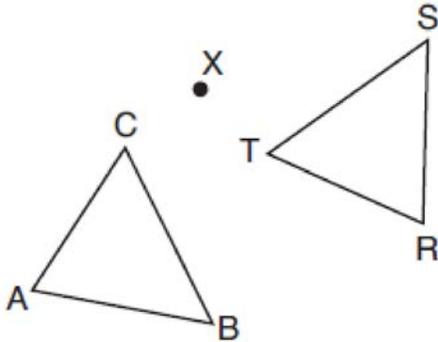


0618geo

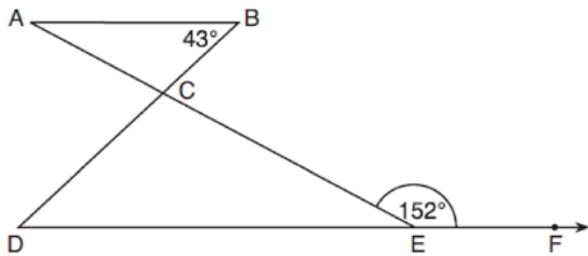
- 1 After a counterclockwise rotation about point X , scalene triangle ABC maps onto $\triangle RST$, as shown in the diagram below.



Which statement must be true?

- 1) $\angle A \cong \angle R$
- 2) $\angle A \cong \angle S$
- 3) $\overline{CB} \cong \overline{TR}$
- 4) $\overline{CA} \cong \overline{TS}$

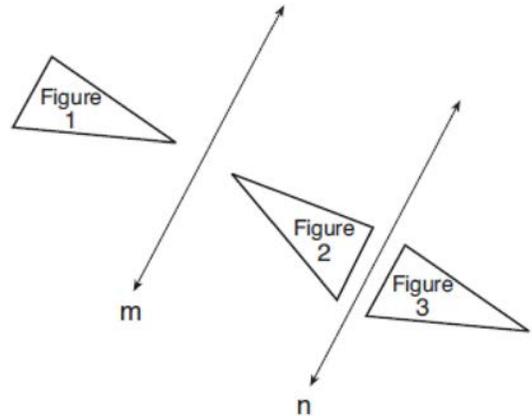
- 2 In the diagram below, $\overline{AB} \parallel \overline{DEF}$, \overline{AE} and \overline{BD} intersect at C , $m\angle B = 43^\circ$, and $m\angle CEF = 152^\circ$.



Which statement is true?

- 1) $m\angle D = 28^\circ$
- 2) $m\angle A = 43^\circ$
- 3) $m\angle ACD = 71^\circ$
- 4) $m\angle BCE = 109^\circ$

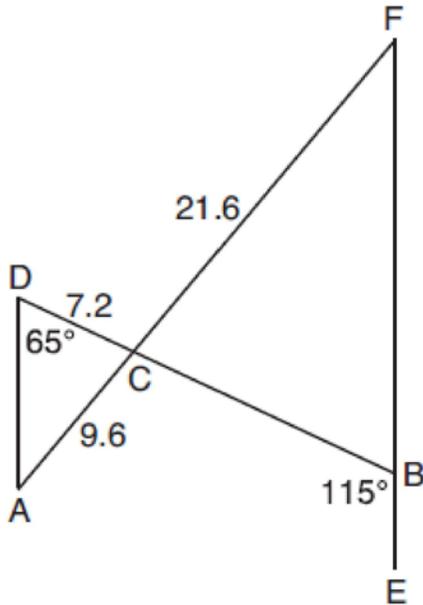
- 3 In the diagram below, line m is parallel to line n . Figure 2 is the image of Figure 1 after a reflection over line m . Figure 3 is the image of Figure 2 after a reflection over line n .



Which single transformation would carry Figure 1 onto Figure 3?

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

- 4 In the diagram below, \overline{AF} , and \overline{DB} intersect at C , and \overline{AD} and \overline{FBE} are drawn such that $m\angle D = 65^\circ$, $m\angle CBE = 115^\circ$, $DC = 7.2$, $AC = 9.6$, and $FC = 21.6$.

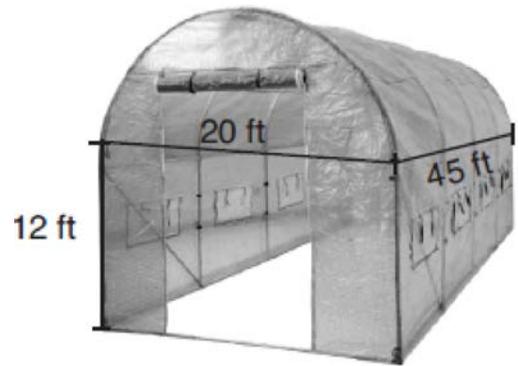


What is the length of \overline{CB} ?

