overline{WD}$ (Definition of bisect and division property of equality). $\overline{AR} \parallel \overline{DN}$ (Opposite sides of a parallelogram are parallel). *AWDE* is a parallelogram (Definition of parallelogram). $RE = \dfrac{1}{2}AR$, $NW = \dfrac{1}{2}DN$, so $\overline{RE} \cong \overline{NW}$ (Definition of bisect and division property of equality). $\overline{ED} \cong \overline{AW}$ (Opposite sides of a parallelogram are congruent). $\triangle ANW \cong \triangle DRE$ (SSS).

PTS: 6   REF: 011635geo   NAT: G.SRT.B.5   TOP: Quadrilateral Proofs

36 ANS:

$\tan 52.8 = \dfrac{h}{x}$

$h = x\tan 52.8$

$\tan 34.9 = \dfrac{h}{x+8}$

$h = (x+8)\tan 34.9$

$x\tan 52.8 = x\tan 34.9 + 8\tan 34.9$

$x\tan 52.8 - x\tan 34.9 = 8\tan 34.9$

$x(\tan 52.8 - \tan 34.9) = 8\tan 34.9$

$x = \dfrac{8\tan 34.9}{\tan 52.8 - \tan 34.9}$

$x \approx 9$

$\tan 52.8 \approx \dfrac{h}{9}$

$x \approx 11.86$

$11.86 + 1.7 \approx 13.6$

PTS: 6   REF: 011636geo   NAT: G.SRT.C.8   TOP: Using Trigonometry to Find a Side
KEY: advanced

0616geo
Answer Section

1 ANS: 3   PTS: 2   REF: 061601geo   NAT: G.GMD.B.4
   TOP: Rotations of Two-Dimensional Objects

2 ANS: 4
   $3 \times 6 = 18$

   PTS: 2   REF: 061602geo   NAT: G.SRT.A.1   TOP: Line Dilations

3 ANS: 2   PTS: 2   REF: 061603geo   NAT: G.GPE.A.1
   TOP: Equations of Circles   KEY: find center and radius | completing the square

4 ANS: 1   PTS: 2   REF: 061604geo   NAT: G.CO.A.2
   TOP: Identifying Transformations   KEY: graphics

5 ANS: 3
   1) $\dfrac{12}{9} = \dfrac{4}{3}$ 2) AA 3) $\dfrac{32}{16} \neq \dfrac{8}{2}$ 4) SAS

   PTS: 2   REF: 061605geo   NAT: G.SRT.B.5   TOP: Similarity
   KEY: basic

6 ANS: 4   PTS: 2   REF: 061606geo   NAT: G.GMD.A.3
   TOP: Volume   KEY: compositions

7 ANS: 3
   1) only proves AA; 2) need congruent legs for HL; 3) SAS; 4) only proves product of altitude and base is equal

   PTS: 2   REF: 061607geo   NAT: G.SRT.B.5   TOP: Triangle Proofs
   KEY: statements

8 ANS: 4   PTS: 2   REF: 061608geo   NAT: G.SRT.A.2
   TOP: Compositions of Transformations   KEY: grids

9 ANS: 1
   1) opposite sides; 2) adjacent sides; 3) perpendicular diagonals; 4) diagonal bisects angle

   PTS: 2   REF: 061609geo   NAT: G.CO.C.11   TOP: Special Quadrilaterals

10 ANS: 2   PTS: 2   REF: 061610geo   NAT: G.C.A.2
   TOP: Chords, Secants and Tangents   KEY: inscribed

11 ANS: 4
   $\sin 70 = \dfrac{x}{20}$

   $x \approx 18.8$

   PTS: 2   REF: 061611geo   NAT: G.SRT.C.8   TOP: Using Trigonometry to Find a Side
   KEY: without graphics

12 ANS: 1
   $m = \left(\dfrac{-11+5}{2}, \dfrac{5+-7}{2} \right) = (-3,-1)$ $m = \dfrac{5--7}{-11-5} = \dfrac{12}{-16} = -\dfrac{3}{4}$ $m_\perp = \dfrac{4}{3}$

   PTS: 2   REF: 061612geo   NAT: G.GPE.B.5   TOP: Parallel and Perpendicular Lines
   KEY: perpendicular bisector

13 ANS: 2

$$h^2 = 30 \cdot 12$$

$$h^2 = 360$$

$$h = 6\sqrt{10}$$

PTS: 2 REF: 061613geo NAT: G.SRT.B.5 TOP: Similarity
KEY: altitude

14 ANS: 4

The slope of $\overline{BC}$ is $\dfrac{2}{5}$. Altitude is perpendicular, so its slope is $-\dfrac{5}{2}$.

PTS: 2 REF: 061614geo NAT: G.GPE.B.5 TOP: Parallel and Perpendicular Lines
KEY: find slope of perpendicular line

15 ANS: 4 PTS: 2 REF: 061615geo NAT: G.SRT.C.6
TOP: Trigonometric Ratios

16 ANS: 3 PTS: 2 REF: 061616geo NAT: G.CO.A.2
TOP: Identifying Transformations KEY: graphics

17 ANS: 1

$$\frac{f}{4} = \frac{15}{6}$$

$$f = 10$$

PTS: 2 REF: 061617geo NAT: G.CO.C.9 TOP: Lines and Angles

18 ANS: 2

$$\frac{11}{1.2\,\text{oz}}\left(\frac{16\,\text{oz}}{1\,\text{lb}}\right) = \frac{13.\overline{3}1}{\text{lb}} \quad \frac{13.\overline{3}1}{\text{lb}}\left(\frac{1\,\text{g}}{3.7851}\right) \approx \frac{3.5\,\text{g}}{1\,\text{lb}}$$

PTS: 2 REF: 061618geo NAT: G.MG.A.2 TOP: Density

19 ANS: 2
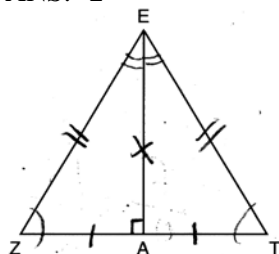
PTS: 2 REF: 061619geo NAT: G.CO.C.10 TOP: Triangle Proofs

20 ANS: 1

$$\frac{1}{2}\left(\frac{4}{3}\right)\pi \cdot 5^3 \cdot 62.4 \approx 16,336$$

PTS: 2 REF: 061620geo NAT: G.MG.A.2 TOP: Density

21 ANS: 2

$$\frac{12}{4} = \frac{36}{x}$$

$$12x = 144$$

$$x = 12$$

PTS: 2 REF: 061621geo NAT: G.SRT.B.5 TOP: Side Splitter Theorem

22 ANS: 3
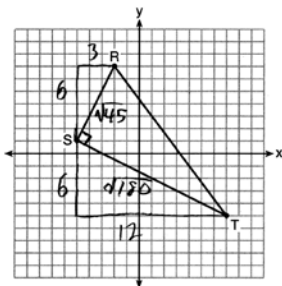
$$\sqrt{45} = 3\sqrt{5} \quad a = \frac{1}{2}\left(3\sqrt{5}\right)\left(6\sqrt{5}\right) = \frac{1}{2}(18)(5) = 45$$

$$\sqrt{180} = 6\sqrt{5}$$

PTS: 2 REF: 061622geo NAT: G.GPE.B.7 TOP: Polygons in the Coordinate Plane

23 ANS: 1
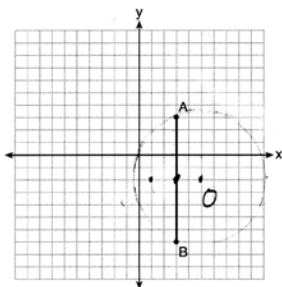
Since the midpoint of $\overline{AB}$ is $(3,-2)$, the center must be either $(5,-2)$ or $(1,-2)$.

