Geometry CCSS Regents Exam 0615
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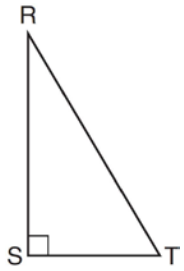
0615geo

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

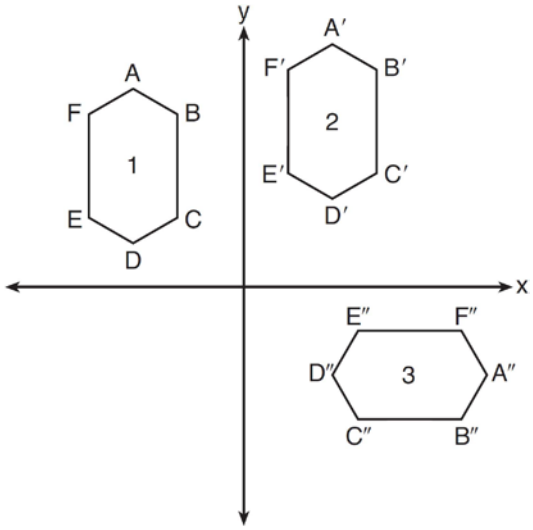
2 The vertices of $\triangle JKL$ have coordinates $J(5,1)$, $K(-2,-3)$, and $L(-4,1)$. Under which transformation is the image $\triangle J'K'L'$ *not* congruent to $\triangle JKL$?

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

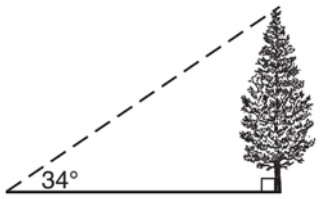
4 In the diagram below, congruent figures 1, 2, and 3 are drawn.



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

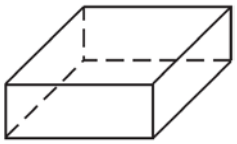
5 As shown in the diagram below, the angle of elevation from a point on the ground to the top of the tree is 34°.



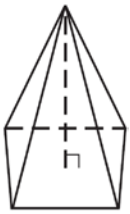
If the point is 20 feet from the base of the tree, what is the height of the tree, to the *nearest tenth of a foot*?

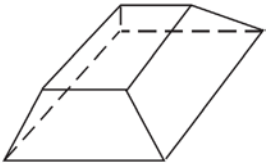
1) 29.7
2) 16.6
3) 13.5
4) 11.2

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

1) 

2) 

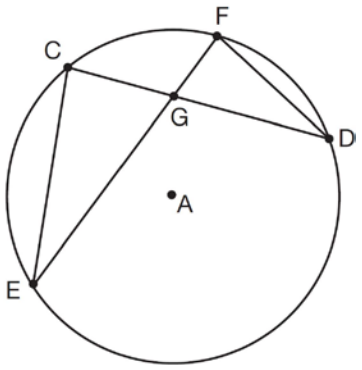
3) 

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) $\frac{CE}{EG} = \frac{FD}{DG}$
4) $\triangle CEG \sim \triangle FDG$

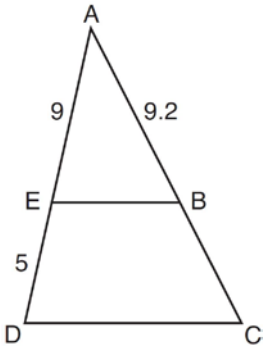
9 Which equation represents a line that is perpendicular to the line represented by $2x - y = 7$?

1) $y = -\frac{1}{2}x + 6$
2) $y = \frac{1}{2}x + 6$
3) $y = -2x + 6$
4) $y = 2x + 6$

10 Which regular polygon has a minimum rotation of 45° to carry the polygon onto itself?

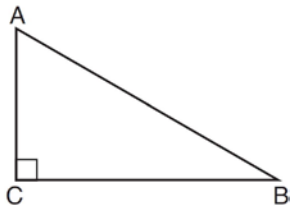
1) octagon
2) decagon
3) hexagon
4) pentagon

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, $m\angle C = 90°$.