- 1) 3.2
 - 2) 4.8
 - 3) 16.2
 - 4) 19.2
- 5 Given square $RSTV$, where $RS = 9$ cm. If square $RSTV$ is dilated by a scale factor of 3 about a given center, what is the perimeter, in centimeters, of the image of $RSTV$ after the dilation?
- 1) 12
 - 2) 27
 - 3) 36
 - 4) 108

- 6 In right triangle ABC , hypotenuse \overline{AB} has a length of 26 cm, and side \overline{BC} has a length of 17.6 cm. What is the measure of angle B , to the nearest degree?
- 1) 48°
 - 2) 47°
 - 3) 43°
 - 4) 34°

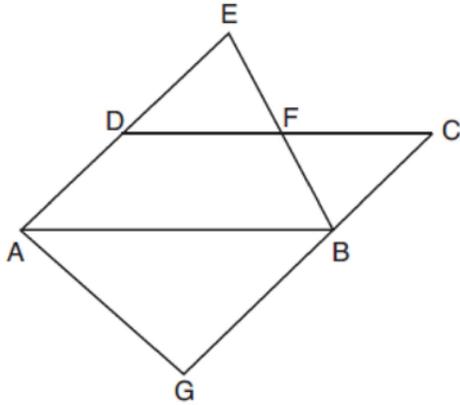
- 7 The greenhouse pictured below can be modeled as a rectangular prism with a half-cylinder on top. The rectangular prism is 20 feet wide, 12 feet high, and 45 feet long. The half-cylinder has a diameter of 20 feet.



To the nearest cubic foot, what is the volume of the greenhouse?

- 1) 17,869
 - 2) 24,937
 - 3) 39,074
 - 4) 67,349
- 8 In a right triangle, the acute angles have the relationship $\sin(2x + 4) = \cos(46)$. What is the value of x ?
- 1) 20
 - 2) 21
 - 3) 24
 - 4) 25

- 9 In the diagram below, $\overline{AB} \parallel \overline{DFC}$, $\overline{EDA} \parallel \overline{CBG}$, and \overline{EFB} and \overline{AG} are drawn.

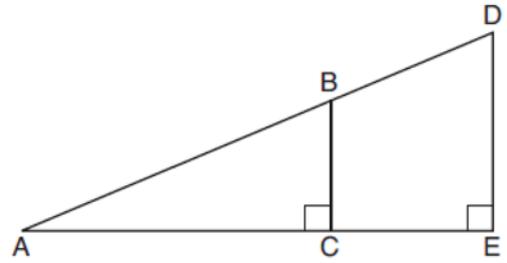


Which statement is always true?

- 1) $\triangle DEF \cong \triangle CBF$
- 2) $\triangle BAG \cong \triangle BAE$
- 3) $\triangle BAG \sim \triangle AEB$
- 4) $\triangle DEF \sim \triangle AEB$

- 10 The base of a pyramid is a rectangle with a width of 4.6 cm and a length of 9 cm. What is the height, in centimeters, of the pyramid if its volume is 82.8 cm^3 ?
- 1) 6
 - 2) 2
 - 3) 9
 - 4) 18

- 11 In the diagram below of right triangle AED , $\overline{BC} \parallel \overline{DE}$.

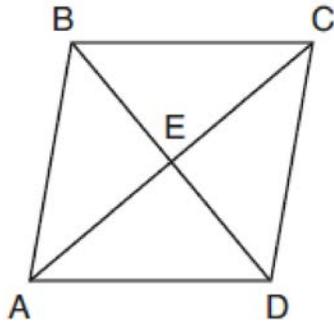


Which statement is always true?

- 1) $\frac{AC}{BC} = \frac{DE}{AE}$
- 2) $\frac{AB}{AD} = \frac{BC}{DE}$
- 3) $\frac{AC}{CE} = \frac{BC}{DE}$
- 4) $\frac{DE}{BC} = \frac{DB}{AB}$

- 12 What is an equation of the line that passes through the point $(6, 8)$ and is perpendicular to a line with equation $y = \frac{3}{2}x + 5$?
- 1) $y - 8 = \frac{3}{2}(x - 6)$
 - 2) $y - 8 = -\frac{2}{3}(x - 6)$
 - 3) $y + 8 = \frac{3}{2}(x + 6)$
 - 4) $y + 8 = -\frac{2}{3}(x + 6)$

