# JMAP
REGENTS AT RANDOM

NY Geometry CCSS Regents Exam Questions
from Fall 2014-January 2017

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Geometry Common Core State Standards Regents at Random

1 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.
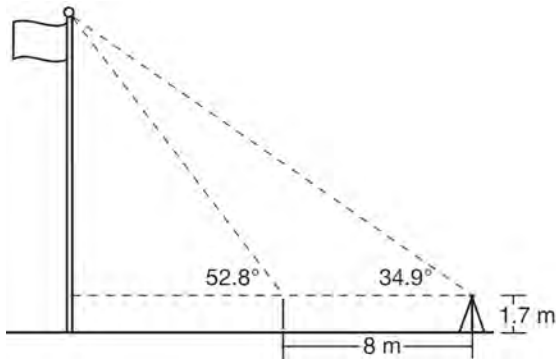
Determine and state, to the *nearest tenth of a meter*, the height of the flagpole.

2 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.

3 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

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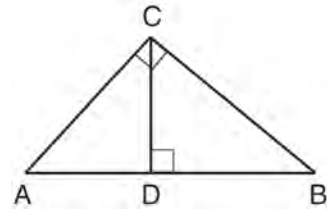
Which lengths would *not* produce an altitude that measures $6\sqrt{2}$?
1) $AD = 2$ and $DB = 36$
2) $AD = 3$ and $AB = 24$
3) $AD = 6$ and $DB = 12$
4) $AD = 8$ and $AB = 17$

5 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

6 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

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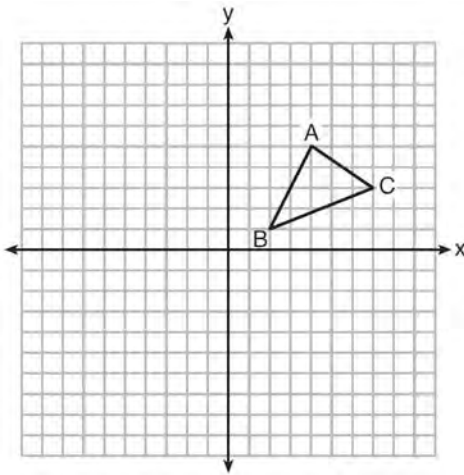
What is the slope of the altitude drawn from A to $\overline{BC}$?

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

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

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

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

8   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) $y = 2x + 6$

9   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.

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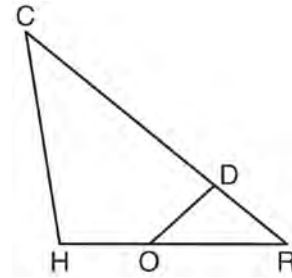
If $RD = 4$, $RO = 6$, and $OH = 4$, what is the length of $\overline{CD}$?

1) $2\dfrac{2}{3}$

2) $6\dfrac{2}{3}$

3) 11

4) 15

11   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?
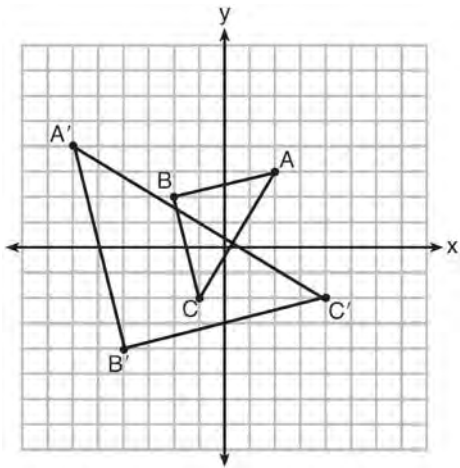
1) 15

2) 16

3) 31

4) 32

12 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: $\triangle ABC \cong \triangle DEC$
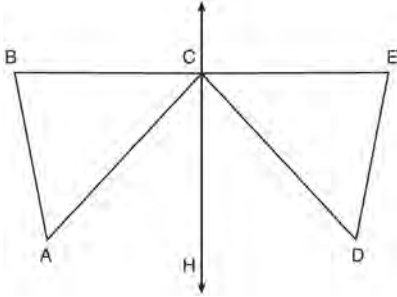
13 Which sequence of transformations will map $\triangle ABC$ onto $\triangle A'B'C'$?

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

14 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

15 In the diagram below of circle O, $GO = 8$ and $m\angle GOJ = 60°$.
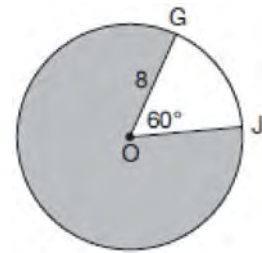
What is the area, in terms of π, of the shaded region?

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

2) $\dfrac{20\pi}{3}$

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

4) $\dfrac{160\pi}{3}$

16 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

3

17 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.
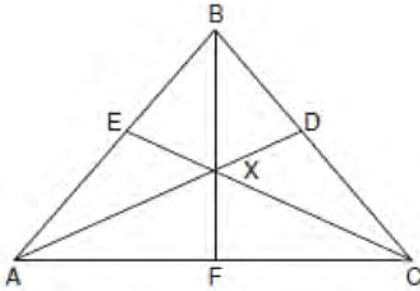

If m$\angle BAC = 50°$, find m$\angle AXC$.

18 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

19 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

20 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

21 Triangle QRS is graphed on the set of axes below.
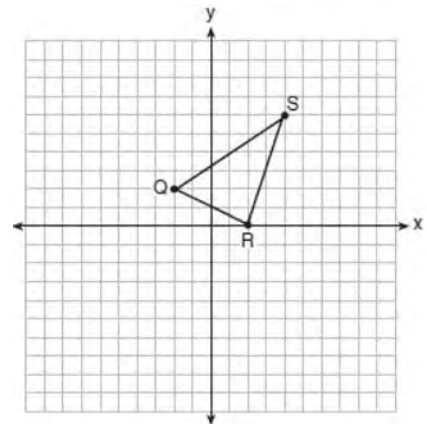
On the same set of axes, graph and label $\triangle Q'R'S'$, the image of $\triangle QRS$ after a dilation with a scale factor of $\frac{3}{2}$ centered at the origin. Use slopes to explain why $Q'R' \parallel QR$.

4

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

1)

2)

3)

4)
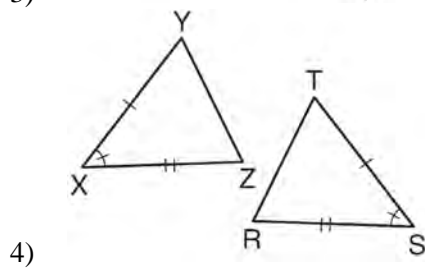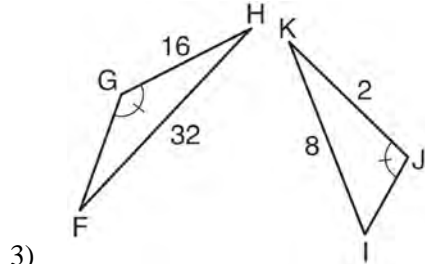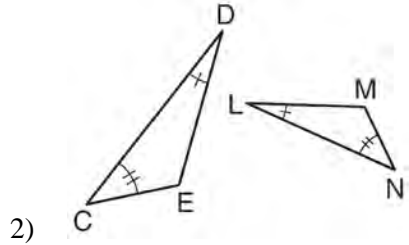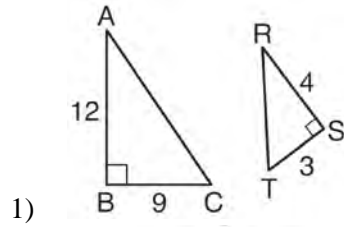
23 In parallelogram $ABCD$, diagonals $\overline{AC}$ and $\overline{BD}$ intersect at E. Which statement does *not* prove parallelogram $ABCD$ is a rhombus?
1) $\overline{AC} \cong \overline{DB}$
2) $\overline{AB} \cong \overline{BC}$
3) $\overline{AC} \perp \overline{DB}$
4) $\overline{AC}$ bisects $\angle DCB$

24 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) $(6,0)$

25 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

26 In the diagram below, tangent $\overline{DA}$ and secant $\overline{DBC}$ are drawn to circle O from external point D, such that $\overset{\frown}{AC} \cong \overset{\frown}{BC}$.
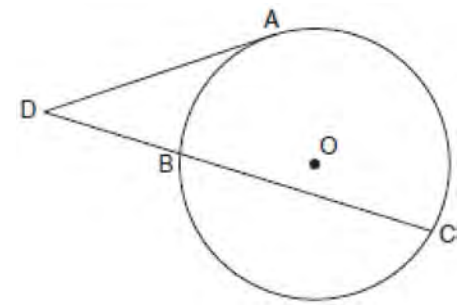
If $m\overset{\frown}{BC} = 152°$, determine and state $m\angle D$.
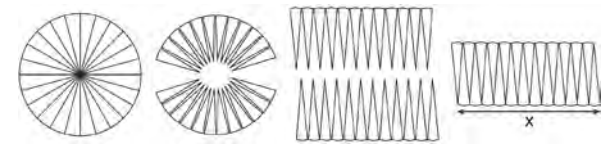
5

27 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. $(AC \cdot AD = AB^2)$
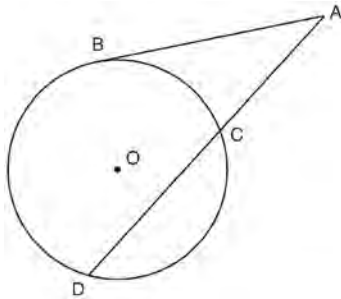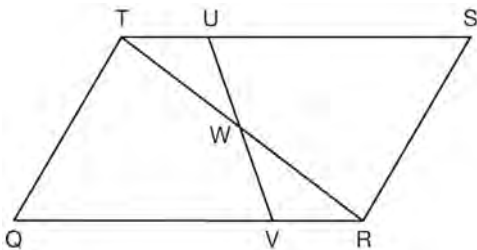
28 In parallelogram $QRST$ shown below, diagonal $\overline{TR}$ is drawn, U and V are points on $\overline{TS}$ and $\overline{QR}$, respectively, and $\overline{UV}$ intersects $\overline{TR}$ at W.

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°

29 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.

30 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) $y = 2x + 1$

31 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.]
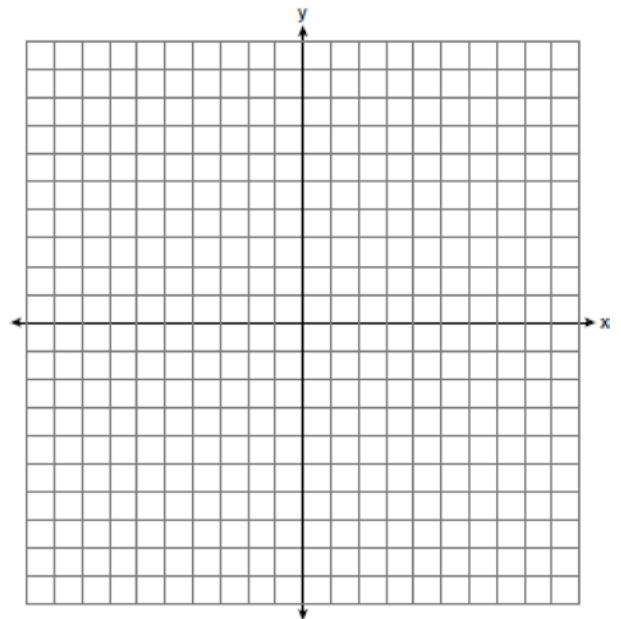
32 Line segment *EA* is the perpendicular bisector of $\overline{ZT}$, and $\overline{ZE}$ and $\overline{TE}$ are drawn.
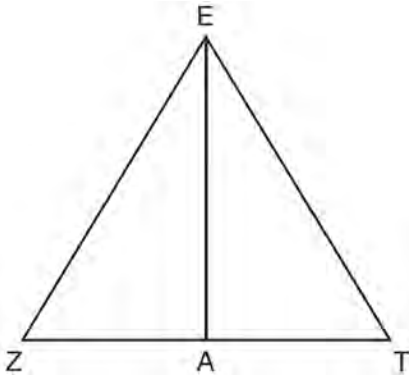
Which conclusion can *not* be proven?
1) $\overline{EA}$ bisects angle *ZET*.
2) Triangle *EZT* is equilateral.
3) $\overline{EA}$ is a median of triangle *EZT*.
4) Angle *Z* is congruent to angle *T*.