$$r = \sqrt{2^2 + 5^2} = \sqrt{29}$$

PTS: 2 REF: 061623geo NAT: G.GPE.A.1 TOP: Equations of Circles
KEY: other

24 ANS: 3

$$\frac{60}{360} \cdot 8^2 \pi = \frac{1}{6} \cdot 64\pi = \frac{32\pi}{3}$$

PTS: 2 REF: 061624geo NAT: G.C.B.5 TOP: Sectors

25 ANS:

$$T_{6,0} \circ r_{x\text{-axis}}$$

PTS: 2 REF: 061625geo NAT: G.CO.A.5 TOP: Compositions of Transformations
KEY: identify

3

26 ANS:

$4 + \dfrac{4}{9}(22 - 4)$ $2 + \dfrac{4}{9}(2 - 2)$ $(12, 2)$

$\quad 4 + \dfrac{4}{9}(18) \qquad 2 + \dfrac{4}{9}(0)$

$\qquad 4 + 8 \qquad\quad 2 + 0$

$\qquad\quad 12 \qquad\qquad 2$

PTS: 2   REF: 061626geo   NAT: G.GPE.B.6   TOP: Directed Line Segments

27 ANS:

$\dfrac{3.75}{5} = \dfrac{4.5}{6} \qquad \overline{AB}$ is parallel to $\overline{CD}$ because $\overline{AB}$ divides the sides proportionately.

$39.375 = 39.375$

PTS: 2   REF: 061627geo   NAT: G.SRT.B.5   TOP: Side Splitter Theorem

28 ANS:

$73 + R = 90$ Equal cofunctions are complementary.

$\qquad R = 17$

PTS: 2   REF: 061628geo   NAT: G.SRT.C.7   TOP: Cofunctions

29 ANS:

$s = \theta \cdot r \qquad s = \theta \cdot r \qquad$ Yes, both angles are equal.

$\pi = A \cdot 4 \quad \dfrac{13\pi}{8} = B \cdot 6.5$

$\dfrac{\pi}{4} = A$

$\qquad\qquad \dfrac{\pi}{4} = B$

PTS: 2   REF: 061629geo   NAT: G.C.B.5   TOP: Arc Length
KEY: arc length

30 ANS:

$\tan x = \dfrac{10}{4}$

$\quad x \approx 68$

PTS: 2   REF: 061630geo   NAT: G.SRT.C.8   TOP: Using Trigonometry to Find an Angle

31 ANS:
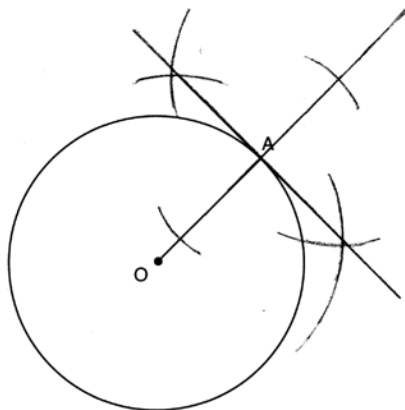
PTS: 2   REF: 061631geo   NAT: G.CO.D.12   TOP: Constructions
KEY: parallel and perpendicular lines

32 ANS:

$$\frac{\pi \cdot 11.25^2 \cdot 33.5}{231} \approx 57.7$$

PTS: 4   REF: 061632geo   NAT: G.GMD.A.3   TOP: Volume
KEY: cylinders

33 ANS:

Parallelogram *ABCD*, $\overline{EFG}$, and diagonal $\overline{DFB}$ (given); $\angle DFE \cong \angle BFG$ (vertical angles); $\overline{AD} \parallel \overline{CB}$ (opposite sides of a parallelogram are parallel); $\angle EDF \cong \angle GBF$ (alternate interior angles are congruent); $\triangle DEF \sim \triangle BGF$ (AA).

PTS: 4   REF: 061633geo   NAT: G.SRT.A.3   TOP: Similarity Proofs

34 ANS:

A dilation of $\frac{5}{2}$ about the origin. Dilations preserve angle measure, so the triangles are similar by AA.

PTS: 4   REF: 061634geo   NAT: G.SRT.A.3   TOP: Similarity Proofs

35 ANS:

Quadrilateral *ABCD* with diagonals $\overline{AC}$ and $\overline{BD}$ that bisect each other, and $\angle 1 \cong \angle 2$ (given); quadrilateral *ABCD* is a parallelogram (the diagonals of a parallelogram bisect each other); $\overline{AB} \parallel \overline{CD}$ (opposite sides of a parallelogram are parallel); $\angle 1 \cong \angle 3$ and $\angle 2 \cong \angle 4$ (alternate interior angles are congruent); $\angle 2 \cong \angle 3$ and $\angle 3 \cong \angle 4$ (substitution); $\triangle ACD$ is an isosceles triangle (the base angles of an isosceles triangle are congruent); $\overline{AD} \cong \overline{DC}$ (the sides of an isosceles triangle are congruent); quadrilateral *ABCD* is a rhombus (a rhombus has consecutive congruent sides); $\overline{AE} \perp \overline{BE}$ (the diagonals of a rhombus are perpendicular); $\angle BEA$ is a right angle (perpendicular lines form a right angle); $\triangle AEB$ is a right triangle (a right triangle has a right angle).

PTS: 6   REF: 061635geo   NAT: G.CO.C.11   TOP: Quadrilateral Proofs

36 ANS:

Similar triangles are required to model and solve a proportion. $\dfrac{x+5}{1.5} = \dfrac{x}{1}$ $\dfrac{1}{3}\pi(1.5)^2(15) - \dfrac{1}{3}\pi(1)^2(10) \approx 24.9$

$$x + 5 = 1.5x$$
$$5 = .5x$$
$$10 = x$$
$$10 + 5 = 15$$

PTS: 6   REF: 061636geo   NAT: G.GMD.A.3   TOP: Volume
KEY: cones

0816geo
Answer Section

1 ANS: 2   PTS: 2   REF: 081601geo   NAT: G.CO.C.9
   TOP: Lines and Angles
2 ANS: 2   PTS: 2   REF: 081602geo   NAT: G.CO.A.2
   TOP: Identifying Transformations   KEY: basic
3 ANS: 1   PTS: 2   REF: 081603geo   NAT: G.GMD.B.4
   TOP: Rotations of Two-Dimensional Objects
4 ANS: 2
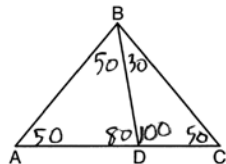
   PTS: 2   REF: 081604geo   NAT: G.CO.C.10   TOP: Interior and Exterior Angles of Triangles
5 ANS: 1   PTS: 2   REF: 081605geo   NAT: G.CO.A.5
   TOP: Rotations   KEY: grids
6 ANS: 1   PTS: 2   REF: 081606geo   NAT: G.SRT.C.7
   TOP: Cofunctions
7 ANS: 3
   (3) Could be a trapezoid.