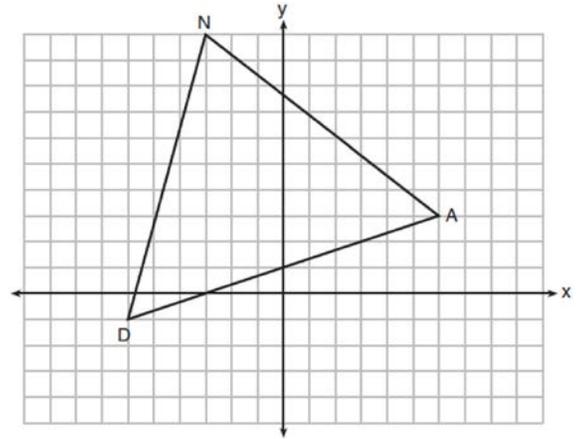
- 13 The diagram below shows parallelogram $ABCD$ with diagonals \overline{AC} and \overline{BD} intersecting at E .



What additional information is sufficient to prove that parallelogram $ABCD$ is also a rhombus?

- 1) \overline{BD} bisects \overline{AC} .
 - 2) \overline{AB} is parallel to \overline{CD} .
 - 3) \overline{AC} is congruent to \overline{BD} .
 - 4) \overline{AC} is perpendicular to \overline{BD} .
- 14 Directed line segment \overline{DE} has endpoints $D(-4, -2)$ and $E(1, 8)$. Point F divides \overline{DE} such that $DF:FE$ is 2:3. What are the coordinates of F ?
- 1) $(-3, 0)$
 - 2) $(-2, 2)$
 - 3) $(-1, 4)$
 - 4) $(2, 4)$

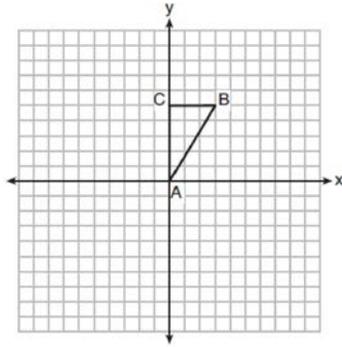
- 15 Triangle DAN is graphed on the set of axes below. The vertices of $\triangle DAN$ have coordinates $D(-6, -1)$, $A(6, 3)$, and $N(-3, 10)$.



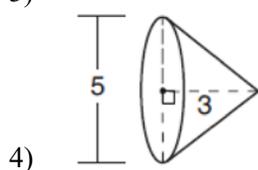
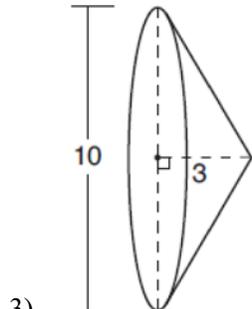
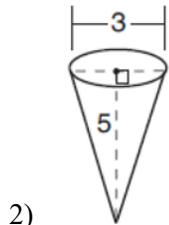
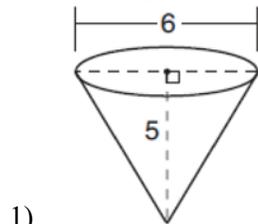
What is the area of $\triangle DAN$?

- 1) 60
- 2) 120
- 3) $20\sqrt{13}$
- 4) $40\sqrt{13}$

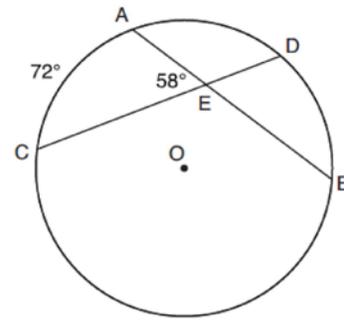
- 16 Triangle ABC , with vertices at $A(0,0)$, $B(3,5)$, and $C(0,5)$, is graphed on the set of axes shown below.



Which figure is formed when $\triangle ABC$ is rotated continuously about \overline{BC} ?



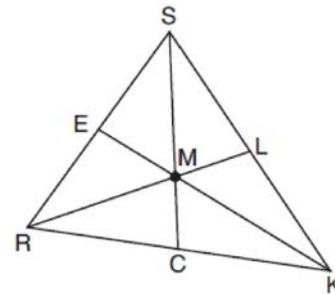
- 17 In the diagram below of circle O , chords \overline{AB} and \overline{CD} intersect at E .



If $m\widehat{AC} = 72^\circ$ and $m\angle AEC = 58^\circ$, how many degrees are in $m\widehat{DB}$?

- 1) 108°
- 2) 65°
- 3) 44°
- 4) 14°

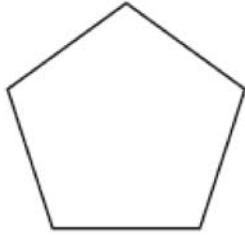
- 18 In triangle SRK below, medians \overline{SC} , \overline{KE} , and \overline{RL} intersect at M .