33 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
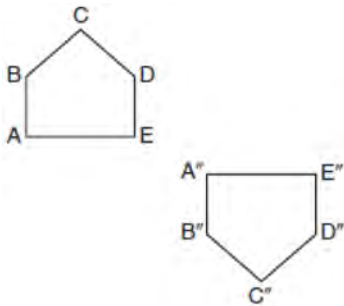4) line reflection followed by a line reflection

34 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.
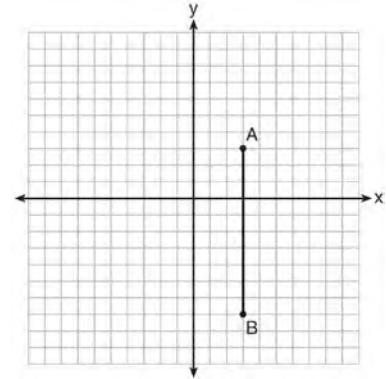
What could be a correct equation for circle *O*?
1) $(x-1)^2 + (y+2)^2 = 29$
2) $(x+5)^2 + (y-2)^2 = 29$
3) $(x-1)^2 + (y-2)^2 = 25$
4) $(x-5)^2 + (y+2)^2 = 25$

35 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.

7

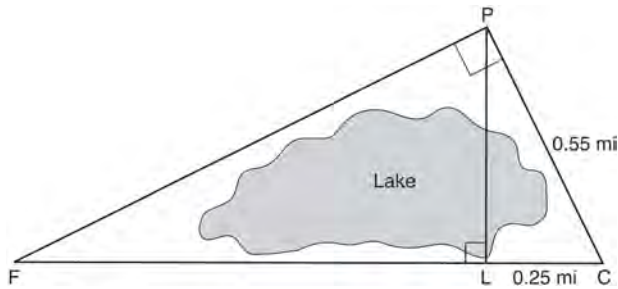36 In the diagram below, the line of sight from the park ranger station, *P*, to the lifeguard chair, *L*, on the beach of a lake is perpendicular to the path joining the campground, *C*, and the first aid station, *F*. The campground is 0.25 mile from the lifeguard chair. The straight paths from both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

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

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

38 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.

39 Using a straightedge and compass, construct a square inscribed in circle *O* below. [Leave all construction marks.]
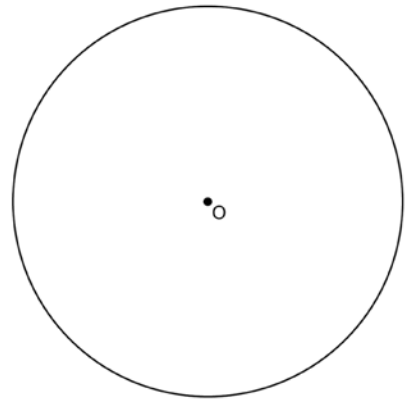
Determine the measure of the arc intercepted by two adjacent sides of the constructed square. Explain your reasoning.

40 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

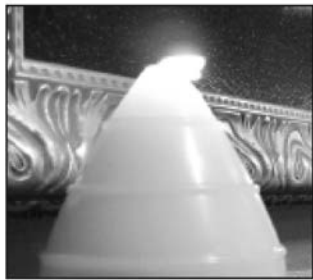41 Point P is on the directed line segment from point $X(-6,-2)$ to point $Y(6,7)$ and divides the segment in the ratio $1:5$. What are the coordinates of point P?

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

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

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

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

42 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.

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

44 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$\angle AOC$.
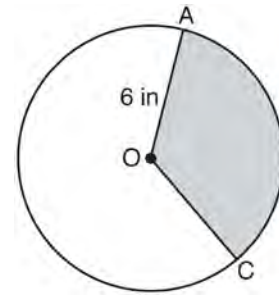
45 What are the coordinates of the center and length of the radius of the circle whose equation is $x^2 + 6x + y^2 - 4y = 23$?

1) $(3,-2)$ and 36
2) $(3,-2)$ and 6
3) $(-3,2)$ and 36
4) $(-3,2)$ and 6

46 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 $PC = 10$.
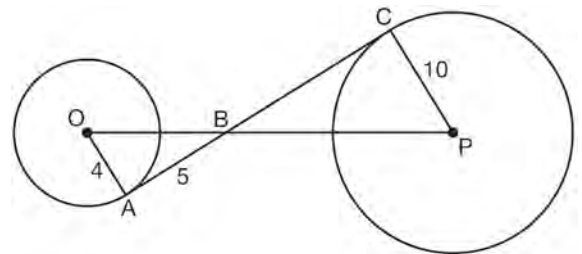
What is the length of $\overline{BC}$?

1) 6.4
2) 8
3) 12.5
4) 16

9

47 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

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

49 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?
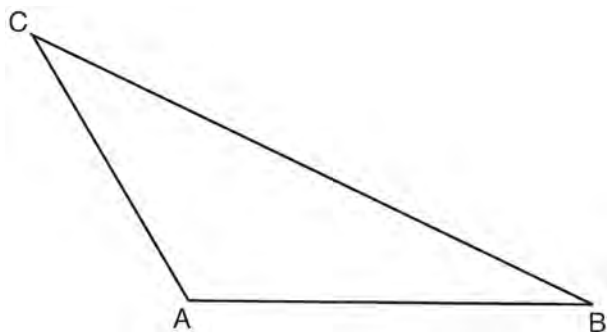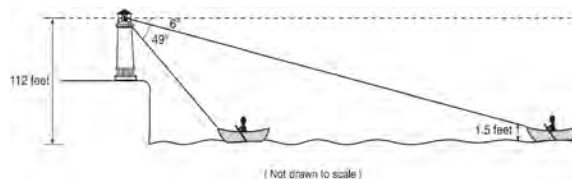1) 1,632
2) 408
3) 102
4) 92

50 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.

51 In the diagram below, $\triangle ABC$ and $\triangle XYZ$ are graphed.
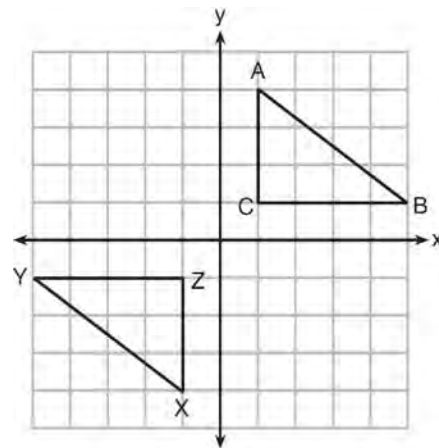
Use the properties of rigid motions to explain why $\triangle ABC \cong \triangle XYZ$.

10

52 In the diagram below, congruent figures 1, 2, and 3 are drawn.
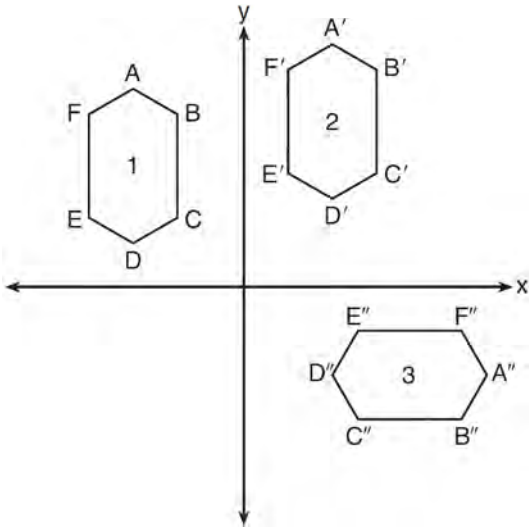
Which sequence of transformations maps figure 1 onto figure 2 and then figure 2 onto figure 3?
1) a reflection followed by a translation
2) a rotation followed by a translation
3) a translation followed by a reflection
4) a translation followed by a rotation

53 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

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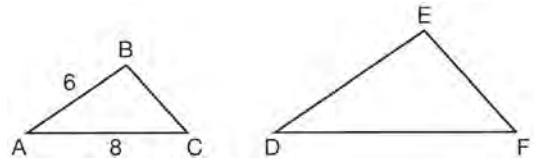
If $AB = 6$ and $AC = 8$, which statement will justify similarity by SAS?
1) $DE = 9$, $DF = 12$, and $\angle A \cong \angle D$
2) $DE = 8$, $DF = 10$, and $\angle A \cong \angle D$
3) $DE = 36$, $DF = 64$, and $\angle C \cong \angle F$
4) $DE = 15$, $DF = 20$, and $\angle C \cong \angle F$

55 Triangle RST is graphed on the set of axes below.
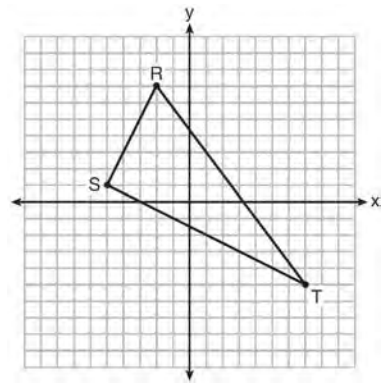
How many square units are in the area of $\triangle RST$?
1) $9\sqrt{3} + 15$
2) $9\sqrt{5} + 15$
3) 45
4) 90

11

56 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

57 In the diagram of $\triangle LAC$ and $\triangle DNC$ below, $\overline{LA} \cong \overline{DN}$, $\overline{CA} \cong \overline{CN}$, and $\overline{DAC} \perp \overline{LCN}$.
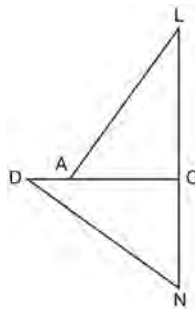
   a) Prove that $\triangle LAC \cong \triangle DNC$.
   b) Describe a sequence of rigid motions that will map $\triangle LAC$ onto $\triangle DNC$.

58 As shown in the diagram below, circle A has a radius of 3 and circle B has a radius of 5.
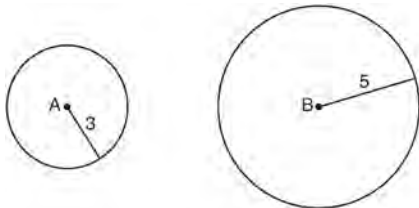
   Use transformations to explain why circles A and B are similar.