   PTS: 2   REF: 081607geo   NAT: G.CO.C.11   TOP: Parallelograms
8 ANS: 3
   $\sqrt{20^2 - 10^2} \approx 17.3$

   PTS: 2   REF: 081608geo   NAT: G.SRT.C.8   TOP: Pythagorean Theorem
   KEY: without graphics
9 ANS: 4   PTS: 2   REF: 081609geo   NAT: G.SRT.A.2
   TOP: Compositions of Transformations   KEY: grids
10 ANS: 2
   $x^2 = 4 \cdot 10$

   $x = \sqrt{40}$

   $x = 2\sqrt{10}$

   PTS: 2   REF: 081610geo   NAT: G.SRT.B.5   TOP: Similarity
   KEY: leg
11 ANS: 4   PTS: 2   REF: 081611geo   NAT: G.CO.C.9
   TOP: Lines and Angles

12 ANS: 3

$$\frac{x}{10} = \frac{6}{4} \quad \overline{CD} = 15 - 4 = 11$$

$$x = 15$$

PTS: 2   REF: 081612geo   NAT: G.SRT.B.5   TOP: Similarity
KEY: basic

13 ANS: 3   PTS: 2   REF: 081613geo   NAT: G.GMD.B.4
TOP: Cross-Sections of Three-Dimensional Objects

14 ANS: 1

$$m_{\overline{TA}} = -1 \quad y = mx + b$$

$$m_{\overline{EM}} = 1 \quad 1 = 1(2) + b$$

$$-1 = b$$

PTS: 2   REF: 081614geo   NAT: G.GPE.B.4   TOP: Quadrilaterals in the Coordinate Plane
KEY: general

15 ANS: 3

$$A = \frac{1}{2}ab \quad 3 - 6 = -3 = x$$

$$24 = \frac{1}{2}a(8) \quad \frac{4 + 12}{2} = 8 = y$$

$$a = 6$$

PTS: 2   REF: 081615geo   NAT: G.GPE.B.7   TOP: Polygons in the Coordinate Plane

16 ANS: 1

$$x^2 - 4x + 4 + y^2 + 8y + 16 = -11 + 4 + 16$$

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

PTS: 2   REF: 081616geo   NAT: G.GPE.A.1   TOP: Equations of Circles
KEY: completing the square

17 ANS: 2

$$C = \pi d \quad V = \pi\left(\frac{2.25}{\pi}\right)^2 \cdot 8 \approx 12.8916 \quad W = 12.8916 \cdot 752 \approx 9694$$

$$4.5 = \pi d$$

$$\frac{4.5}{\pi} = d$$

$$\frac{2.25}{\pi} = r$$

PTS: 2   REF: 081617geo   NAT: G.MG.A.2   TOP: Density

18 ANS: 4

$$x = -6 + \frac{1}{6}(6 - -6) = -6 + 2 = -4 \quad y = -2 + \frac{1}{6}(7 - -2) = -2 + \frac{9}{6} = -\frac{1}{2}$$

    PTS: 2   REF: 081618geo   NAT: G.GPE.B.6   TOP: Directed Line Segments

19 ANS: 2   PTS: 2   REF: 081619geo   NAT: G.C.B.5

    TOP: Sectors

20 ANS: 4

$$V = \pi \left(\frac{6.7}{2} \right)^2 (4 \cdot 6.7) \approx 945$$

    PTS: 2   REF: 081620geo   NAT: G.GMD.A.3   TOP: Volume

    KEY: cylinders

21 ANS: 4

$$\sqrt{(32 - 8)^2 + (28 - -4)^2} = \sqrt{576 + 1024} = \sqrt{1600} = 40$$

    PTS: 2   REF: 081621geo   NAT: G.SRT.A.1   TOP: Line Dilations

22 ANS: 3   PTS: 2   REF: 081622geo   NAT: G.SRT.B.5

    TOP: Triangle Proofs   KEY: statements

23 ANS: 1

The other statements are true only if $\overline{AD} \perp \overline{BC}$.

    PTS: 2   REF: 081623geo   NAT: G.C.A.2   TOP: Chords, Secants and Tangents

    KEY: inscribed

24 ANS: 1

$180 - (68 \cdot 2)$

    PTS: 2   REF: 081624geo   NAT: G.CO.C.11   TOP: Interior and Exterior Angles of Polygons

25 ANS:

$$\frac{3}{8} \cdot 56 = 21$$

    PTS: 2   REF: 081625geo   NAT: G.C.A.2   TOP: Chords, Secants and Tangents

    KEY: common tangents

26 ANS:
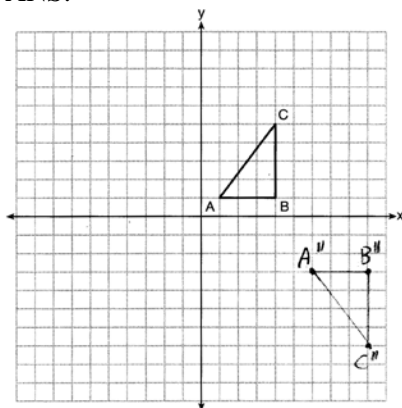
PTS: 2   REF: 081626geo   NAT: G.CO.A.5   TOP: Compositions of Transformations
KEY: grids

27 ANS:
$$\frac{360}{6} = 60$$

PTS: 2   REF: 081627geo   NAT: G.CO.A.3   TOP: Mapping a Polygon onto Itself

28 ANS:
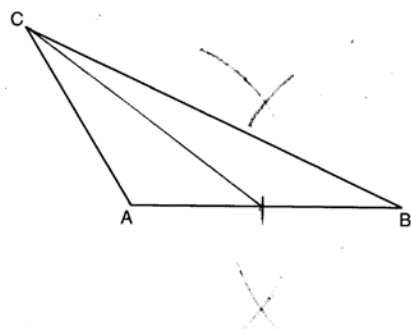
PTS: 2   REF: 081628geo   NAT: G.CO.D.12   TOP: Constructions
KEY: line bisector

29 ANS:
$M = 180 - (47 + 57) = 76$ Rotations do not change angle measurements.

PTS: 2   REF: 081629geo   NAT: G.CO.B.6   TOP: Properties of Transformations

30 ANS:
Yes. $(x - 1)^2 + (y + 2)^2 = 4^2$

$$(3.4 - 1)^2 + (1.2 + 2)^2 = 16$$

$$5.76 + 10.24 = 16$$

$$16 = 16$$

PTS: 2   REF: 081630geo   NAT: G.GPE.B.4   TOP: Circles in the Coordinate Plane

31 ANS:

$\sin 75 = \dfrac{15}{x}$

$x = \dfrac{15}{\sin 75}$

$x \approx 15.5$

PTS: 2　　　　REF: 081631geo　　NAT: G.SRT.C.8　　TOP: Using Trigonometry to Find a Side
KEY: graphics

32 ANS:
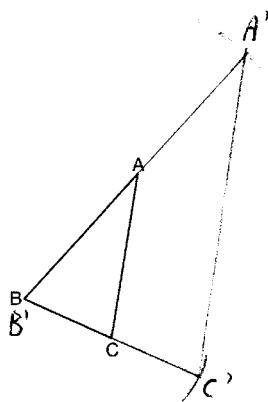
The length of $\overline{A'C'}$ is twice $\overline{AC}$.

PTS: 4　　　　REF: 081632geo　　NAT: G.CO.D.12　　TOP: Constructions
KEY: congruent and similar figures

33 ANS:

$ABC -$ point of reflection $\rightarrow (-y, x) +$ point of reflection　$\triangle DEF \cong \triangle A'B'C'$ because $\triangle DEF$ is a reflection of

$A(2, -3) - (2, -3) = (0, 0) \rightarrow (0, 0) + (2, -3) = A'(2, -3)$

$B(6, -8) - (2, -3) = (4, -5) \rightarrow (5, 4) + (2, -3) = B'(7, 1)$

$C(2, -9) - (2, -3) = (0, -6) \rightarrow (6, 0) + (2, -3) = C'(8, -3)$

$\triangle A'B'C'$ and reflections preserve distance.