Which statement must always be true?

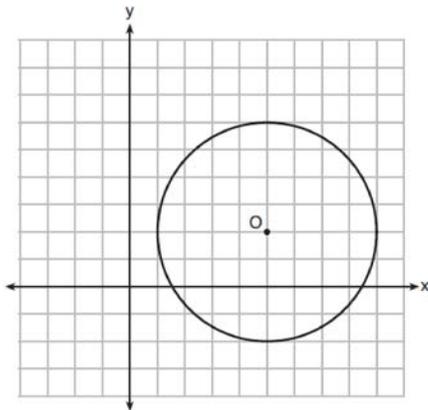
- 1) $3(MC) = SC$
- 2) $MC = \frac{1}{3}(SM)$
- 3) $RM = 2MC$
- 4) $SM = KM$

- 19 The regular polygon below is rotated about its center.



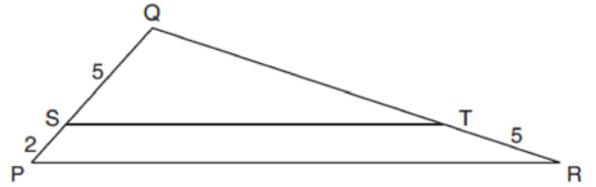
Which angle of rotation will carry the figure onto itself?

- 1) 60°
 - 2) 108°
 - 3) 216°
 - 4) 540°
- 20 What is an equation of circle O shown in the graph below?



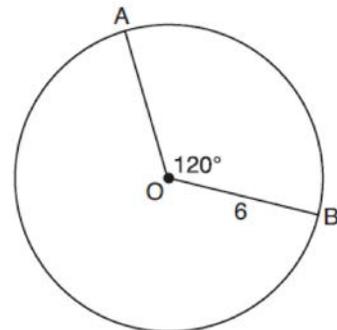
- 1) $x^2 + 10x + y^2 + 4y = -13$
- 2) $x^2 - 10x + y^2 - 4y = -13$
- 3) $x^2 + 10x + y^2 + 4y = -25$
- 4) $x^2 - 10x + y^2 - 4y = -25$

- 21 In the diagram below of $\triangle PQR$, \overline{ST} is drawn parallel to \overline{PR} , $PS = 2$, $SQ = 5$, and $TR = 5$.



What is the length of \overline{QR} ?

- 1) 7
 - 2) 2
 - 3) $12\frac{1}{2}$
 - 4) $17\frac{1}{2}$
- 22 The diagram below shows circle O with radii \overline{OA} and \overline{OB} . The measure of angle AOB is 120° , and the length of a radius is 6 inches.

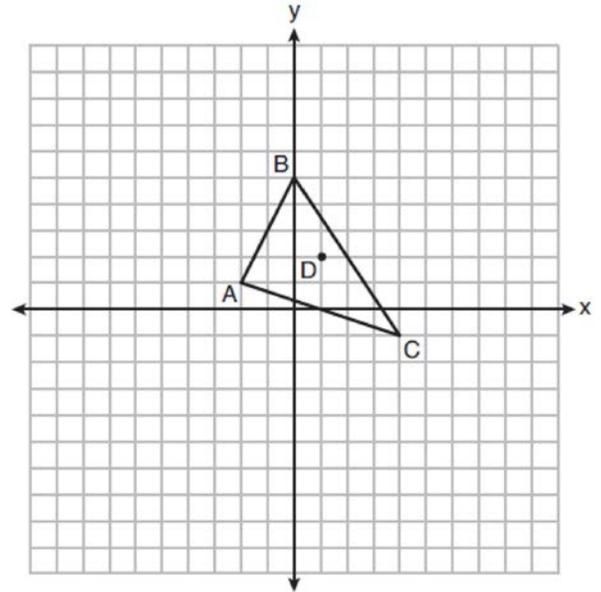


Which expression represents the length of arc AB , in inches?

- 1) $\frac{120}{360}(6\pi)$
- 2) $120(6)$
- 3) $\frac{1}{3}(36\pi)$
- 4) $\frac{1}{3}(12\pi)$