59 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.]
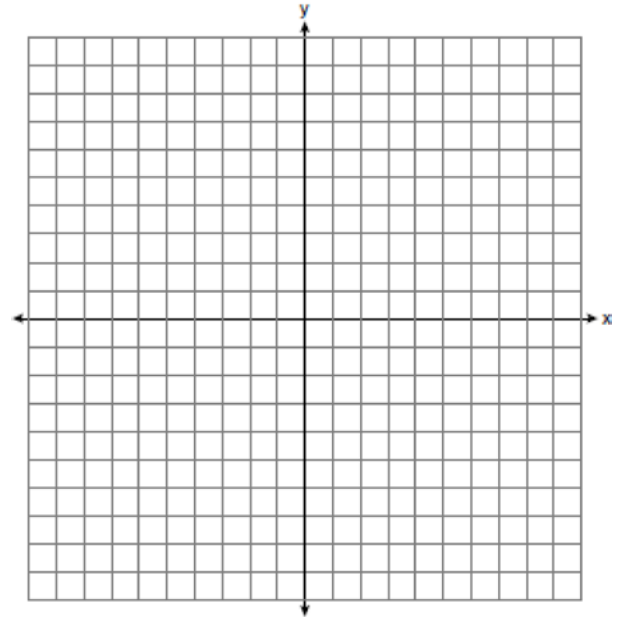
60 In the diagram of parallelogram $ABCD$ below, $\overline{BE} \perp \overline{CED}$, $\overline{DF} \perp \overline{BFC}$, $\overline{CE} \cong \overline{CF}$.
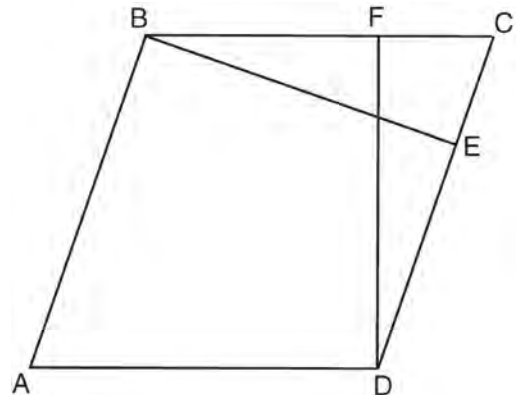
   Prove $ABCD$ is a rhombus.

12

61 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.
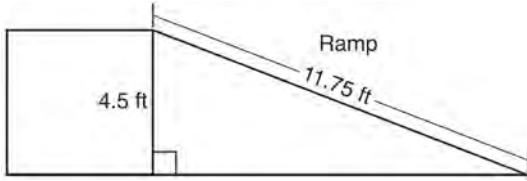
Determine and state, to the *nearest degree*, the angle of elevation formed by the ramp and the ground.

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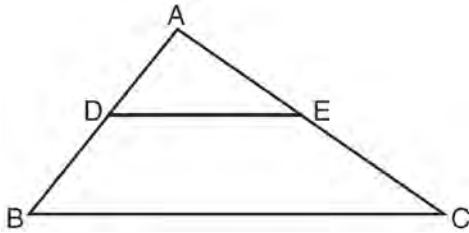
Which measurements are justified by this similarity?
1) $AD = 3$, $AB = 6$, $AE = 4$, and $AC = 12$
2) $AD = 5$, $AB = 8$, $AE = 7$, and $AC = 10$
3) $AD = 3$, $AB = 9$, $AE = 5$, and $AC = 10$
4) $AD = 2$, $AB = 6$, $AE = 5$, and $AC = 15$

63 The line $y = 2x - 4$ is dilated by a scale factor of $\dfrac{3}{2}$ 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) $y = 3x - 6$

64 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 $\overline{AH}$.
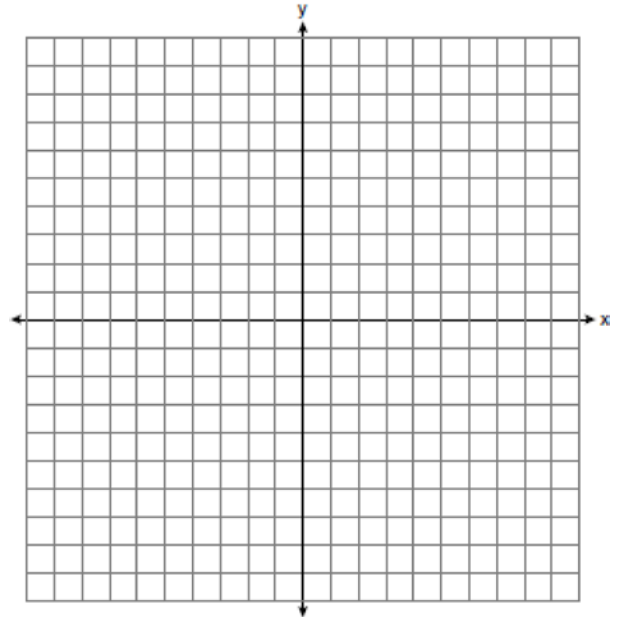
65 Two stacks of 23 quarters each are shown below. One stack forms a cylinder but the other stack does not form a cylinder.
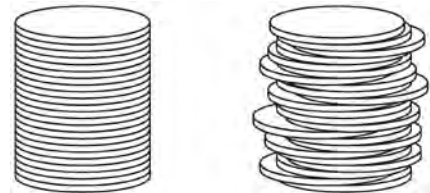
Use Cavelieri's principle to explain why the volumes of these two stacks of quarters are equal.

13

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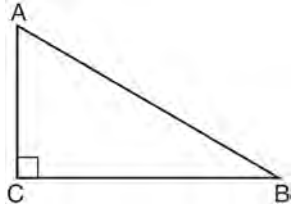
Which equation is always true?
1) $\sin A = \sin B$
2) $\cos A = \cos B$
3) $\cos A = \sin C$
4) $\sin A = \cos B$

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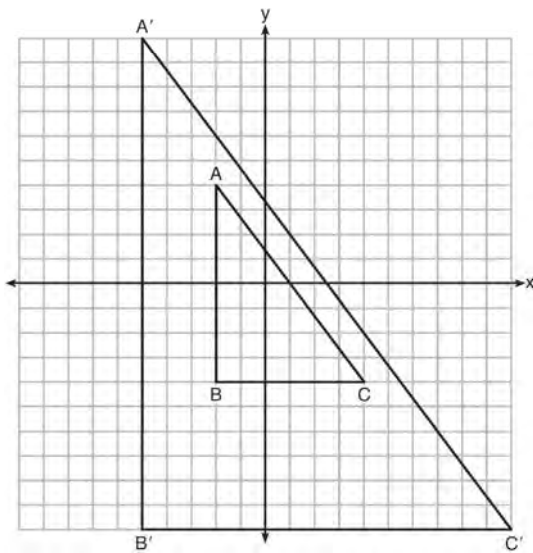
Describe the transformation that was performed. Explain why $\triangle A'B'C' \sim \triangle ABC$.

68 A regular pentagon is shown in the diagram below.
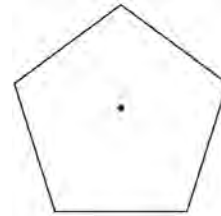
If the pentagon is rotated clockwise around its center, the minimum number of degrees it must be rotated to carry the pentagon onto itself is
1) 54°
2) 72°
3) 108°
4) 360°

69 After a reflection over a line, $\triangle A'B'C'$ is the image of $\triangle ABC$. Explain why triangle ABC is congruent to triangle $\triangle A'B'C'$.

70 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.
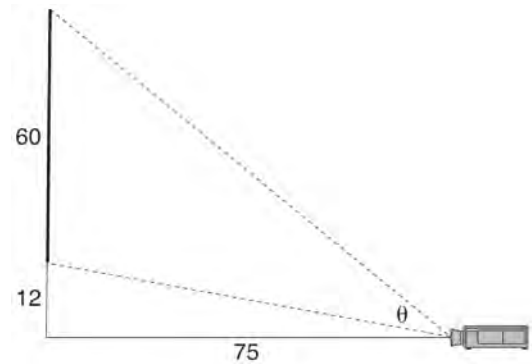
Determine and state, to the *nearest tenth of a degree*, the measure of θ, the projection angle.

14

71 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

72 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

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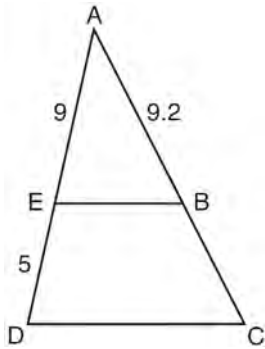
What is the length of $\overline{AC}$, to the *nearest tenth*?
1) 5.1
2) 5.2
3) 14.3
4) 14.4

74 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 $E(0,4)$.
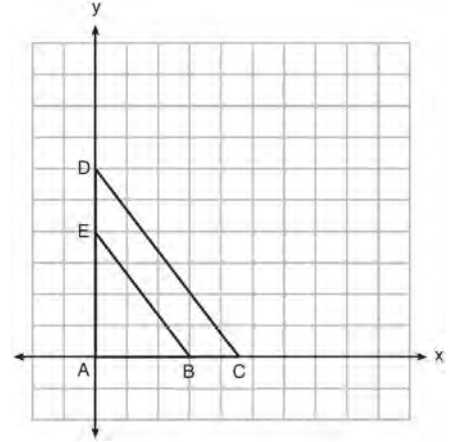
The ratio of the lengths of $\overline{BE}$ to $\overline{CD}$ is
1) $\frac{2}{3}$
2) $\frac{3}{2}$
3) $\frac{3}{4}$
4) $\frac{4}{3}$

75 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*.

76 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

77 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

78 Triangles *ABC* and *DEF* are drawn below.
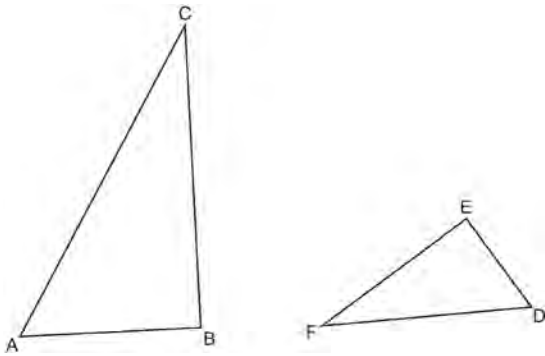
If *AB* = 9, *BC* = 15, *DE* = 6, *EF* = 10, and ∠*B* ≅ ∠*E*, which statement is true?
1) ∠*CAB* ≅ ∠*DEF*
2) $\frac{AB}{CB} = \frac{FE}{DE}$
3) △*ABC* ~ △*DEF*
4) $\frac{AB}{DE} = \frac{FE}{CB}$

79 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)

16
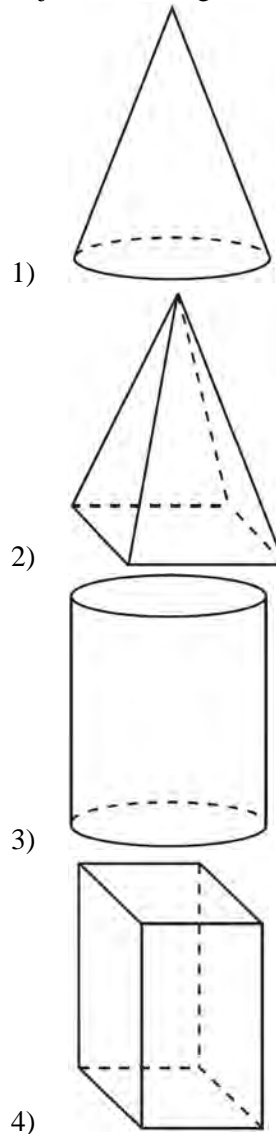
80 Given $\overline{MN}$ shown below, with $M(-6,1)$ and $N(3,-5)$, what is an equation of the line that passes through point $P(6,1)$ and is parallel to $\overline{MN}$?
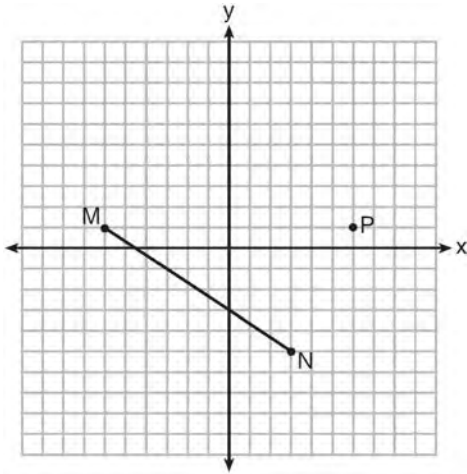
1) $y = -\frac{2}{3}x + 5$