PTS: 4　　　　REF: 081633geo　　NAT: G.CO.A.5　　TOP: Rotations
KEY: grids

34 ANS:

$\tan x = \dfrac{12}{75}$　　$\tan y = \dfrac{72}{75}$　　$43.83 - 9.09 \approx 34.7$

$x \approx 9.09$　　$y \approx 43.83$

PTS: 4　　　　REF: 081634geo　　NAT: G.SRT.C.8　　TOP: Using Trigonometry to Find an Angle

35 ANS:

Circle O, chords $\overline{AB}$ and $\overline{CD}$ intersect at E (Given); Chords $\overline{CB}$ and $\overline{AD}$ are drawn (auxiliary lines drawn); $\angle CEB \cong \angle AED$ (vertical angles); $\angle C \cong \angle A$ (Inscribed angles that intercept the same arc are congruent); $\triangle BCE \sim \triangle DAE$ (AA); $\dfrac{AE}{CE} = \dfrac{ED}{EB}$ (Corresponding sides of similar triangles are proportional); $AE \cdot EB = CE \cdot ED$ (The product of the means equals the product of the extremes).

PTS: 6   REF: 081635geo   NAT: G.SRT.B.5   TOP: Circle Proofs

36 ANS:

$V = \dfrac{1}{3}\pi\left(\dfrac{8.3}{2}\right)^2 (10.2) + \dfrac{1}{2} \cdot \dfrac{4}{3}\pi\left(\dfrac{8.3}{2}\right)^3 \approx 183.961 + 149.693 \approx 333.65 \text{ cm}^3$ $333.65 \times 50 = 16682.7 \text{ cm}^3$

$16682.7 \times 0.697 = 11627.8 \text{ g}$ $11.6278 \times 3.83 = \$44.53$

PTS: 6   REF: 081636geo   NAT: G.MG.A.2   TOP: Density

0117geo
Answer Section

1 ANS: 3
$y = mx + b$

$2 = \dfrac{1}{2}(-2) + b$

$3 = b$

PTS: 2   REF: 011701geo   NAT: G.GPE.B.5   TOP: Parallel and Perpendicular Lines
KEY: write equation of parallel line

2 ANS: 2   PTS: 2   REF: 011702geo   NAT: G.SRT.A.2
TOP: Compositions of Transformations   KEY: basic

3 ANS: 1   PTS: 2   REF: 011703geo   NAT: G.SRT.B.5
TOP: Triangle Congruency

4 ANS: 4   PTS: 2   REF: 011704geo   NAT: G.CO.C.10
TOP: Midsegments

5 ANS: 4   PTS: 2   REF: 011705geo   NAT: G.CO.C.11
TOP: Special Quadrilaterals

6 ANS: 4   PTS: 2   REF: 011706geo   NAT: G.CO.A.2
TOP: Identifying Transformations   KEY: basic

7 ANS: 2
$\tan \theta = \dfrac{2.4}{x}$

$\dfrac{3}{7} = \dfrac{2.4}{x}$

$x = 5.6$

PTS: 2   REF: 011707geo   NAT: G.SRT.C.8   TOP: Using Trigonometry to Find a Side

8 ANS: 1
$\dfrac{64}{4} = 16$ $16^2 = 256$ $2w + 2(w + 2) = 64$ $15 \times 17 = 255$ $2w + 2(w + 4) = 64$ $14 \times 18 = 252$ $2w + 2(w + 6) = 64$

$w = 15$ $w = 14$ $w = 13$

$13 \times 19 = 247$

PTS: 2   REF: 011708geo   NAT: G.MG.A.3   TOP: Area of Polygons

9 ANS: 2
$6 + 6\sqrt{3} + 6 + 6\sqrt{3} \approx 32.8$

PTS: 2   REF: 011709geo   NAT: G.SRT.C.8   TOP: 30-60-90 Triangles

10 ANS: 3   PTS: 2   REF: 011710geo   NAT: G.CO.A.5
TOP: Compositions of Transformations   KEY: identify

11   ANS: 2
$4 \times 4 \times 6 - \pi(1)^2(6) \approx 77$

PTS: 2   REF: 011711geo   NAT: G.GMD.A.3   TOP: Volume
KEY: compositions

12   ANS: 3
$\cos 40 = \dfrac{14}{x}$

$x \approx 18$

PTS: 2   REF: 011712geo   NAT: G.SRT.C.8   TOP: Using Trigonometry to Find a Side

13   ANS: 1
$B: (4-3, 3-4) \rightarrow (1,-1) \rightarrow (2,-2) \rightarrow (2+3, -2+4)$

$C: (2-3, 1-4) \rightarrow (-1,-3) \rightarrow (-2,-6) \rightarrow (-2+3, -6+4)$

PTS: 2   REF: 011713geo   NAT: G.SRT.A.1   TOP: Line Dilations

14   ANS: 3   PTS: 2   REF: 011714geo   NAT: G.SRT.C.6
TOP: Trigonometric Ratios

15   ANS: 2
$8(x+8) = 6(x+18)$

$8x + 64 = 6x + 108$

$2x = 44$

$x = 22$

PTS: 2   REF: 011715geo   NAT: G.C.A.2   TOP: Chords, Secants and Tangents
KEY: secants drawn from common point, length

16   ANS: 1   PTS: 2   REF: 011716geo   NAT: G.CO.C.11
TOP: Special Quadrilaterals

17   ANS: 4
$\dfrac{360°}{10} = 36°$ 252° is a multiple of 36º

PTS: 2   REF: 011717geo   NAT: G.CO.A.3   TOP: Mapping a Polygon onto Itself

18   ANS: 1
$x^2 + y^2 - 6y + 9 = -1 + 9$

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

PTS: 2   REF: 011718geo   NAT: G.GPE.A.1   TOP: Equations of Circles
KEY: completing the square

19   ANS: 3
$\dfrac{7-1}{0-2} = \dfrac{6}{-2} = -3$ The diagonals of a rhombus are perpendicular.

PTS: 2   REF: 011719geo   NAT: G.GPE.B.4   TOP: Quadrilaterals in the Coordinate Plane

20 ANS: 1

$3 + \dfrac{2}{5}(8-3) = 3 + \dfrac{2}{5}(5) = 3 + 2 = 5 \quad 5 + \dfrac{2}{5}(-5-5) = 5 + \dfrac{2}{5}(-10) = 5 - 4 = 1$

PTS: 2   REF: 011720geo   NAT: G.GPE.B.6   TOP: Directed Line Segments

21 ANS: 4

$\dfrac{300}{360} \cdot 8^2 \pi = \dfrac{160\pi}{3}$

PTS: 2   REF: 011721geo   NAT: G.C.B.5   TOP: Sectors

22 ANS: 3

$\sqrt{(-5)^2 + 12^2} = \sqrt{169} \quad \sqrt{11^2 + (2\sqrt{12})^2} = \sqrt{121 + 48} = \sqrt{169}$

PTS: 2   REF: 011722geo   NAT: G.GPE.B.4   TOP: Circles in the Coordinate Plane

23 ANS: 4   PTS: 2   REF: 011723geo   NAT: G.GMD.B.4

TOP: Cross-Sections of Three-Dimensional Objects

24 ANS: 1

$V = \dfrac{1}{3}\pi\left(\dfrac{1.5}{2}\right)^2\left(\dfrac{4}{2}\right) \approx 1.2$

PTS: 2   REF: 011724geo   NAT: G.GMD.A.3   TOP: Volume

KEY: cones

25 ANS:
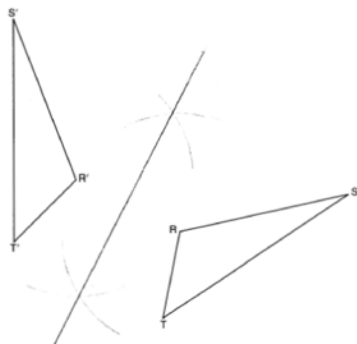
PTS: 2   REF: 011725geo   NAT: G.CO.D.12   TOP: Constructions

KEY: line bisector

26 ANS:

$T_{0,-2} \circ r_{y\text{-axis}}$

PTS: 2   REF: 011726geo   NAT: G.CO.A.5   TOP: Compositions of Transformations

KEY: identify

27 ANS:

Yes, because 28° and 62° angles are complementary. The sine of an angle equals the cosine of its complement.