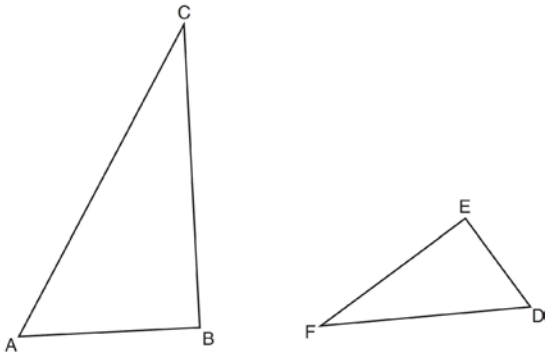


Which equation is always true?
1) $\sin A = \sin B$
2) $\cos A = \cos B$
3) $\cos A = \sin C$
4) $\sin A = \cos B$

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

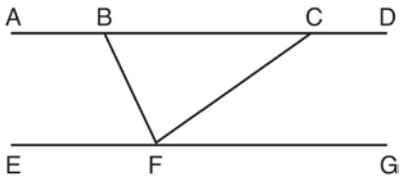
15 Triangles ABC and DEF are drawn below.



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) $\frac{AB}{CB} = \frac{FE}{DE}$
3) $\triangle ABC \sim \triangle DEF$
4) $\frac{AB}{DE} = \frac{FE}{CB}$

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) $3(m\angle C') = m\angle C$

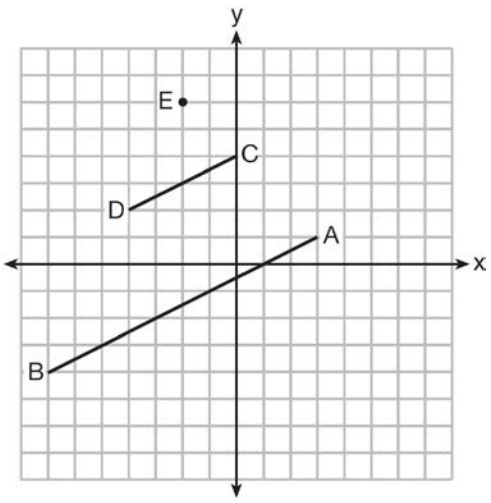
17 Steve drew line segments $ABCD$, EFG, BF, and CF as shown in the diagram below. Scalene $\triangle BFC$ is formed.



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.



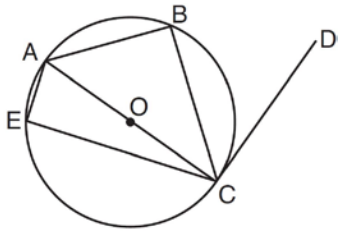
Which ratio is equal to the scale factor k of the dilation?

1) $\frac{EC}{EA}$
2) $\frac{BA}{EA}$
3) $\frac{EA}{BA}$
4) $\frac{EA}{EC}$

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

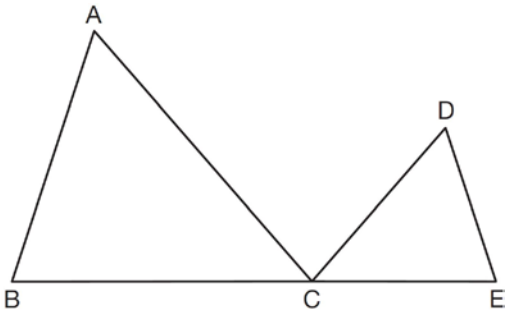
20 In circle O shown below, diameter $\overline{AC}$ is perpendicular to $\overline{CD}$ at point C, and chords $\overline{AB}$, $\overline{BC}$, $\overline{AE}$, and $\overline{CE}$ are drawn.



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, $\triangle ABC \sim \triangle DEC$.



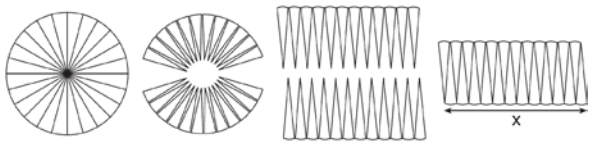
If $AC = 12$, $DC = 7$, $DE = 5$, and the perimeter of $\triangle ABC$ is 30, what is the perimeter of $\triangle DEC$?