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

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

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

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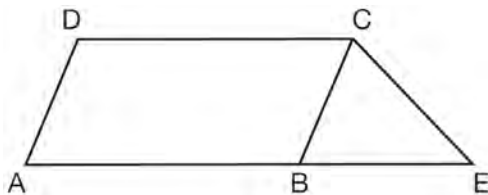
If $\overline{CE} \cong \overline{BE}$ and $m\angle D = 112°$, what is $m\angle E$?
1) 44°
2) 56°
3) 68°
4) 112°

82 Using a compass and straightedge, construct the line of reflection over which triangle RST reflects onto triangle R'S'T'. [Leave all construction marks.]
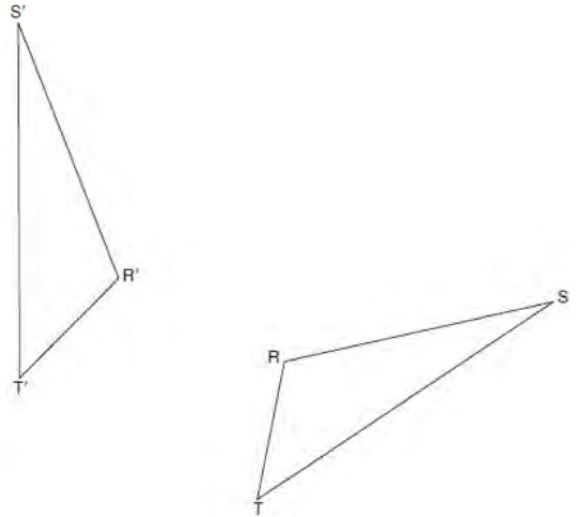
83 In the diagram below of circle O, the area of the shaded sector LOM is 2π cm^2.
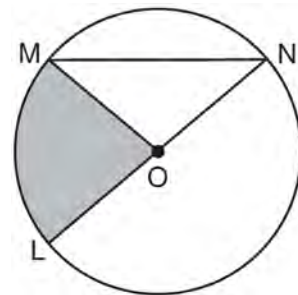
If the length of $\overline{NL}$ is 6 cm, what is $m\angle N$?
1) 10°
2) 20°
3) 40°
4) 80°

17

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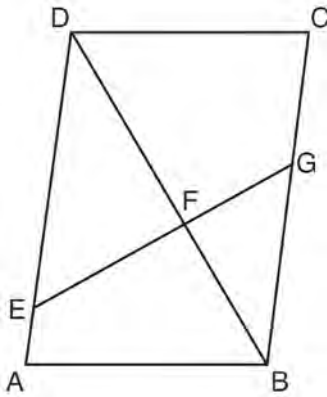
Prove: $\triangle DEF \sim \triangle BGF$

85 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

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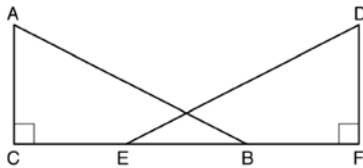
87 As shown in the diagram below, $\overline{AB}$ and $\overline{CD}$ intersect at E, and $\overline{AC} \parallel \overline{BD}$.
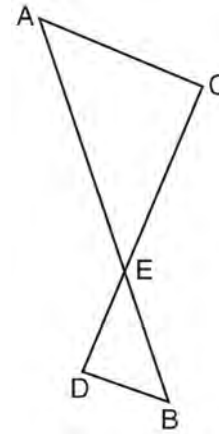
Given $\triangle AEC \sim \triangle BED$, which equation is true?
1) $\dfrac{CE}{DE} = \dfrac{EB}{EA}$
2) $\dfrac{AE}{BE} = \dfrac{AC}{BD}$
3) $\dfrac{EC}{AE} = \dfrac{BE}{ED}$
4) $\dfrac{ED}{EC} = \dfrac{AC}{BD}$

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

89 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 $\dfrac{AE}{AC}$ centered at point A.
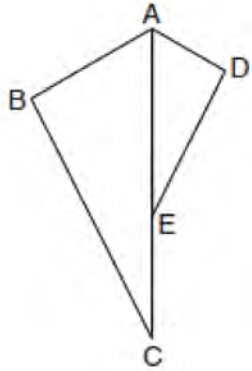
Which statement must be true?
1) $m\angle BAC \cong m\angle AED$
2) $m\angle ABC \cong m\angle ADE$
3) $m\angle DAE \cong \dfrac{1}{2} m\angle BAC$
4) $m\angle ACB \cong \dfrac{1}{2} m\angle DAB$

90 Using a compass and straightedge, construct an altitude of triangle ABC below. [Leave all construction marks.]
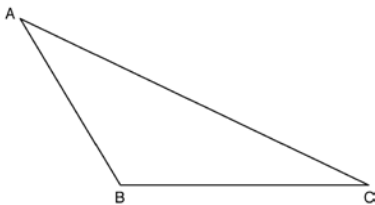
91 In the diagram below, $\overline{GI}$ is parallel to $\overline{NT}$, and $\overline{IN}$ intersects $\overline{GT}$ at A.
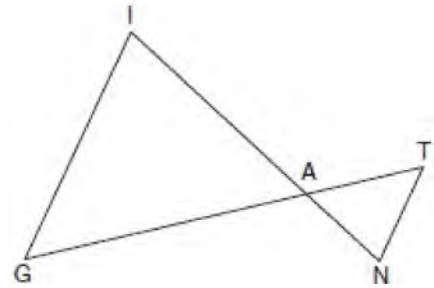
Prove: $\triangle GIA \sim \triangle TNA$

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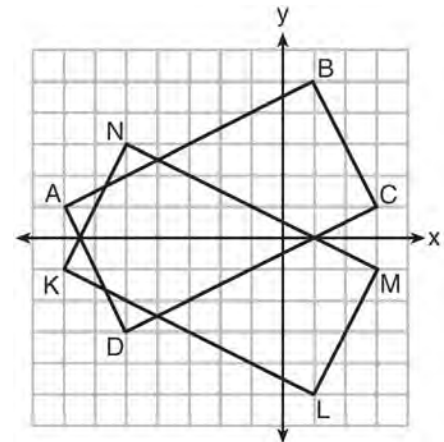
1) rotation
2) translation
3) reflection over the x-axis
4) reflection over the y-axis

19

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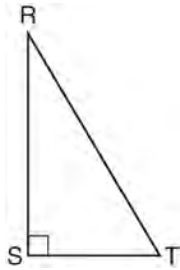
1) a pyramid with a square base
2) an isosceles triangle
3) a right triangle
4) a cone

94 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?
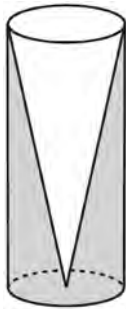
Walter goes to a hobby store to buy the wax for his candles. The wax costs $0.10 per ounce. If the weight of the wax is 0.52 ounce per cubic inch, how much will it cost Walter to buy the wax for 100 candles? If Walter spent a total of $37.83 for the molds and charges $1.95 for each candle, what is Walter's profit after selling 100 candles?

95 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 $1920 \text{ kg}/\text{m}^3$. The maximum capacity of the contractor's trailer is 900 kg. Can the trailer hold the weight of 500 bricks? Justify your answer.

96 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

97 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.

98 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) $y = -x - 3$

20

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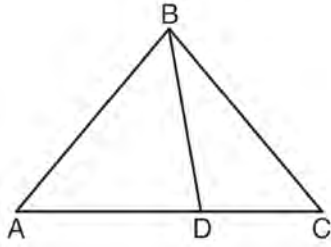
Which statement is true?
1) △ABD is obtuse.
2) △ABC is isosceles.
3) m∠ABD = 80°
4) △ABD is scalene.

100 In the diagram below, $\overline{DB}$ and $\overline{AF}$ intersect at point C, and $\overline{AD}$ and $\overline{FBE}$ are drawn.
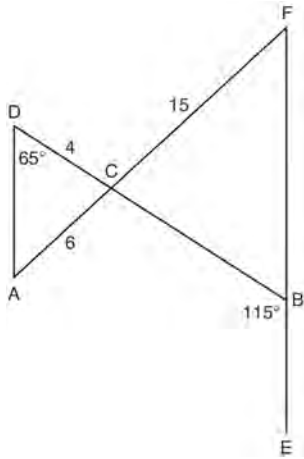
If AC = 6, DC = 4, FC = 15, m∠D = 65°, and m∠CBE = 115°, what is the length of $\overline{CB}$?
1) 10
2) 12
3) 17
4) 22.5

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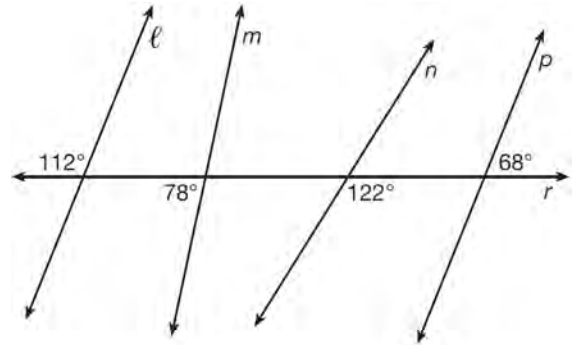
Which statement is true?
1) ℓ ∥ n
2) ℓ ∥ p
3) m ∥ p
4) m ∥ n

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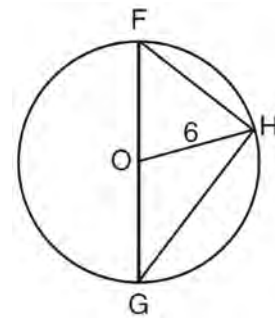
What is the area of the sector formed by angle FOH?
1) 2π
2) $\frac{3}{2}\pi$
3) 6π
4) 24π

21

103 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) $(x,y) \rightarrow (x+2,y-5)$

104 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.]
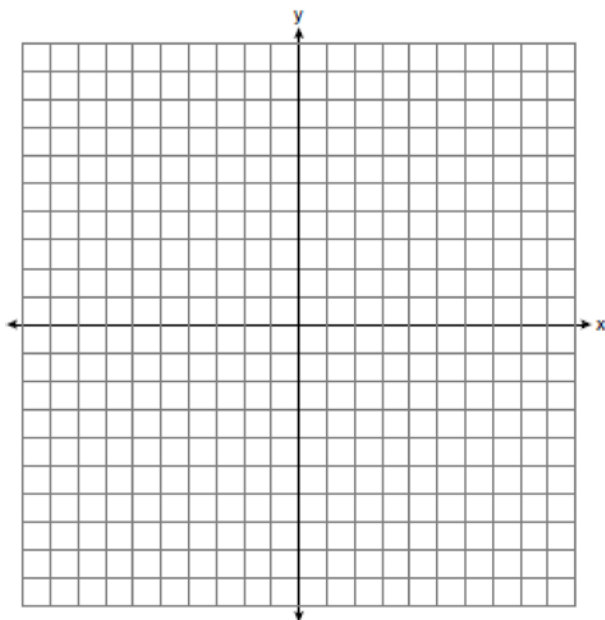
105 A parallelogram is always a rectangle if

1) the diagonals are congruent
2) the diagonals bisect each other
3) the diagonals intersect at right angles
4) the opposite angles are congruent

106 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.
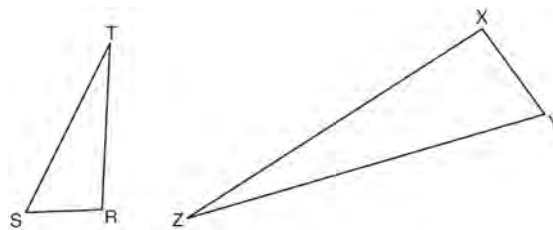
107 In the diagram of parallelogram $FRED$ shown below, $\overline{ED}$ is extended to A, and $\overline{AF}$ is drawn such that $\overline{AF} \cong \overline{DF}$.
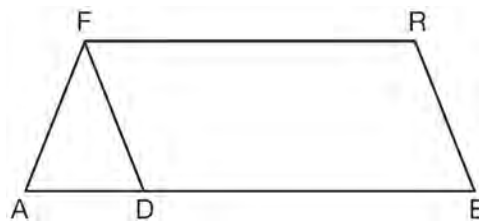
If $m\angle R = 124°$, what is $m\angle AFD$?