PTS: 2   REF: 011727geo   NAT: G.SRT.C.7   TOP: Cofunctions

28 ANS:
$$\frac{152-56}{2}=48$$

PTS: 2   REF: 011728geo   NAT: G.C.A.2   TOP: Chords, Secants and Tangents
KEY: secant and tangent drawn from common point, angle

29 ANS:
$\overline{GI}$ is parallel to $\overline{NT}$, and $\overline{IN}$ intersects at *A* (given); $\angle I \cong \angle N$, $\angle G \cong \angle T$ (paralleling lines cut by a transversal form congruent alternate interior angles); $\triangle GIA \sim \triangle TNA$ (AA).

PTS: 2   REF: 011729geo   NAT: G.SRT.A.3   TOP: Similarity Proofs

30 ANS:
$180-2(25)=130$

PTS: 2   REF: 011730geo   NAT: G.SRT.B.5   TOP: Isosceles Triangle Theorem

31 ANS:
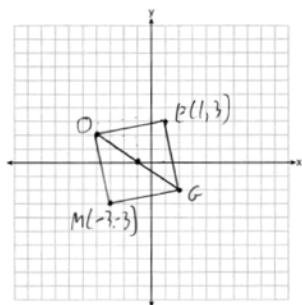
PTS: 2   REF: 011731geo   NAT: G.GPE.B.4   TOP: Quadrilaterals in the Coordinate Plane
KEY: grids

32 ANS:
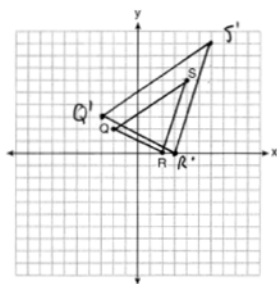
A dilation preserves slope, so the slopes of $\overline{QR}$ and $\overline{Q'R'}$ are equal. Because the slopes are equal, $Q'R' \parallel QR$.

PTS: 4   REF: 011732geo   NAT: G.SRT.A.2   TOP: Dilations
KEY: grids

33 ANS:
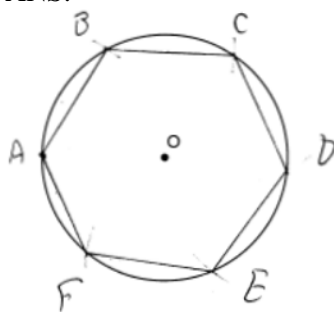
Right triangle because $\angle CBF$ is inscribed in a semi-circle.

PTS: 4   REF: 011733geo   NAT: G.CO.D.13   TOP: Constructions

34 ANS:

$$C = 2\pi r \quad V = \frac{1}{3}\pi \cdot 5^2 \cdot 13 \approx 340$$

$$31.416 = 2\pi r$$

$$5 \approx r$$

PTS: 4   REF: 011734geo   NAT: G.GMD.A.3   TOP: Volume
KEY: cones

35 ANS:

Quadrilateral $ABCD$, $\overline{AB} \cong \overline{CD}$, $\overline{AB} \| \overline{CD}$, and $\overline{BF}$ and $\overline{DE}$ are perpendicular to diagonal $\overline{AC}$ at points F and E (given). $\angle AED$ and $\angle CFB$ are right angles (perpendicular lines form right angles). $\angle AED \cong \angle CFB$ (All right angles are congruent). $ABCD$ is a parallelogram (A quadrilateral with one pair of sides congruent and parallel is a parallelogram). $\overline{AD} \| \overline{BC}$ (Opposite sides of a parallelogram are parallel). $\angle DAE \cong \angle BCF$ (Parallel lines cut by a transversal form congruent alternate interior angles). $\overline{DA} \cong \overline{BC}$ (Opposite sides of a parallelogram are congruent). $\triangle ADE \cong \triangle CBF$ (AAS). $\overline{AE} \cong \overline{CF}$ (CPCTC).

PTS: 6   REF: 011735geo   NAT: G.SRT.B.5   TOP: Quadrilateral Proofs

36 ANS:

C: $V = \pi(26.7)^2(750) - \pi(24.2)^2(750) = 95,437.5\pi$

$$95,437.5\pi \text{ cm}^3 \left(\frac{2.7 \text{ g}}{\text{cm}^3}\right)\left(\frac{1 \text{ kg}}{1000 \text{ g}}\right)\left(\frac{\$0.38}{\text{kg}}\right) = \$307.62$$

P: $V = 40^2(750) - 35^2(750) = 281,250$ $\$307.62 - 288.56 = \$19.06$

$$281,250 \text{ cm}^3 \left(\frac{2.7 \text{ g}}{\text{cm}^3}\right)\left(\frac{1 \text{ kg}}{1000 \text{ g}}\right)\left(\frac{\$0.38}{\text{kg}}\right) = \$288.56$$

PTS: 6   REF: 011736geo   NAT: G.MG.A.2   TOP: Density

0617geo
Answer Section

1 ANS: 2   PTS: 2   REF: 061701geo   NAT: G.CO.A.5
   TOP: Compositions of Transformations   KEY: identify
2 ANS: 3   PTS: 2   REF: 061702geo   NAT: G.GPE.B.7
   TOP: Polygons in the Coordinate Plane
3 ANS: 3   PTS: 2   REF: 061703geo   NAT: G.SRT.C.7
   TOP: Cofunctions
4 ANS: 4
   $\dfrac{1}{2}(360 - 268) = 46$

   PTS: 2   REF: 061704geo   NAT: G.C.A.2   TOP: Chords, Secants and Tangents
   KEY: inscribed
5 ANS: 4
   $\dfrac{2}{4} = \dfrac{9 - x}{x}$

   $36 - 4x = 2x$

   $x = 6$

   PTS: 2   REF: 061705geo   NAT: G.SRT.B.5   TOP: Side Splitter Theorem
6 ANS: 3   PTS: 2   REF: 061706geo   NAT: G.SRT.A.1
   TOP: Line Dilations
7 ANS: 1   PTS: 2   REF: 061707geo   NAT: G.CO.A.3
   TOP: Mapping a Polygon onto Itself
8 ANS: 2
   $6 \cdot 6 = x(x - 5)$

   $36 = x^2 - 5x$

   $0 = x^2 - 5x - 36$

   $0 = (x - 9)(x + 4)$

   $x = 9$

   PTS: 2   REF: 061708geo   NAT: G.C.A.2   TOP: Chords, Secants and Tangents
   KEY: intersecting chords, length
9 ANS: 2   PTS: 2   REF: 061709geo   NAT: G.SRT.B.5
   TOP: Triangle Proofs   KEY: statements
10 ANS: 2
   $\angle B = 180 - (82 + 26) = 72$; $\angle DEC = 180 - 26 = 154$; $\angle EDB = 360 - (154 + 26 + 72) = 108$; $\angle BDF = \dfrac{108}{2} = 54$;
   $\angle DFB = 180 - (54 + 72) = 54$

   PTS: 2   REF: 061710geo   NAT: G.CO.C.10   TOP: Interior and Exterior Angles of Triangles

11 ANS: 4 PTS: 2 REF: 061711geo NAT: G.CO.C.11
TOP: Special Quadrilaterals

12 ANS: 1

$x^2 + y^2 - 12y + 36 = -20 + 36$

$x^2 + (y - 6)^2 = 16$

PTS: 2 REF: 061712geo NAT: G.GPE.A.1 TOP: Equations of Circles
KEY: completing the square

13 ANS: 1

$\cos S = \dfrac{60}{65}$

$S \approx 23$

PTS: 2 REF: 061713geo NAT: G.SRT.C.8 TOP: Using Trigonometry to Find an Angle

14 ANS: 1

NYSED accepts either (1) or (3) as a correct answer. Statement III is not true if *A, B, A'* and *B'* are collinear.