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) $3x - 2y = 5$

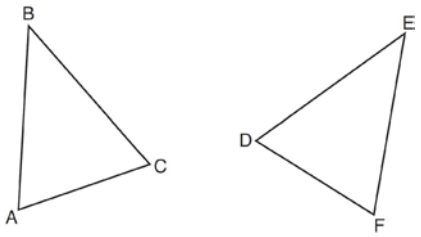
23 A circle with a radius of 5 was divided into 24 congruent sectors. The sectors were then rearranged, as shown in the diagram below.



To the *nearest integer*, the value of x is

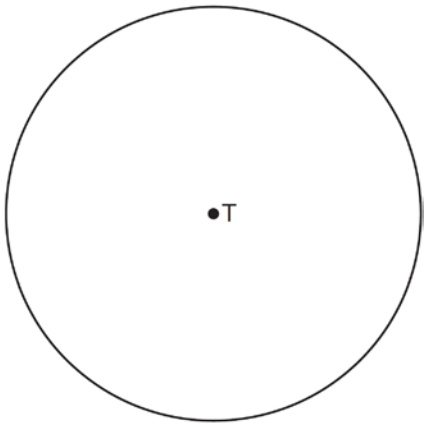
1) 31
2) 16
3) 12
4) 10

24 Which statement is sufficient evidence that $\triangle DEF$ is congruent to $\triangle ABC$?

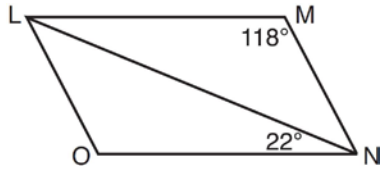


1) $AB = DE$ and $BC = EF$
2) $\angle D \cong \angle A$, $\angle B \cong \angle E$, $\angle C \cong \angle F$
3) There is a sequence of rigid motions that maps $\overline{AB}$ onto $\overline{DE}$, $\overline{BC}$ onto $\overline{EF}$, and $\overline{AC}$ onto $\overline{DF}$.
4) There is a sequence 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.]

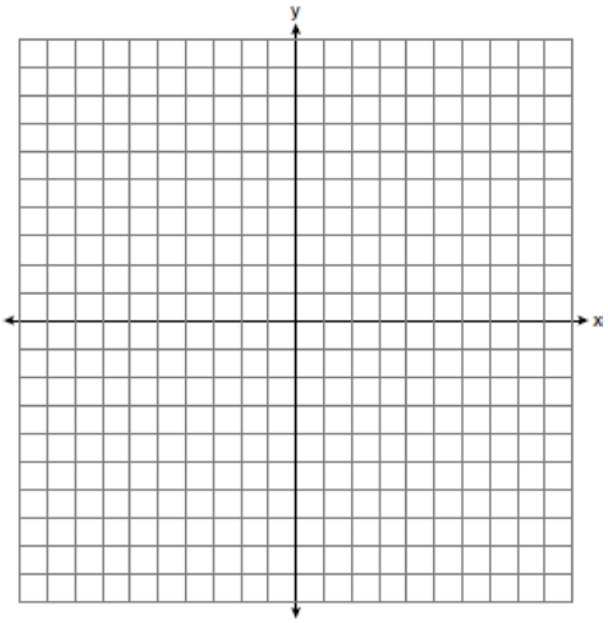


26 The diagram below shows parallelogram $LMNO$ with diagonal $\overline{LN}$, $m\angle M = 118°$, and $m\angle LNO = 22°$.

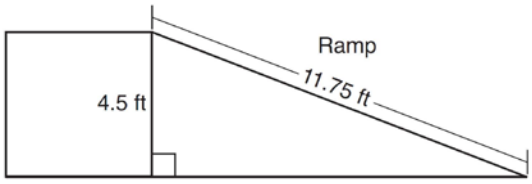


Explain why $m\angle NLO$ is 40 degrees.

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.]