1) $124°$
2) $112°$
3) $68°$
4) $56°$

108 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) $25\sqrt{2}$

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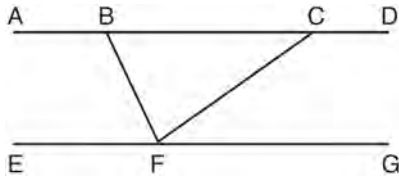
Which statement will allow Steve to prove $\overline{ABCD} \parallel \overline{EFG}$?
1) $\angle CFG \cong \angle FCB$
2) $\angle ABF \cong \angle BFC$
3) $\angle EFB \cong \angle CFB$
4) $\angle CBF \cong \angle GFC$

110 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*.
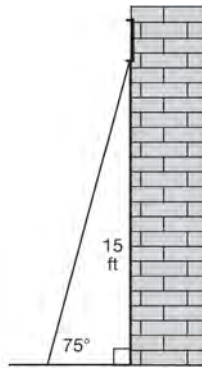
111 Explain why $\cos(x) = \sin(90 - x)$ for *x* such that $0 < x < 90$.

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

113 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

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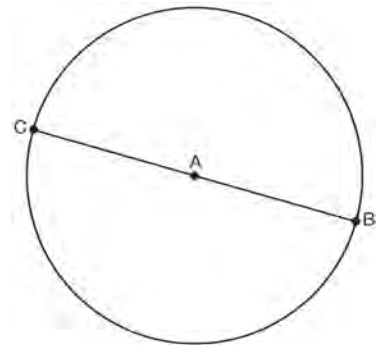
Point *D*, which is unique from points *B* and *C*, is plotted on circle *A*. Which statement must always be true?
1) △*BCD* is a right triangle.
2) △*BCD* is an isosceles triangle.
3) △*BAD* and △*CBD* are similar triangles.
4) △*BAD* and △*CAD* are congruent triangles.

23

115 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.

116 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."
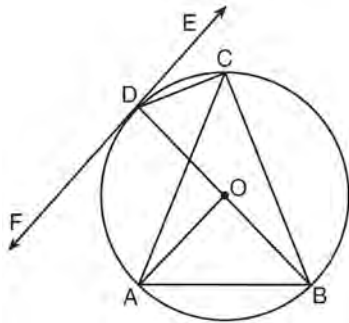
Which angle is Sam referring to?
1) $\angle AOB$
2) $\angle BAC$
3) $\angle DCB$
4) $\angle FDB$

117 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) $y = 3x - 1$

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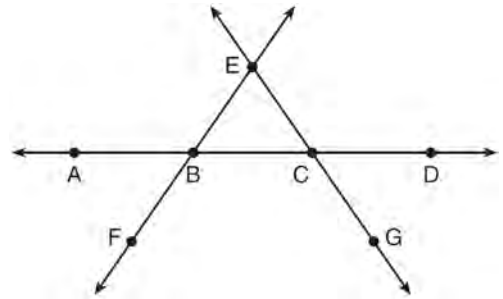
Which statement is always true?
1) $\overline{AB} \cong \overline{DC}$
2) $\overline{FB} \cong \overline{EB}$
3) $\overleftrightarrow{BD}$ bisects $\overline{GE}$ at C.
4) $\overleftrightarrow{AC}$ bisects $\overline{FE}$ at B.

119 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

120 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

24

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

122 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 $\triangle DEF$

123 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.
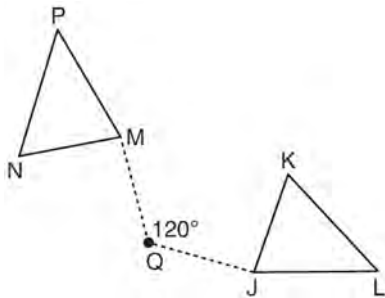
124 Which statement is sufficient evidence that $\triangle DEF$ is congruent to $\triangle ABC$?
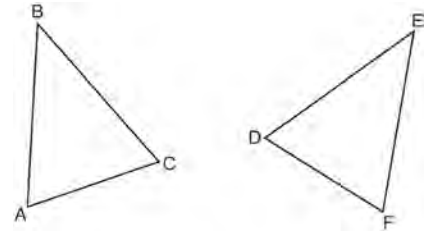
1) $AB = DE$ and $BC = EF$
2) $\angle D \cong \angle A$, $\angle B \cong \angle E$, $\angle C \cong \angle F$
3) There is a sequence of rigid motions that maps $\overline{AB}$ onto $\overline{DE}$, $\overline{BC}$ onto $\overline{EF}$, and $\overline{AC}$ onto $\overline{DF}$.
4) There is a sequence of rigid motions that maps point *A* onto point *D*, $\overline{AB}$ onto $\overline{DE}$, and $\angle B$ onto $\angle E$.

125 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.
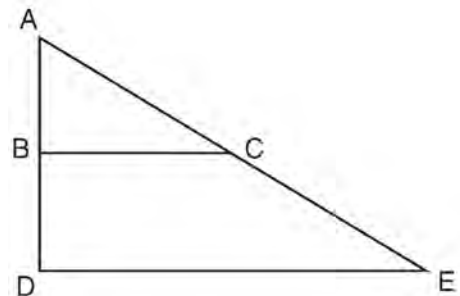
Which statement is always true?

1) $2AB = AD$
2) $\overline{AD} \perp \overline{DE}$
3) $AC = CE$
4) $\overline{BC} \parallel \overline{DE}$

126 Construct an equilateral triangle inscribed in circle *T* shown below. [Leave all construction marks.]
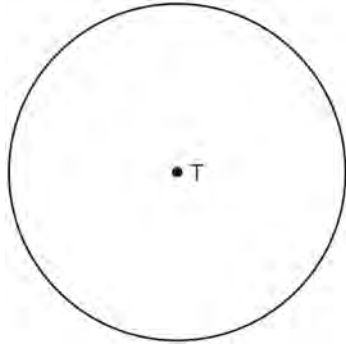
127 The equation of a circle is $x^2 + y^2 + 6y = 7$. What are the coordinates of the center and the length of the radius of the circle?
1) center $(0,3)$ and radius 4
2) center $(0,-3)$ and radius 4
3) center $(0,3)$ and radius 16
4) center $(0,-3)$ and radius 16

128 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) $\sin \angle A = \cos \angle B$

129 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

130 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.
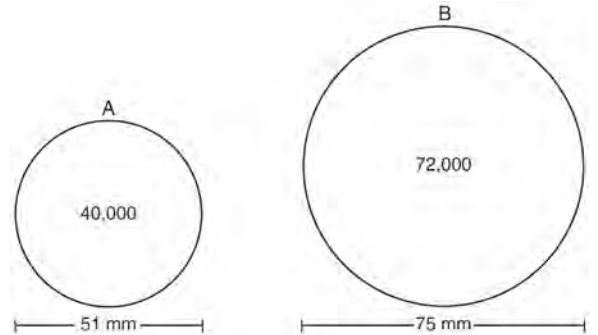
Determine and state which petri dish has the greater population density of bacteria at the end of the first hour.

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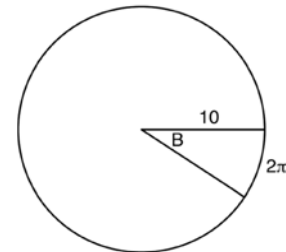
What is the measure of angle *B*, in radians?
1) $10 + 2\pi$
2) 20π
3) $\dfrac{\pi}{5}$
4) $\dfrac{5}{\pi}$

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

133 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

134 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 $y = 0$.
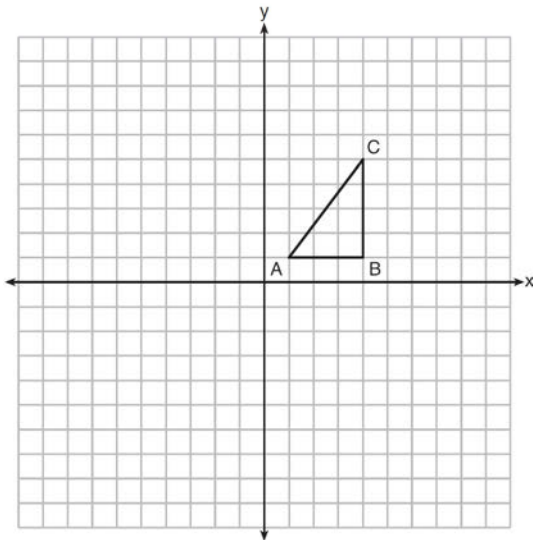
135 Describe a sequence of transformations that will map $\triangle ABC$ onto $\triangle DEF$ as shown below.
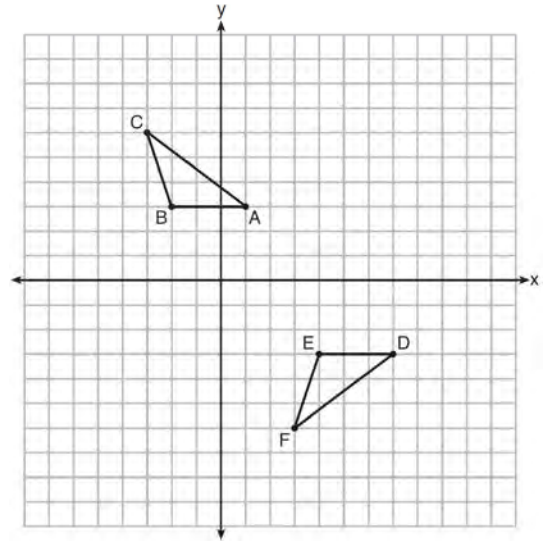
136 New streetlights will be installed along a section of the highway. The posts for the streetlights will be 7.5 m tall and made of aluminum. The city can choose to buy the posts shaped like cylinders or the posts shaped like rectangular prisms. The cylindrical posts have a hollow core, with aluminum 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?

27

137 'In the coordinate plane, the vertices of △RST are R(6,−1), S(1,−4), and T(−5,6). Prove that △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.]