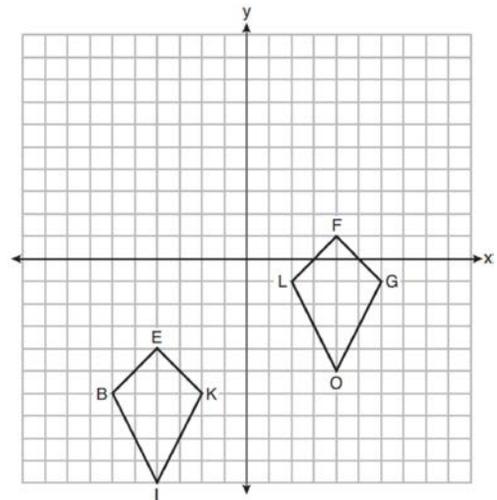
- 23 Line segment \overline{CD} is the altitude drawn to hypotenuse \overline{EF} in right triangle ECF . If $EC = 10$ and $EF = 24$, then, to the nearest tenth, ED is
- 1) 4.2
 - 2) 5.4
 - 3) 15.5
 - 4) 21.8
- 24 Line \overleftrightarrow{MN} is dilated by a scale factor of 2 centered at the point $(0,6)$. If \overleftrightarrow{MN} is represented by $y = -3x + 6$, which equation can represent $\overleftrightarrow{M'N'}$, the image of \overleftrightarrow{MN} ?
- 1) $y = -3x + 12$
 - 2) $y = -3x + 6$
 - 3) $y = -6x + 12$
 - 4) $y = -6x + 6$
- 25 Triangle $A'B'C'$ is the image of triangle ABC after a translation of 2 units to the right and 3 units up. Is triangle ABC congruent to triangle $A'B'C'$? Explain why.

- 26 Triangle ABC and point $D(1,2)$ are graphed on the set of axes below.



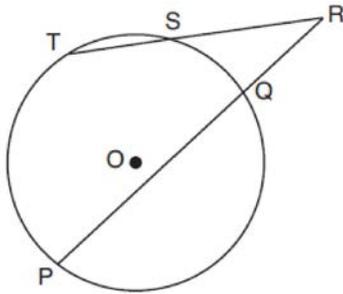
Graph and label $\triangle A'B'C'$, the image of $\triangle ABC$, after a dilation of scale factor 2 centered at point D .

- 27 Quadrilaterals $BIKE$ and $GOLF$ are graphed on the set of axes below.



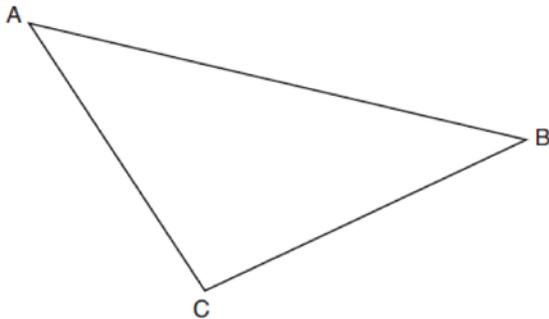
Describe a sequence of transformations that maps quadrilateral $BIKE$ onto quadrilateral $GOLF$.

- 28 In the diagram below, secants \overline{RST} and \overline{RQP} , drawn from point R , intersect circle O at $S, T, Q,$ and P .

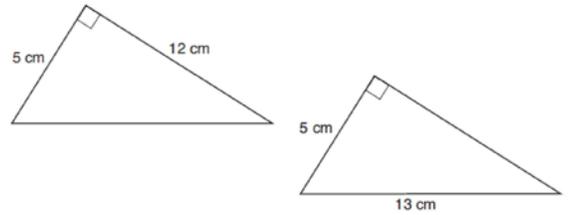


If $\overline{RS} = 6$, $\overline{ST} = 4$, and $\overline{RP} = 15$, what is the length of \overline{RQ} ?

- 29 Using a compass and straightedge, construct the median to side \overline{AC} in $\triangle ABC$ below. [Leave all construction marks.]

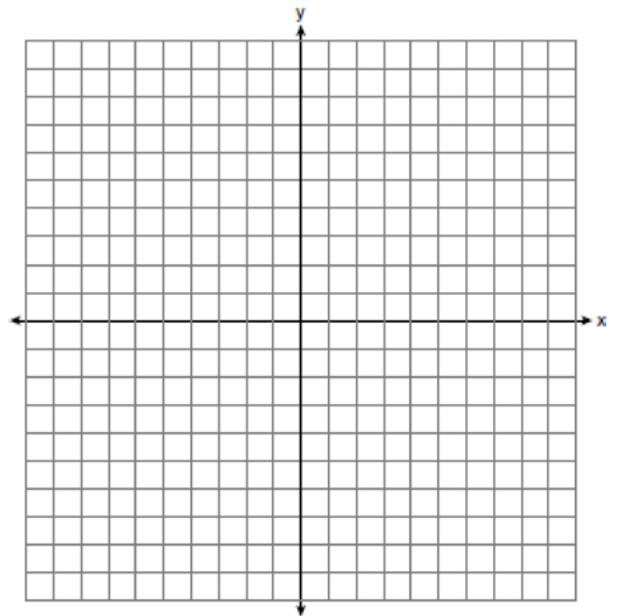


- 30 Skye says that the two triangles below are congruent. Margaret says that the two triangles are similar.