PTS: 2 REF: 061714geo NAT: G.SRT.A.2 TOP: Compositions of Transformations
KEY: basic

15 ANS: 2

$-4 + \dfrac{2}{5}(6 - -4) = -4 + \dfrac{2}{5}(10) = -4 + 4 = 0 \ \ 5 + \dfrac{2}{5}(20 - 5) = 5 + \dfrac{2}{5}(15) = 5 + 6 = 11$

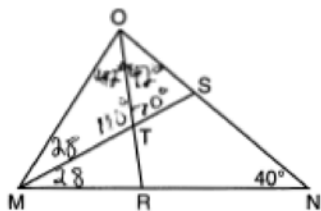PTS: 2 REF: 061715geo NAT: G.GPE.B.6 TOP: Directed Line Segments

16 ANS: 1

$84 = \dfrac{1}{3} \cdot s^2 \cdot 7$

$6 = s$

PTS: 2 REF: 061716geo NAT: G.GMD.A.3 TOP: Volume
KEY: pyramids

17 ANS: 4

PTS: 2 REF: 061717geo NAT: G.CO.C.10 TOP: Interior and Exterior Angles of Triangles

18 ANS: 1

$V = \dfrac{1}{3}\pi(4)^2(6) = 32\pi$

PTS: 2 REF: 061718geo NAT: G.GMD.B.4 TOP: Rotations of Two-Dimensional Objects

19 ANS: 2

$m = \dfrac{3}{2}$. $1 = -\dfrac{2}{3}(-6) + b$

$m_\perp = -\dfrac{2}{3}$ $1 = 4 + b$

$-3 = b$

PTS: 2   REF: 061719geo   NAT: G.GPE.B.5   TOP: Parallel and Perpendicular Lines
KEY: write equation of perpendicular line

20 ANS: 2   PTS: 2   REF: 061720geo   NAT: G.CO.C.11
TOP: Parallelograms

21 ANS: 4

$\sin 71 = \dfrac{x}{20}$

$x = 20 \sin 71 \approx 19$

PTS: 2   REF: 061721geo   NAT: G.SRT.C.8   TOP: Using Trigonometry to Find a Side
KEY: without graphics

22 ANS: 3
NYSED has stated that all students should be awarded credit regardless of their answer to this question.

PTS: 2   REF: 061722geo   NAT: G.CO.B.7   TOP: Triangle Congruency

23 ANS: 3

$2.5 \times 1.25 \times (27 \times 12) + \dfrac{1}{2}\pi(1.25)^2(27 \times 12) \approx 1808$

PTS: 2   REF: 061723geo   NAT: G.GMD.A.3 TOP: Volume
KEY: compositions

24 ANS: 2
(1) AA; (3) SAS; (4) SSS. NYSED has stated that all students should be awarded credit regardless of their answer to this question.
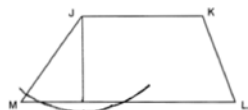
PTS: 2   REF: 061724geo   NAT: G.SRT.B.5   TOP: Similarity
KEY: basic

25 ANS:

PTS: 2   REF: 061725geo   NAT: G.CO.D.12   TOP: Constructions
KEY: parallel and perpendicular lines

26 ANS:

$$\frac{40}{360} \cdot \pi(4.5)^2 = 2.25\pi$$

PTS: 2   REF: 061726geo   NAT: G.C.B.5   TOP: Sectors

27 ANS:
Each triangular prism has the same base area. Therefore, each corresponding cross-section of the prisms will have the same area. Since the two prisms have the same height of 14, the two volumes must be the same.

PTS: 2   REF: 061727geo   NAT: G.GMD.A.1   TOP: Volume

28 ANS:

$$\sqrt[3]{\frac{3V_f}{4\pi}} - \sqrt[3]{\frac{3V_p}{4\pi}} = \sqrt[3]{\frac{3(294)}{4\pi}} - \sqrt[3]{\frac{3(180)}{4\pi}} \approx 0.6$$

PTS: 2   REF: 061728geo   NAT: G.GMD.A.3   TOP: Volume
KEY: spheres

29 ANS:
If an altitude is drawn to the hypotenuse of a triangle, it divides the triangle into two right triangles similar to each other and the original triangle.

PTS: 2   REF: 061729geo   NAT: G.SRT.B.5   TOP: Similarity
KEY: altitude

30 ANS:
Rotate $\triangle ABC$ clockwise about point C until $\overline{DF} \parallel \overline{AC}$. Translate $\triangle ABC$ along $\overline{CF}$ so that C maps onto F.

PTS: 2   REF: 061730geo   NAT: G.CO.A.5   TOP: Compositions of Transformations
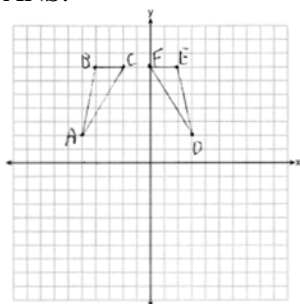KEY: identify

31 ANS:
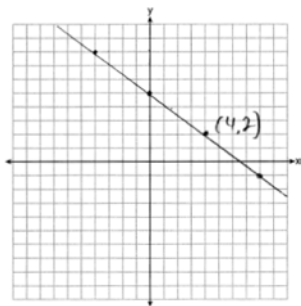
The line is on the center of dilation, so the line does not change. $p: 3x + 4y = 20$

PTS: 2   REF: 061731geo   NAT: G.SRT.A.1   TOP: Line Dilations

32 ANS:

$r_{x=-1}$ Reflections are rigid motions that preserve distance, so $\triangle ABC \cong \triangle DEF$.

PTS: 4   REF: 061732geo   NAT: G.CO.A.2   TOP: Identifying Transformations
KEY: graphics

33 ANS:

$\overline{RS}$ and $\overline{TV}$ bisect each other at point X; $\overline{TR}$ and $\overline{SV}$ are drawn (given); $\overline{TX} \cong \overline{XV}$ and $\overline{RX} \cong \overline{XS}$ (segment bisectors create two congruent segments); $\angle TXR \cong \angle VXS$ (vertical angles are congruent); $\triangle TXR \cong \triangle VXS$ (SAS); $\angle T \cong \angle V$ (CPCTC); $\overline{TR} \parallel \overline{SV}$ (a transversal that creates congruent alternate interior angles cuts parallel lines).