139 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.

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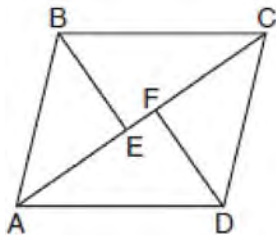
1) square
2) rhombus
3) rectangle
4) parallelogram

140 Given: △XYZ, $\overline{XY} \cong \overline{ZY}$, and $\overline{YW}$ bisects ∠XYZ
Prove that ∠YWZ is a right angle.
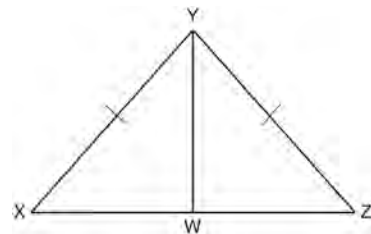
141 In the diagram below, $\triangle ERM \sim \triangle JTM$.
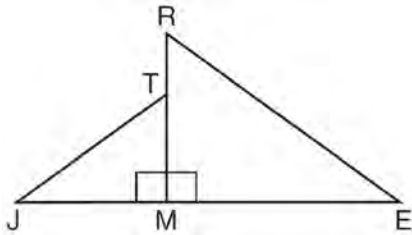
Which statement is always true?

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

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

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

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

142 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) $(1,-1)$

143 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

144 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.

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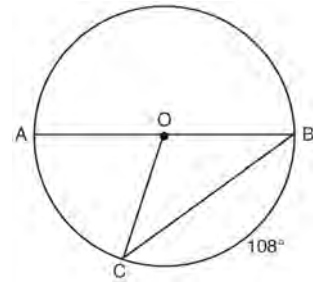
Some students wrote these formulas to find the area of sector COB:

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

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

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

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

Which students wrote correct formulas?

1) Amy and Dex

2) Beth and Carl

3) Carl and Amy

4) Dex and Beth

29

146 Given the theorem, "The sum of the measures of the interior angles of a triangle is 180°," complete the proof for this theorem.
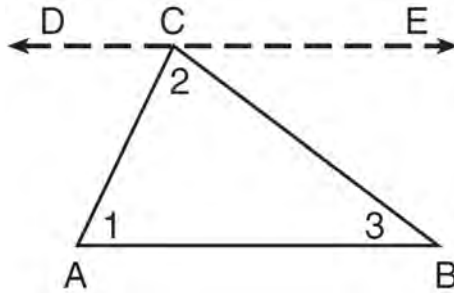
Given: $\triangle ABC$
Prove: $m\angle 1 + m\angle 2 + m\angle 3 = 180°$
Fill in the missing reasons below.

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) _____ _____ _____

147 Kevin's work for deriving the equation of a circle is shown below.

$$x^2 + 4x = -(y^2 - 20)$$

STEP 1 $\quad x^2 + 4x = -y^2 + 20$

STEP 2 $\quad x^2 + 4x + 4 = -y^2 + 20 - 4$

STEP 3 $\quad (x+2)^2 = -y^2 + 20 - 4$

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

148 The image of $\triangle ABC$ after a rotation of 90° clockwise about the origin is $\triangle DEF$, as shown below.
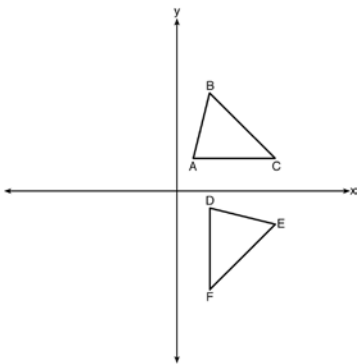
Which statement is true?

1) $\overline{BC} \cong \overline{DE}$
2) $\overline{AB} \cong \overline{DF}$
3) $\angle C \cong \angle E$
4) $\angle A \cong \angle D$

149 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) $(-8, 5\sqrt{21})$

150 In the diagram below of circle O with diameter $\overline{BC}$ and radius $\overline{OA}$, chord $\overline{DC}$ is parallel to chord $\overline{BA}$.
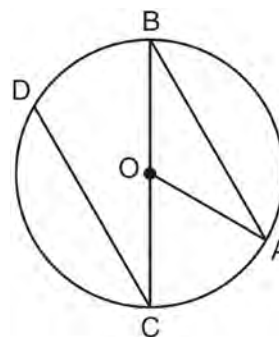
If m$\angle BCD = 30°$, determine and state m$\angle AOB$.

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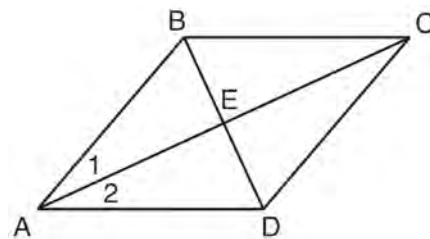
Prove: $\triangle ACD$ is an isosceles triangle and $\triangle AEB$ is a right triangle

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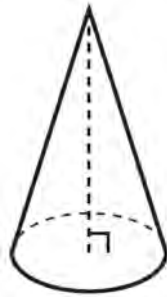
Which drawing can *not* be a cross section of a cone?

1)

2)

3)

4)

153 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

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

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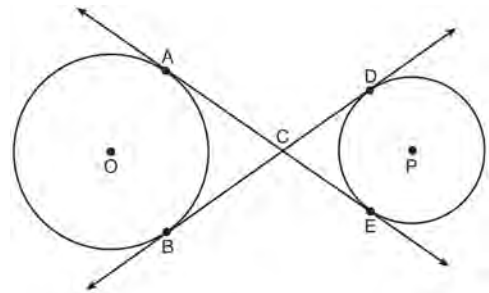
156 Which transformation of $\overline{OA}$ would result in an image parallel to $\overline{OA}$?
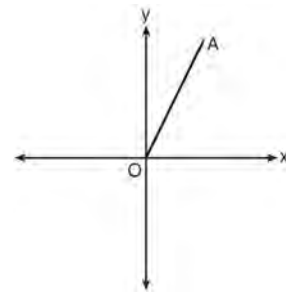
1)   a translation of two units down
2)   a reflection over the x-axis
3)   a reflection over the y-axis
4)   a clockwise rotation of 90° about the origin

157 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 $BD = 6$.
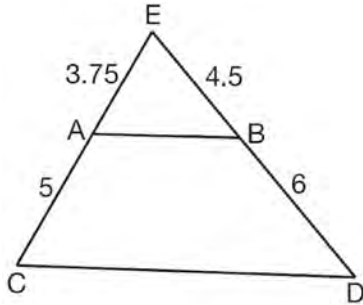
Explain why $\overline{AB}$ is parallel to $\overline{CD}$.

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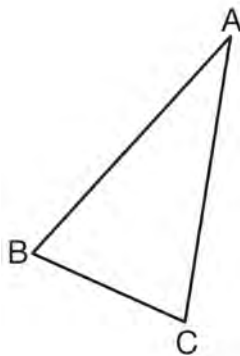
159 In $\triangle ABC$, where $\angle C$ is a right angle, $\cos A = \dfrac{\sqrt{21}}{5}$. What is $\sin B$?

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

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

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

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

160 Use a compass and straightedge to construct an inscribed square in circle T shown below. [Leave all construction marks.]
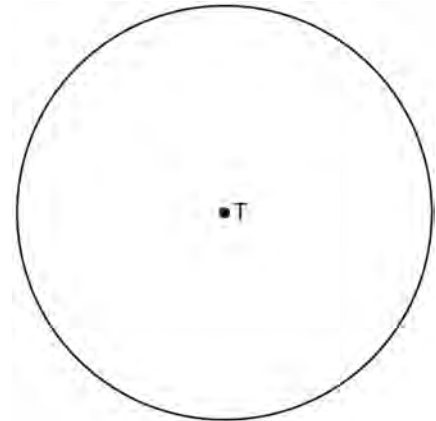
161 A 20-foot support post leans against a wall, making a 70° angle with the ground. To the *nearest tenth of a foot*, how far up the wall will the support post reach?

1) 6.8
2) 6.9
3) 18.7
4) 18.8

33

162 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*.

164 In 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*.

Prove: $\overline{AE} \cong \overline{CF}$

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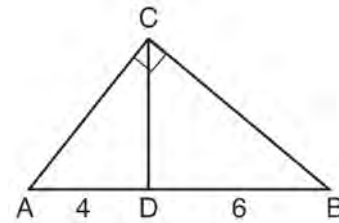
If *AD* = 4 and *DB* = 6, which length of $\overline{AC}$ makes $\overline{CD} \perp \overline{AB}$?
1) $2\sqrt{6}$
2) $2\sqrt{10}$
3) $2\sqrt{15}$
4) $4\sqrt{2}$

163 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 ∠*COD* is 20 degrees.

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

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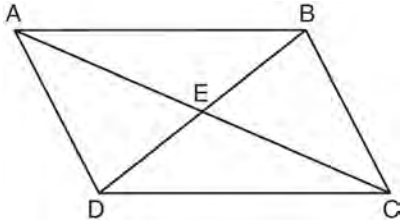
Prove: $\triangle AED \cong \triangle CEB$
Describe a single rigid motion that maps $\triangle AED$ onto $\triangle CEB$.

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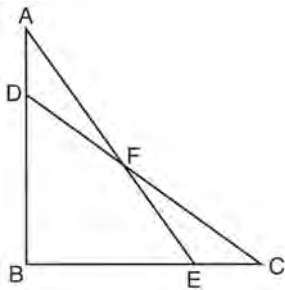
Which statement is needed to prove $\triangle ABE \cong \triangle CBD$ using only SAS $\cong$ SAS?
1) $\angle CDB \cong \angle AEB$
2) $\angle AFD \cong \angle EFC$
3) $\overline{AD} \cong \overline{CE}$
4) $\overline{AE} \cong \overline{CD}$

168 An equation of a line perpendicular to the line represented by the equation $y = -\dfrac{1}{2}x - 5$ and passing through $(6,-4)$ is
1) $y = -\dfrac{1}{2}x + 4$
2) $y = -\dfrac{1}{2}x - 1$
3) $y = 2x + 14$
4) $y = 2x - 16$

169 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 $\dfrac{1}{3}$.
4) The slope of $\overline{AB}$ is $\dfrac{1}{3}$.