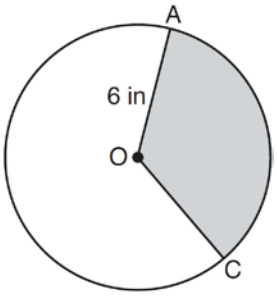


28 The diagram below shows a ramp connecting the ground to a loading platform 4.5 feet above the ground. The ramp measures 11.75 feet from the ground to the top of the loading platform.



Determine and state, to the *nearest degree*, the angle of elevation formed by the ramp and the ground.

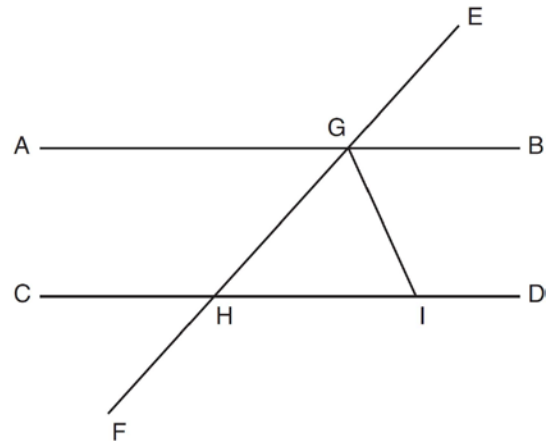
29 In the diagram below of circle O, the area of the shaded sector AOC is 12π in^2 and the length of $\overline{OA}$ is 6 inches. Determine and state m$\angle AOC$.



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 $\triangle A'B'C'$.

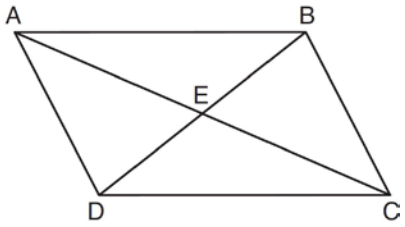
31 A flagpole casts a shadow 16.60 meters long. Tim stands at a distance of 12.45 meters from the base of the flagpole, such that the end of Tim's shadow meets the end of the flagpole's shadow. If Tim is 1.65 meters tall, determine and state the height of the flagpole to the *nearest tenth of a meter*.

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 $\overline{GH} \cong \overline{IH}$.



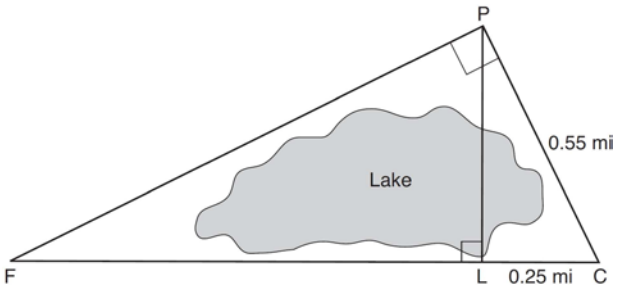
If m$\angle EGB = 50°$ and m$\angle DIG = 115°$, explain why $\overline{AB} \parallel \overline{CD}$.

33 Given: Quadrilateral $ABCD$ is a parallelogram with diagonals $\overline{AC}$ and $\overline{BD}$ intersecting at E



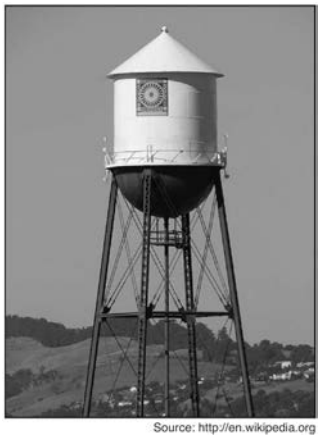
Prove: $\triangle AED \cong \triangle CEB$
Describe a single rigid motion that maps $\triangle AED$ onto $\triangle CEB$.