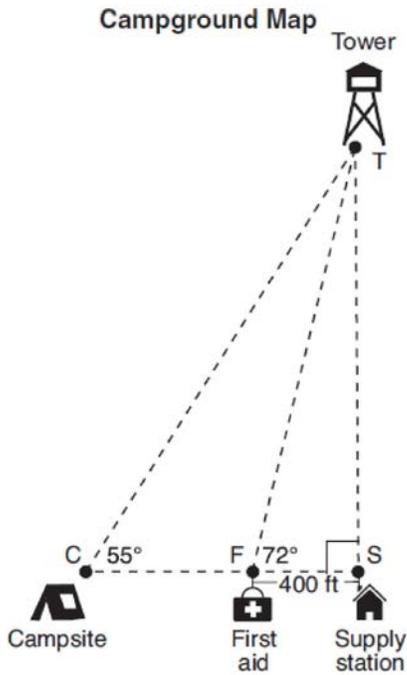


Are Skye and Margaret both correct? Explain why.

- 31 Randy's basketball is in the shape of a sphere with a maximum circumference of 29.5 inches. Determine and state the volume of the basketball, to the *nearest cubic inch*.
- 32 Triangle ABC has vertices with coordinates $A(-1,-1)$, $B(4,0)$, and $C(0,4)$. Prove that $\triangle ABC$ is an isosceles triangle but *not* an equilateral triangle. [The use of the set of axes below is optional.]

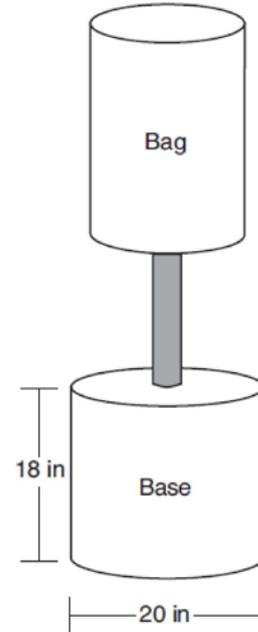


- 33 The map of a campground is shown below. Campsite C , first aid station F , and supply station S lie along a straight path. The path from the supply station to the tower, T , is perpendicular to the path from the supply station to the campsite. The length of path \overline{FS} is 400 feet. The angle formed by path \overline{TF} and path \overline{FS} is 72° . The angle formed by path \overline{TC} and path \overline{CS} is 55° .



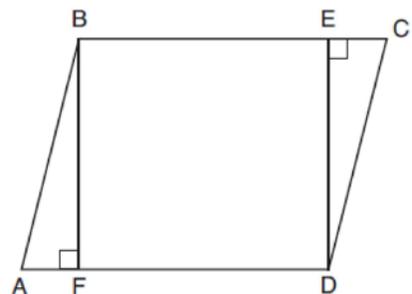
Determine and state, to the *nearest foot*, the distance from the campsite to the tower.

- 34 Shae has recently begun kickboxing and purchased training equipment as modeled in the diagram below. The total weight of the bag, pole, and unfilled base is 270 pounds. The cylindrical base is 18 inches tall with a diameter of 20 inches. The dry sand used to fill the base weighs 95.46 lbs per cubic foot.



To the *nearest pound*, determine and state the total weight of the training equipment if the base is filled to 85% of its capacity.

- 35 Given: Parallelogram $ABCD$, $\overline{BF} \perp \overline{AFD}$, and $\overline{DE} \perp \overline{BEC}$