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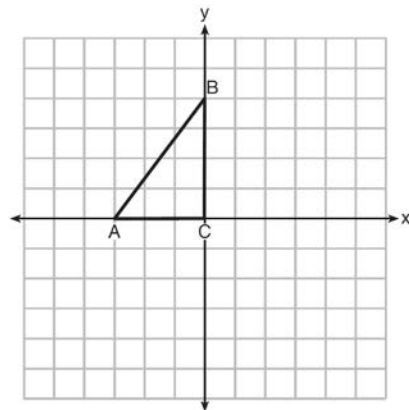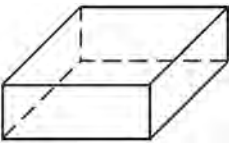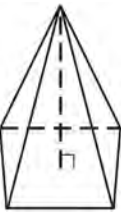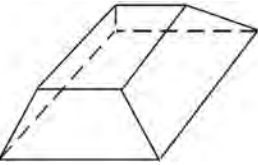
171 Quadrilateral *ABCD* with diagonals $\overline{AC}$ and $\overline{BD}$ is shown in the diagram below.
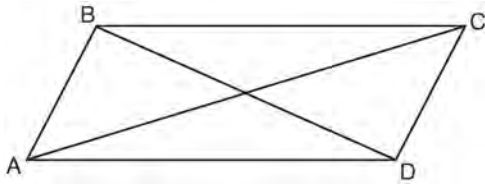
Which information is *not* enough to prove *ABCD* is a parallelogram?
1) $\overline{AB} \cong \overline{CD}$ and $\overline{AB} \parallel \overline{DC}$
2) $\overline{AB} \cong \overline{CD}$ and $\overline{BC} \cong \overline{DA}$
3) $\overline{AB} \cong \overline{CD}$ and $\overline{BC} \parallel \overline{AD}$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

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

1)

2)

3)

4)

173 The graph below shows $\triangle ABC$ and its image, $\triangle A''B''C''$.
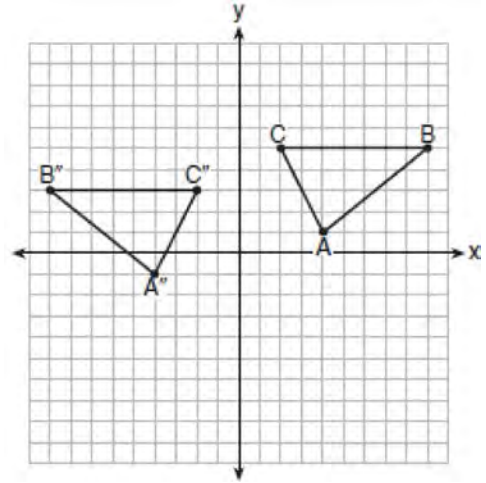
Describe a sequence of rigid motions which would map $\triangle ABC$ onto $\triangle A''B''C''$.

174 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*

36
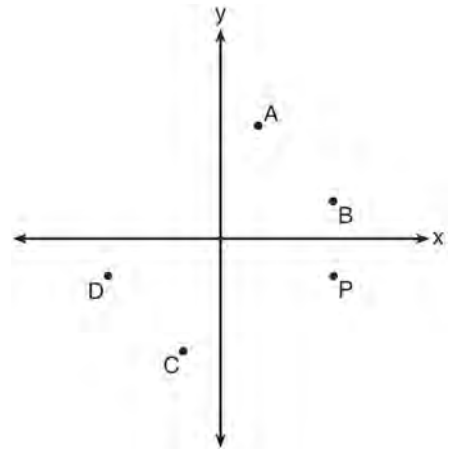
175 Quadrilateral *ABCD* is graphed on the set of axes below.
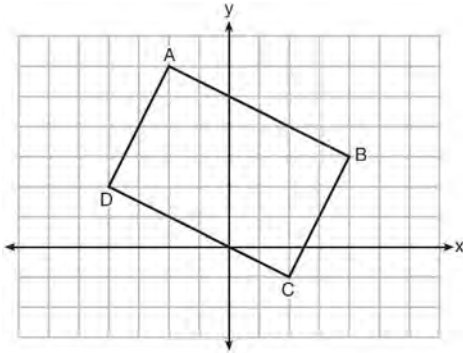
When *ABCD* is rotated 90° in a counterclockwise direction about the origin, its image is quadrilateral *A'B'C'D'*. Is distance preserved under this rotation, and which coordinates are correct for the given vertex?

1) no and $C'(1,2)$
2) no and $D'(2,4)$
3) yes and $A'(6,2)$
4) yes and $B'(-3,4)$

176 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) $y = -2x + 3$

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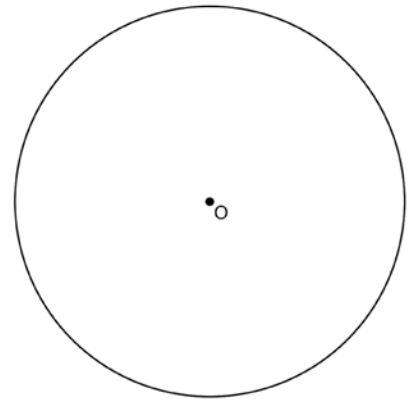
If chords $\overline{FB}$ and $\overline{FC}$ are drawn, which type of triangle, according to its angles, would $\triangle FBC$ be? Explain your answer.

178 In the diagram below, $\overline{AC} \cong \overline{DF}$ and points *A*, *C*, *D*, and *F* are collinear on line ℓ.
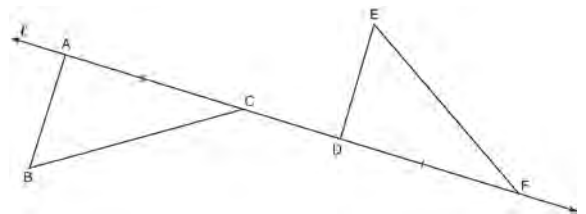
Let $\triangle D'E'F'$ be the image of $\triangle DEF$ after a translation along ℓ, such that point *D* is mapped onto point *A*. Determine and state the location of *F'*. Explain your answer. Let $\triangle D''E''F''$ be the image of $\triangle D'E'F'$ after a reflection across line ℓ. Suppose that *E''* is located at *B*. Is $\triangle DEF$ congruent to $\triangle ABC$? Explain your answer.

179 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.

8.3 cm

10.2 cm
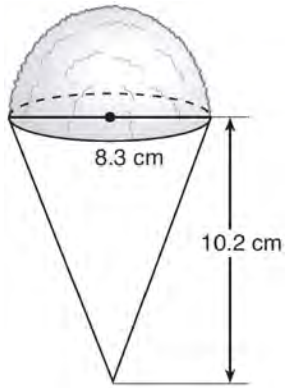
The desired density of the shaved ice is 0.697 g/cm^3, and the cost, per kilogram, of ice is 3.83. Determine and state the cost of the ice needed to make 50 snow cones.

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

34°
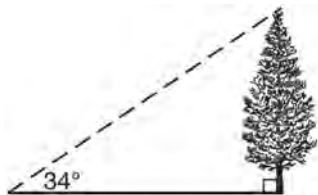
If the point is 20 feet from the base of the tree, what is the height of the tree, to the *nearest tenth of a foot*?
1) 29.7
2) 16.6
3) 13.5
4) 11.2

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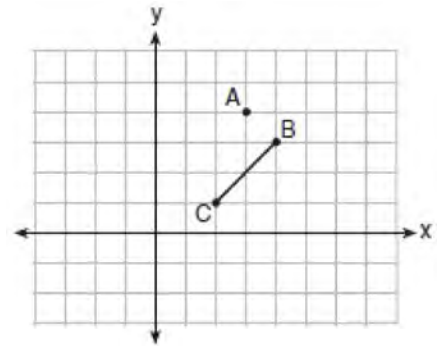
What are the coordinates of B' and C' after $\overline{BC}$ undergoes a dilation centered at point A with a scale factor of 2?
1) $B'(5,2)$ and $C'(1,-2)$
2) $B'(6,1)$ and $C'(0,-1)$
3) $B'(5,0)$ and $C'(1,-2)$
4) $B'(5,2)$ and $C'(3,0)$

182 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.

230 yd   120 yd   85 yd
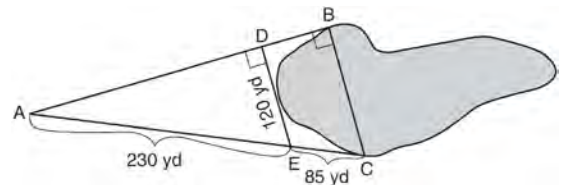
Use the surveyor's information to determine and state the distance from point B to point C, to the *nearest yard*.

38

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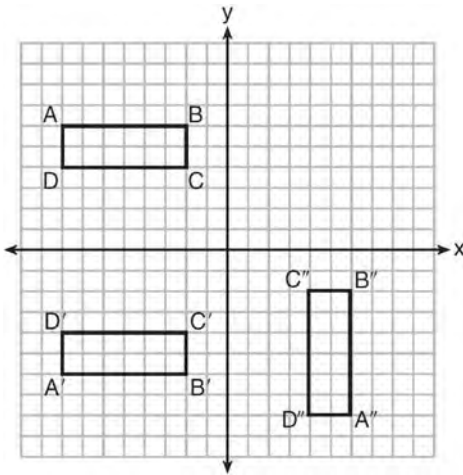
Which sequence of transformations maps *ABCD* onto *A'B'C'D'* and then maps *A'B'C'D'* onto *A"B"C"D"*?
1) a reflection followed by a rotation
2) a reflection followed by a translation
3) a translation followed by a rotation
4) a translation followed by a reflection

184 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.
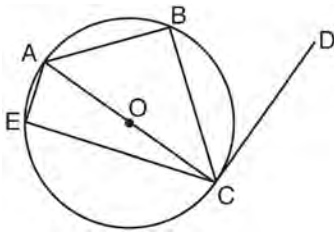
Which statement is *not* always true?
1) $\angle ACB \cong \angle BCD$
2) $\angle ABC \cong \angle ACD$
3) $\angle BAC \cong \angle DCB$
4) $\angle CBA \cong \angle AEC$

185 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.
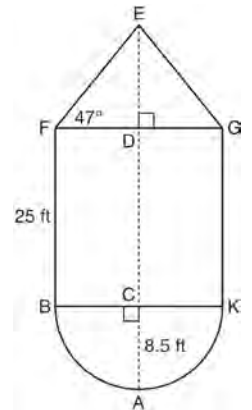
If *AC* = 8.5 feet, *BF* = 25 feet, and m∠*EFD* = 47°, determine and state, to the *nearest cubic foot*, the volume of the water tower. The water tower was constructed to hold a maximum of 400,000 pounds of water. If water weighs 62.4 pounds per cubic foot, can the water tower be filled to 85% of its volume and *not* exceed the weight limit? Justify your answer.

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

39

187 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) $\overline{DE},\overline{CE}$

188 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

189 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.]
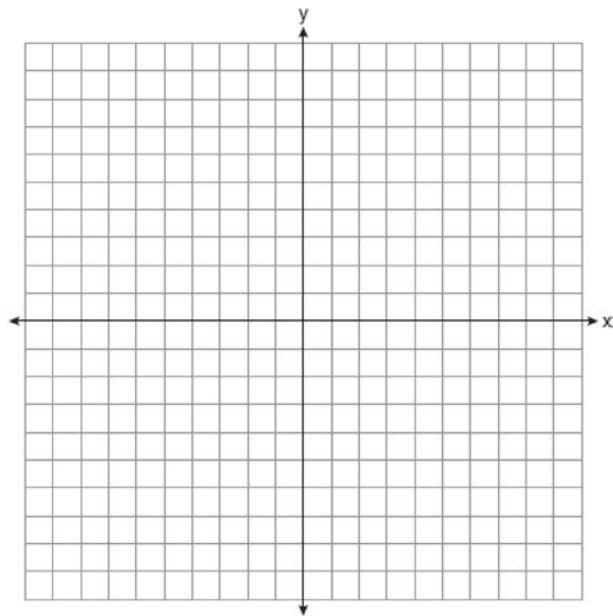
190 In parallelogram *ABCD* shown below, diagonals $\overline{AC}$ and $\overline{BD}$ intersect at *E*.
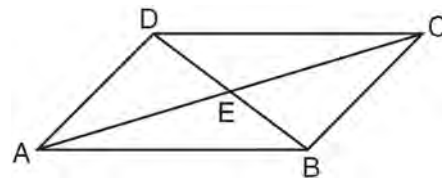
Prove: $\angle ACD \cong \angle CAB$

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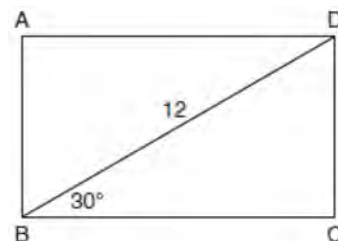
What is the perimeter of rectangle *ABCD*, to the *nearest tenth*?
1) 28.4
2) 32.8
3) 48.0
4) 62.4

192 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

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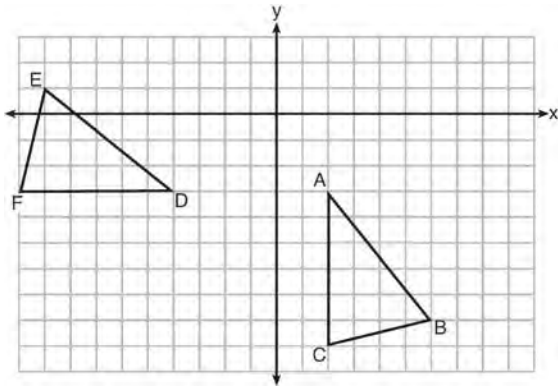
Let $\triangle A'B'C'$ be the image of $\triangle ABC$ after a rotation about point A. Determine and state the location of B' if the location of point C' is $(8,-3)$. Explain your answer. Is $\triangle DEF$ congruent to $\triangle A'B'C'$? Explain your answer.