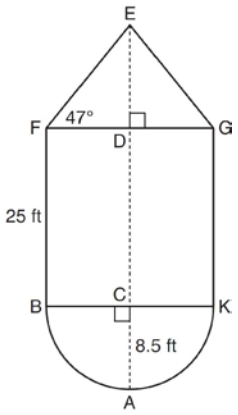
34 In the diagram below, the line of sight from the park ranger station, P, to the lifeguard chair, L, on the beach of a lake is perpendicular to the path joining the campground, C, and the first aid station, F. The campground is 0.25 mile from the lifeguard chair. The straight paths from both the campground 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.

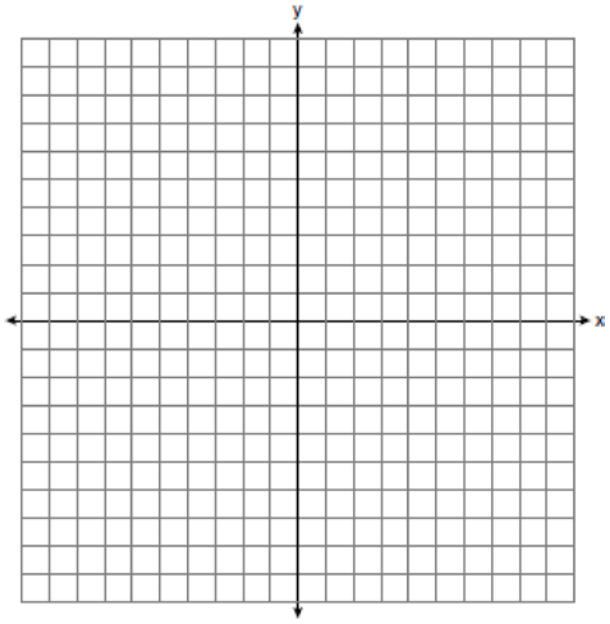
35 The water tower in the picture below is modeled by the two-dimensional figure beside it. The water tower is composed of a hemisphere, a cylinder, and a cone. Let C be the center of the hemisphere and let D be the center of the base of the cone.


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.]



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

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

$9x = 46$

$x \approx 5.1$

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

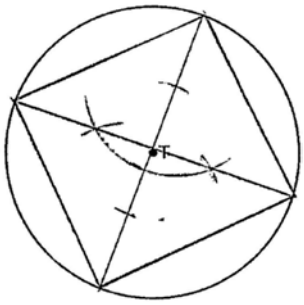
23 ANS: 2

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:



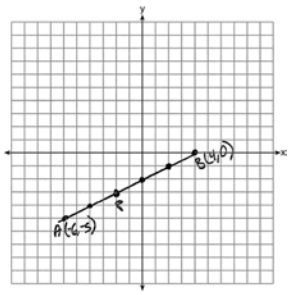
PTS: 2 REF: 061525geo NAT: G.CO.D.13 TOP: Constructions

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:



$-6+\frac{2}{5}(4--6)\ \ -5+\frac{2}{5}(0--5)\ \ (-2,-3)$

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

$-6+4 \qquad -5+2$

$-2 \qquad -3$

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

28 ANS:

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

$x \approx 23$

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

29 ANS:

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

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

$x = 120$

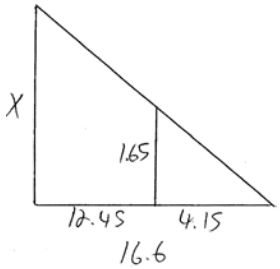
PTS: 2 REF: 061529geo NAT: G.C.B.5 TOP: Sectors

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, $.49^2 = .25y$ $.9604 + .25 < 1.5$

$$.9604 = y$$

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

35 ANS:

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

$x \approx 9.115$

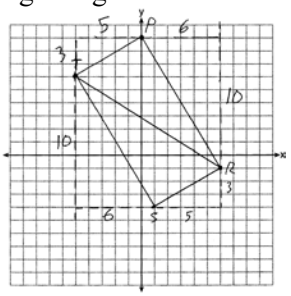
$V = \frac{1}{2}\left(\frac{4}{3}\pi(8.5)^3\right) \approx 1286.3$ $689.6 + 5674.5 + 1286.3 \approx 7650$ No, because $7650 \cdot 62.4 = 477{,}360$

$477{,}360 \cdot .85 = 405{,}756$, 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