Prove: $BEDF$ is a rectangle

0618geo

Answer Section

1 ANS: 1 PTS: 2 REF: 061801geo NAT: G.CO.B.6
TOP: Properties of Transformations KEY: graphics

2 ANS: 3 PTS: 2 REF: 061802geo NAT: G.CO.C.9
TOP: Lines and Angles

3 ANS: 4 PTS: 2 REF: 061803geo NAT: G.CO.A.2
TOP: Identifying Transformations KEY: graphics

4 ANS: 3

$$\triangle CFB \sim \triangle CAD \quad \frac{CB}{CF} = \frac{CD}{CA}$$

$$\frac{x}{21.6} = \frac{7.2}{9.6}$$

$$x = 16.2$$

PTS: 2 REF: 061804geo NAT: G.SRT.B.5 TOP: Similarity
KEY: basic

5 ANS: 4
 $9 \cdot 3 = 27, 27 \cdot 4 = 108$

PTS: 2 REF: 061805geo NAT: G.SRT.A.2 TOP: Dilations

6 ANS: 2

$$\cos B = \frac{17.6}{26}$$

$$B \approx 47$$

PTS: 2 REF: 061806geo NAT: G.SRT.C.8 TOP: Using Trigonometry to Find an Angle

7 ANS: 1

$$20 \cdot 12 \cdot 45 + \frac{1}{2} \pi (10)^2 (45) \approx 17869$$

PTS: 2 REF: 061807geo NAT: G.GMD.A.3 TOP: Volume
KEY: compositions

8 ANS: 1

$$2x + 4 + 46 = 90$$

$$2x = 40$$

$$x = 20$$

PTS: 2 REF: 061808geo NAT: G.SRT.C.7 TOP: Cofunctions

9 ANS: 4
AA

PTS: 2 REF: 061809geo NAT: G.SRT.A.3 TOP: Similarity Proofs

10 ANS: 1

$$82.8 = \frac{1}{3}(4.6)(9)h$$

$$h = 6$$

PTS: 2 REF: 061810geo NAT: G.GMD.A.3 TOP: Volume

KEY: pyramids

11 ANS: 2

$$\triangle ACB \sim \triangle AED$$

PTS: 2 REF: 061811geo NAT: G.SRT.B.5 TOP: Similarity

KEY: basic

12 ANS: 2

$$m = \frac{3}{2}$$

$$m_{\perp} = -\frac{2}{3}$$

PTS: 2 REF: 061812geo NAT: G.GPE.B.5 TOP: Parallel and Perpendicular Lines

KEY: write equation of perpendicular line

13 ANS: 4 PTS: 2 REF: 061813geo NAT: G.CO.C.11

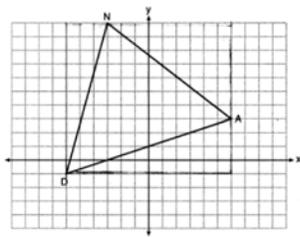
TOP: Special Quadrilaterals

14 ANS: 2

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

PTS: 2 REF: 061814geo NAT: G.GPE.B.6 TOP: Directed Line Segments

15 ANS: 1



$$(12 \cdot 11) - \left(\frac{1}{2}(12 \cdot 4) + \frac{1}{2}(7 \cdot 9) + \frac{1}{2}(11 \cdot 3) \right) = 60$$

PTS: 2 REF: 061815geo NAT: G.GPE.B.7 TOP: Polygons in the Coordinate Plane

16 ANS: 3 PTS: 2 REF: 061816geo NAT: G.GMD.B.4

TOP: Rotations of Two-Dimensional Objects

17 ANS: 3

$$\frac{x+72}{2} = 58$$

$$x+72 = 116$$

$$x = 44$$

PTS: 2 REF: 061817geo NAT: G.C.A.2 TOP: Chords, Secants and Tangents

KEY: intersecting chords, angle

18 ANS: 1

M is a centroid, and cuts each median 2:1.

PTS: 2 REF: 061818geo NAT: G.CO.C.10

TOP: Centroid, Orthocenter, Incenter and Circumcenter

19 ANS: 3

$$\frac{360^\circ}{5} = 72^\circ \quad 216^\circ \text{ is a multiple of } 72^\circ$$

PTS: 2 REF: 061819geo NAT: G.CO.A.3 TOP: Mapping a Polygon onto Itself

20 ANS: 2

$$(x-5)^2 + (y-2)^2 = 16$$

$$x^2 - 10x + 25 + y^2 - 4y + 4 = 16$$

$$x^2 - 10x + y^2 - 4y = -13$$

PTS: 2 REF: 061820geo NAT: G.GPE.A.1 TOP: Equations of Circles

KEY: write equation, given graph

21 ANS: 4

$$\frac{5}{7} = \frac{x}{x+5} \quad 12\frac{1}{2} + 5 = 17\frac{1}{2}$$

$$5x + 25 = 7x$$

$$2x = 25$$

$$x = 12\frac{1}{2}$$

PTS: 2 REF: 061821geo NAT: G.SRT.B.5 TOP: Side Splitter Theorem

22 ANS: 4

$$C = 12\pi \frac{120}{360} (12\pi) = \frac{1}{3} (12\pi)$$

PTS: 2 REF: 061822geo NAT: G.C.B.5 TOP: Arc Length

KEY: arc length

23 ANS: 1
 $24x = 10^2$
 $24x = 100$
 $x \approx 4.2$

PTS: 2 REF: 061823geo NAT: G.SRT.B.5 TOP: Similarity
 KEY: leg

24 ANS: 2
 The line $y = -3x + 6$ passes through the center of dilation, so the dilated line is not distinct.

PTS: 2 REF: 061824geo NAT: G.SRT.A.1 TOP: Line Dilations

25 ANS:
 Yes, as translations do not change angle measurements.

PTS: 2 REF: 061825geo NAT: G.CO.B.6 TOP: Properties of Transformations
 KEY: basic