PTS: 4   REF: 061733geo   NAT: G.SRT.B.5   TOP: Triangle Proofs
KEY: proof

34 ANS:

$$20000 \, \text{g} \left(\frac{1 \, \text{ft}^3}{7.48 \, \text{g}} \right) = 2673.8 \, \text{ft}^3 \quad 2673.8 = \pi r^2 (34.5) \quad 9.9 + 1 = 10.9$$
$$r \approx 4.967$$
$$d \approx 9.9$$

PTS: 4   REF: 061734geo   NAT: G.GMD.A.3   TOP: Volume
KEY: cylinders

35 ANS:

$\overline{PQ}$ $\sqrt{(8-3)^2 + (3--2)^2} = \sqrt{50}$ $\overline{QR}$ $\sqrt{(1-8)^2 + (4-3)^2} = \sqrt{50}$ $\overline{RS}$ $\sqrt{(-4-1)^2 + (-1-4)^2} = \sqrt{50}$

$\overline{PS}$ $\sqrt{(-4-3)^2 + (-1--2)^2} = \sqrt{50}$ $PQRS$ is a rhombus because all sides are congruent. $m_{\overline{PQ}} = \frac{8-3}{3--2} = \frac{5}{5} = 1$

$m_{\overline{QR}} = \frac{1-8}{4-3} = -7$ Because the slopes of adjacent sides are not opposite reciprocals, they are not perpendicular
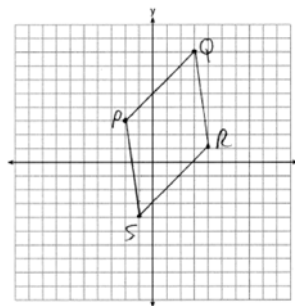
and do not form a right angle. Therefore $PQRS$ is not a square.

PTS: 6   REF: 061735geo   NAT: G.GPE.B.4   TOP: Quadrilaterals in the Coordinate Plane
KEY: grids

5

36 ANS:

$$\tan 15 = \frac{6250}{x} \qquad \tan 52 = \frac{6250}{y} \quad 23325.3 - 4883 = 18442 \quad \frac{18442 \text{ ft}}{1 \text{ min}} \left(\frac{1 \text{ mi}}{5280 \text{ ft}} \right) \left(\frac{60 \text{ min}}{1 \text{ h}} \right) \approx 210$$

$$x \approx 23325.3 \qquad y \approx 4883$$

PTS: 6　　　　REF: 061736geo　　NAT: G.SRT.C.8　　TOP: Using Trigonometry to Find a Side
KEY: advanced

0817geo
Answer Section

1 ANS: 2 PTS: 2 REF: 081701geo NAT: G.GMD.B.4
  TOP: Cross-Sections of Three-Dimensional Objects

2 ANS: 4 PTS: 2 REF: 081702geo NAT: G.CO.A.2
  TOP: Identifying Transformations KEY: basic

3 ANS: 3
$$4\sqrt{(-1--3)^2+(5-1)^2} = 4\sqrt{20}$$

  PTS: 2 REF: 081703geo NAT: G.GPE.B.7 TOP: Polygons in the Coordinate Plane

4 ANS: 1
  Parallel chords intercept congruent arcs. $\dfrac{180-130}{2} = 25$

  PTS: 2 REF: 081704geo NAT: G.C.A.2 TOP: Chords, Secants and Tangents
  KEY: parallel lines

5 ANS: 4
$$\frac{6.6}{x} = \frac{4.2}{5.25}$$
$$4.2x = 34.65$$
$$x = 8.25$$

  PTS: 2 REF: 081705geo NAT: G.SRT.B.5 TOP: Similarity
  KEY: basic

6 ANS: 3
  The x-axis and line $x = 4$ are lines of symmetry and $(4,0)$ is a point of symmetry.
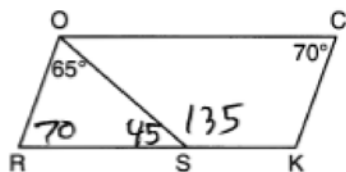
  PTS: 2 REF: 081706geo NAT: G.CO.A.3 TOP: Mapping a Polygon onto Itself

7 ANS: 4
$$\frac{1}{3.5} = \frac{x}{18-x}$$
$$3.5x = 18 - x$$
$$4.5x = 18$$
$$x = 4$$

  PTS: 2 REF: 081707geo NAT: G.SRT.B.5 TOP: Side Splitter Theorem

8 ANS: 4

PTS: 2 REF: 081708geo NAT: G.CO.C.11 TOP: Interior and Exterior Angles of Polygons

9 ANS: 4

$$\frac{36}{45} \neq \frac{15}{18}$$

$$\frac{4}{5} \neq \frac{5}{6}$$

PTS: 2 REF: 081709geo NAT: G.SRT.A.3 TOP: Similarity Proofs

10 ANS: 1

Since a dilation preserves parallelism, the line $4y = 3x + 7$ and its image $3x - 4y = 9$ are parallel, with slopes of $\frac{3}{4}$.

PTS: 2 REF: 081710geo NAT: G.SRT.A.1 TOP: Line Dilations

11 ANS: 4
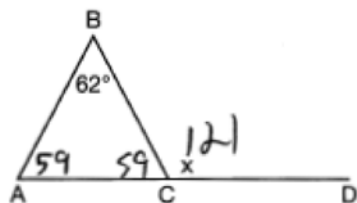
PTS: 2 REF: 081711geo NAT: G.CO.C.10 TOP: Exterior Angle Theorem

12 ANS: 2

$$x^2 = 3 \cdot 18$$

$$x = \sqrt{3 \cdot 3 \cdot 6}$$

$$x = 3\sqrt{6}$$

PTS: 2 REF: 081712geo NAT: G.C.A.2 TOP: Chords, Secants and Tangents
KEY: secant and tangent drawn from common point, length

13 ANS: 3

$$v = \pi r^2 h \quad (1) \ 6^2 \cdot 10 = 360$$

$$150\pi = \pi r^2 h \quad (2) \ 10^2 \cdot 6 = 600$$

$$150 = r^2 h \quad (3) \ 5^2 \cdot 6 = 150$$

$$(4) \ 3^2 \cdot 10 = 900$$

PTS: 2 REF: 081713geo NAT: G.GMD.B.4 TOP: Rotations of Two-Dimensional Objects

14 ANS: 3
In (1) and (2), *ABCD* could be a rectangle with non-congruent sides. (4) is not possible

 PTS: 2   REF: 081714geo   NAT: G.CO.C.11   TOP: Special Quadrilaterals

15 ANS: 1

$$\tan x = \frac{1}{12}$$

$$x \approx 4.76$$

 PTS: 2   REF: 081715geo   NAT: G.SRT.C.8   TOP: Using Trigonometry to Find an Angle

16 ANS: 4   PTS: 2   REF: 081716geo   NAT: G.CO.C.10
 TOP: Midsegments

17 ANS: 1

$$-8 + \frac{3}{8}(16 - -8) = -8 + \frac{3}{8}(24) = -8 + 9 = 1 \quad -2 + \frac{3}{8}(6 - -2) = -2 + \frac{3}{8}(8) = -2 + 3 = 1$$

 PTS: 2   REF: 081717geo   NAT: G.GPE.B.6   TOP: Directed Line Segments

18 ANS: 2

$$12^2 = 9 \cdot 16$$

$$144 = 144$$

 PTS: 2   REF: 081718geo   NAT: G.SRT.B.5   TOP: Similarity
 KEY: leg

19 ANS: 1

$$\sin 32 = \frac{x}{6.2}$$

$$x \approx 3.3$$

 PTS: 2   REF: 081719geo   NAT: G.SRT.C.8   TOP: Using Trigonometry to Find a Side

20 ANS: 1

Illinois: $\frac{12830632}{231.1} \approx 55520$ Florida: $\frac{18801310}{350.6} \approx 53626$ New York: $\frac{19378102}{411.2} \approx 47126$ Pennsylvania:

$\frac{12702379}{283.9} \approx 44742$

 PTS: 2   REF: 081720geo   NAT: G.MG.A.2   TOP: Density

21 ANS: 4

$$40 - x + 3x = 90$$

$$2x = 50$$

$$x = 25$$

 PTS: 2   REF: 081721geo   NAT: G.SRT.C.7   TOP: Cofunctions

22 ANS: 4

$\dfrac{360°}{10} = 36°$ 252° is a multiple of 36°

PTS: 2   REF: 081722geo   NAT: G.CO.A.3   TOP: Mapping a Polygon onto Itself

23 ANS: 2

$\dfrac{\dfrac{512\pi}{3}}{\left(\dfrac{32}{2}\right)^2 \pi} \cdot 2\pi = \dfrac{4\pi}{3}$

PTS: 2   REF: 081723geo   NAT: G.C.B.5   TOP: Sectors

24 ANS: 4

The segment's midpoint is the origin and slope is −2. The slope of a perpendicular line is $\dfrac{1}{2}$. $y = \dfrac{1}{2}x + 0$

$2y = x$

$2y - x = 0$

PTS: 2   REF: 081724geo   NAT: G.GPE.B.5   TOP: Parallel and Perpendicular Lines
KEY: perpendicular bisector

25 ANS:
Yes. The bases of the cylinders have the same area and the cylinders have the same height.

PTS: 2   REF: 081725geo   NAT: G.GMD.A.1   TOP: Volume

26 ANS:
The four small triangles are 8-15-17 triangles. $4 \times 17 = 68$

PTS: 2   REF: 081726geo   NAT: G.CO.C.11   TOP: Special Quadrilaterals

27 ANS:

$R_{180°}$ about $\left(-\dfrac{1}{2}, \dfrac{1}{2}\right)$
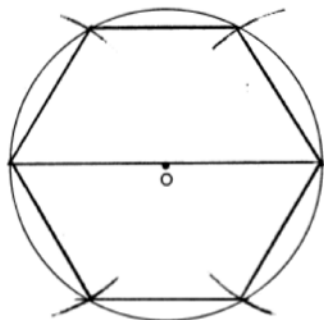
PTS: 2   REF: 081727geo   NAT: G.CO.A.5   TOP: Compositions of Transformations
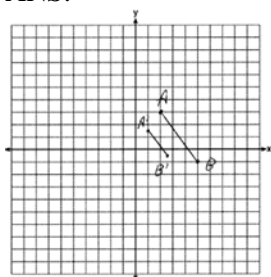KEY: identify

28 ANS:

PTS: 2   REF: 081728geo   NAT: G.CO.D.13   TOP: Constructions

4

29 ANS:

$$\sqrt{(2.5-1)^2 + (-.5-1.5)^2} = \sqrt{2.25+4} = 2.5$$

PTS: 2   REF: 081729geo   NAT: G.SRT.A.2   TOP: Dilations

30 ANS:

Yes. $\angle A \cong \angle X$, $\angle C \cong \angle Z$, $\overline{AC} \cong \overline{XZ}$ after a sequence of rigid motions which preserve distance and angle measure, so $\triangle ABC \cong \triangle XYZ$ by ASA. $\overline{BC} \cong \overline{YZ}$ by CPCTC.

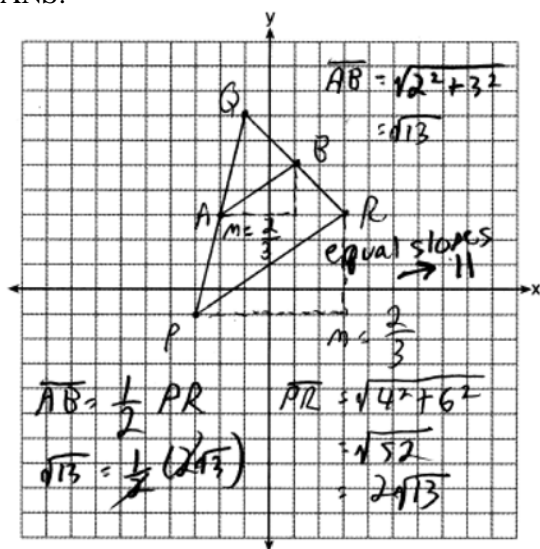PTS: 2   REF: 081730geo   NAT: G.CO.B.7   TOP: Triangle Congruency

31 ANS:

$x^2 - 6x + 9 + y^2 + 8y + 16 = 56 + 9 + 16$ $(3, -4); r = 9$

$(x-3)^2 + (y+4)^2 = 81$

PTS: 2   REF: 081731geo   NAT: G.GPE.A.1   TOP: Equations of Circles
KEY: completing the square

32 ANS:

PTS: 4   REF: 081732geo   NAT: G.GPE.B.4   TOP: Triangles in the Coordinate Plane

5

33 ANS:

Circle O, tangent $\overline{EC}$ to diameter $\overline{AC}$, chord $\overline{BC} \parallel$ secant $\overline{ADE}$, and chord $\overline{AB}$ (given); $\angle B$ is a right angle (an angle inscribed in a semi-circle is a right angle); $\overleftrightarrow{EC} \perp \overline{OC}$ (a radius drawn to a point of tangency is perpendicular to the tangent); $\angle ECA$ is a right angle (perpendicular lines form right angles); $\angle B \cong \angle ECA$ (all right angles are congruent); $\angle BCA \cong \angle CAE$ (the transversal of parallel lines creates congruent alternate interior angles); $\triangle ABC \sim \triangle ECA$ (AA); $\dfrac{BC}{CA} = \dfrac{AB}{EC}$ (Corresponding sides of similar triangles are in proportion).

PTS: 4   REF: 081733geo   NAT: G.SRT.B.5   TOP: Circle Proofs

34 ANS:

$$x^2 + x^2 = 58^2 \qquad A = (\sqrt{1682} + 8)^2 \approx 2402.2$$
$$2x^2 = 3364$$
$$x = \sqrt{1682}$$

PTS: 4   REF: 081734geo   NAT: G.MG.A.3   TOP: Area of Polygons

35 ANS:

Isosceles trapezoid $ABCD$, $\angle CDE \cong \angle DCE$, $\overline{AE} \perp \overline{DE}$, and $\overline{BE} \perp \overline{CE}$ (given); $\overline{AD} \cong \overline{BC}$ (congruent legs of isosceles trapezoid); $\angle DEA$ and $\angle CEB$ are right angles (perpendicular lines form right angles); $\angle DEA \cong \angle CEB$ (all right angles are congruent); $\angle CDA \cong \angle DCB$ (base angles of an isosceles trapezoid are congruent); $\angle CDA - \angle CDE \cong \angle DCB - \angle DCE$ (subtraction postulate); $\triangle ADE \cong \triangle BCE$ (AAS); $\overline{EA} \cong \overline{EB}$ (CPCTC);

$\angle EDA \cong \angle ECB$

$\triangle AEB$ is an isosceles triangle (an isosceles triangle has two congruent sides).

PTS: 6   REF: 081735geo   NAT: G.SRT.B.5   TOP: Quadrilateral Proofs

36 ANS:

$$\tan 16.5 = \frac{x}{13.5} \qquad 9 \times 16 \times 4.5 = 648 \quad 3752 - (35 \times 16 \times .5) = 3472$$
$$x \approx 4 \qquad 13.5 \times 16 \times 4.5 = 972 \quad 3472 \times 7.48 \approx 25971$$
$$4 + 4.5 = 8.5 \quad \frac{1}{2} \times 13.5 \times 16 \times 4 = 432 \quad \frac{25971}{10.5} \approx 2473.4$$
$$12.5 \times 16 \times 8.5 = \underline{1700} \quad \frac{2473.4}{60} \approx 41$$
$$3752$$

PTS: 6   REF: 081736geo   NAT: G.GMD.A.3   TOP: Volume
KEY: compositions