26 ANS:
 $A(-2, 1) \rightarrow (-3, -1) \rightarrow (-6, -2) \rightarrow (-5, 0)$, $B(0, 5) \rightarrow (-1, 3) \rightarrow (-2, 6) \rightarrow (-1, 8)$,
 $C(4, -1) \rightarrow (3, -3) \rightarrow (6, -6) \rightarrow (7, -4)$

PTS: 2 REF: 061826geo NAT: G.SRT.A.2 TOP: Dilations

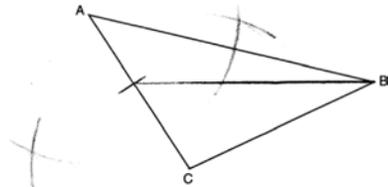
27 ANS:
 Reflection across the y -axis, then translation up 5.

PTS: 2 REF: 061827geo NAT: G.CO.A.5 TOP: Compositions of Transformations
 KEY: grids

28 ANS:
 $10 \cdot 6 = 15x$
 $x = 4$

PTS: 2 REF: 061828geo NAT: G.C.A.2 TOP: Chords, Secants and Tangents
 KEY: secants drawn from common point, length

29 ANS:



PTS: 2 REF: 061829geo NAT: G.CO.D.12 TOP: Constructions
 KEY: line bisector

30 ANS:
 Yes. The triangles are congruent because of SSS ($5^2 + 12^2 = 13^2$). All congruent triangles are similar.

PTS: 2 REF: 061830geo NAT: G.SRT.B.5 TOP: Triangle Congruency

31 ANS:

$$29.5 = 2\pi r \quad V = \frac{4}{3} \pi \cdot \left(\frac{29.5}{2\pi}\right)^3 \approx 434$$

$$r = \frac{29.5}{2\pi}$$

PTS: 2

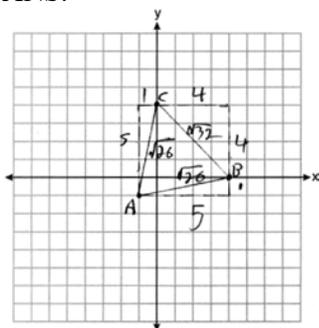
REF: 061831geo

NAT: G.GMD.A.3

TOP: Volume

KEY: spheres

32 ANS:



Because $\overline{AB} \cong \overline{AC}$, $\triangle ABC$ has two congruent sides and is isosceles. Because $\overline{AB} \cong \overline{BC}$ is not true, $\triangle ABC$ has sides that are not congruent and $\triangle ABC$ is not equilateral.

PTS: 4

REF: 061832geo

NAT: G.GPE.B.4

TOP: Triangles in the Coordinate Plane

33 ANS:

$$\tan 72 = \frac{x}{400} \quad \sin 55 = \frac{400 \tan 72}{y}$$

$$x = 400 \tan 72 \quad y = \frac{400 \tan 72}{\sin 55} \approx 1503$$

PTS: 4

REF: 061833geo

NAT: G.SRT.C.8

TOP: Using Trigonometry to Find a Side

KEY: advanced

34 ANS:

$$V = \pi(10)^2(18) = 1800\pi \text{ in}^3 \quad 1800\pi \text{ in}^3 \left(\frac{1 \text{ ft}^3}{12^3 \text{ in}^3}\right) = \frac{25}{24} \pi \text{ ft}^3 \quad \frac{25}{24} \pi(95.46)(0.85) \approx 266 \quad 266 + 270 = 536$$

PTS: 4

REF: 061834geo

NAT: G.MG.A.2

TOP: Density

35 ANS:

Parallelogram $ABCD$, $\overline{BF} \perp \overline{AFD}$, and $\overline{DE} \perp \overline{BEC}$ (given); $\overline{BC} \parallel \overline{AD}$ (opposite sides of a \square are \parallel); $\overline{BE} \parallel \overline{FD}$ (parts of \parallel lines are \parallel); $\overline{BF} \parallel \overline{DE}$ (two lines \perp to the same line are \parallel); $BEDF$ is \square (a quadrilateral with both pairs of opposite sides \parallel is a \square); $\angle DEB$ is a right \angle (\perp lines form right \angle s); $BEDF$ is a rectangle (a \square with one right \angle is a rectangle).

PTS: 6

REF: 061835geo

NAT: G.CO.C.11

TOP: Quadrilateral Proofs