194 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) $3x - 2y = 5$

195 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

196 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 $\overline{BC} \parallel \overline{AD}$

197 Prove the sum of the exterior angles of a triangle is $360°$.
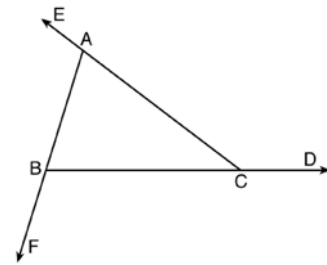
198 As shown in the diagram below, a ship is heading directly toward a lighthouse whose beacon is 125 feet above sea level. At the first sighting, point A, the angle of elevation from the ship to the light was $7°$. A short time later, at point D, the angle of elevation was $16°$.
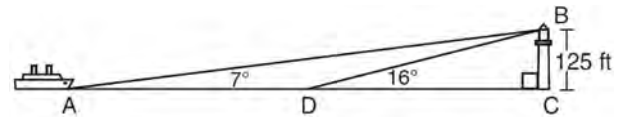
To the *nearest foot*, determine and state how far the ship traveled from point A to point D.

41

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

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

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

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

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

200 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.

201 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.

202 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

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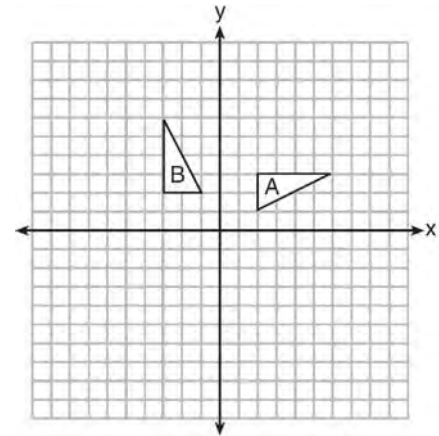
  1) line reflection
  2) rotation
  3) dilation
  4) translation

204 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.

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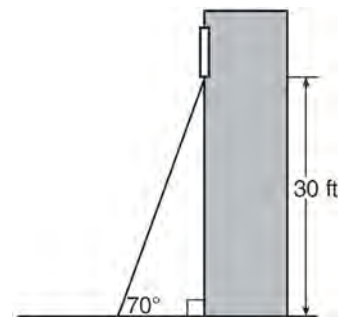
205 In $\triangle RST$ shown below, altitude $\overline{SU}$ is drawn to $\overline{RT}$ at U.
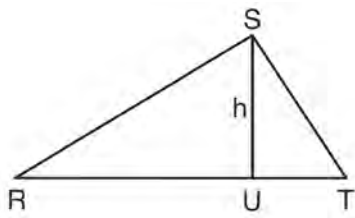
If $SU = h$, $UT = 12$, and $RT = 42$, which value of h will make $\triangle RST$ a right triangle with $\angle RST$ as a right angle?

1) $6\sqrt{3}$
2) $6\sqrt{10}$
3) $6\sqrt{14}$
4) $6\sqrt{35}$

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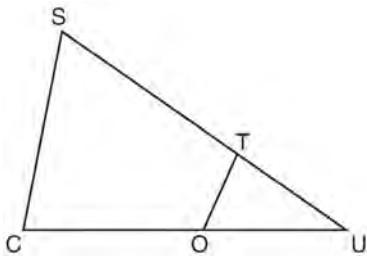
If $TU = 4$, $OU = 5$, and $OC = 7$, what is the length of $\overline{ST}$?

1) 5.6
2) 8.75
3) 11
4) 15

207 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.
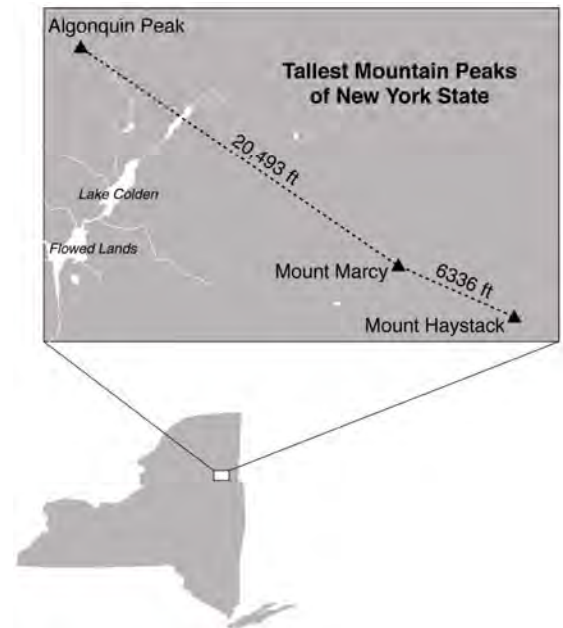
The angle of depression from the peak of Mount Marcy to the peak of Mount Haystack is 3.47 degrees. The angle of elevation from the peak of Algonquin Peak to the peak of Mount Marcy is 0.64 degrees. What are the heights, to the *nearest foot*, of Mount Marcy and Algonquin Peak? Justify your answer.

43

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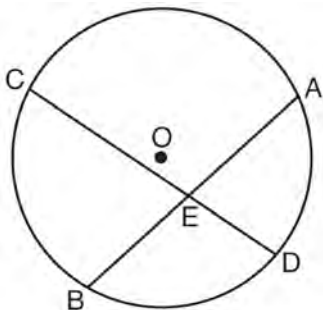
Theorem: If two chords intersect in a circle, the product of the lengths of the segments of one chord is equal to the product of the lengths of the segments of the other chord. Prove this theorem by proving $AE \cdot EB = CE \cdot ED$.

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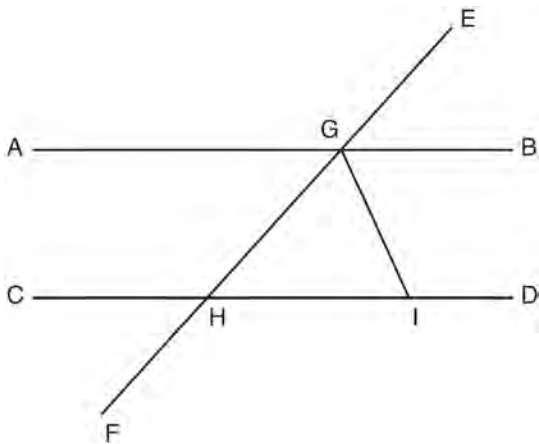
If m$\angle EGB = 50°$ and m$\angle DIG = 115°$, explain why $\overline{AB} \parallel \overline{CD}$.

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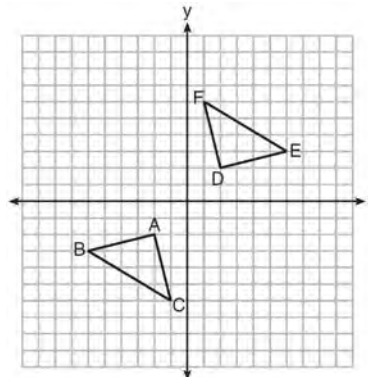
Which sequence of transformations maps triangle ABC onto triangle DEF?
1) a reflection over the x-axis followed by a reflection over the y-axis
2) a 180° rotation about the origin followed by a reflection over the line $y = x$
3) a 90° clockwise rotation about the origin followed by a reflection over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

211 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

212 The diagram below shows two similar triangles.
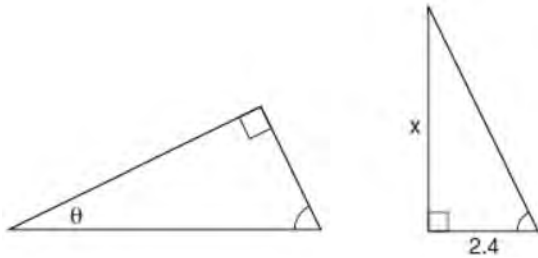
If $\tan \theta = \dfrac{3}{7}$, what is the value of x, to the *nearest tenth*?

1) 1.2
2) 5.6
3) 7.6
4) 8.8

213 The diagram below shows parallelogram *LMNO* with diagonal $\overline{LN}$, m∠*M* = 118°, and m∠*LNO* = 22°.
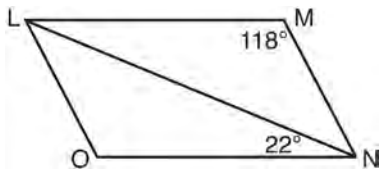
Explain why m∠*NLO* is 40 degrees.

214 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

215 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.
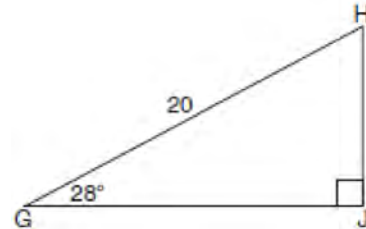
216 In the diagram of right triangle *ABC* shown below, $AB = 14$ and $AC = 9$.
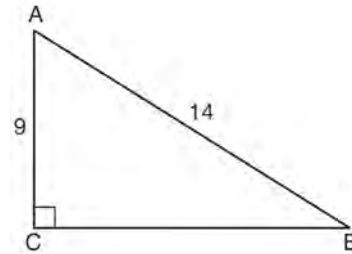
What is the measure of ∠*A*, to the *nearest degree*?

1) 33
2) 40
3) 50
4) 57

217 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) $3(m\angle C') = m\angle C$

45

218 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.
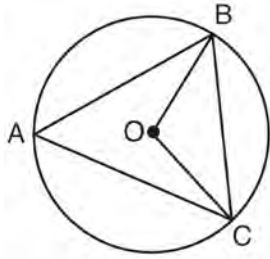
Which statement must always be true?
1) $\angle BAC \cong \angle BOC$
2) $m\angle BAC = \frac{1}{2} m\angle BOC$
3) $\triangle BAC$ and $\triangle BOC$ are isosceles.
4) The area of $\triangle BAC$ is twice the area of $\triangle BOC$.

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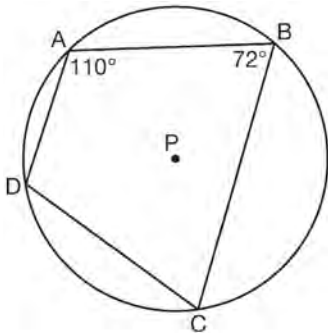
What is $m\angle ADC$?
1) 70°
2) 72°
3) 108°
4) 110°

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

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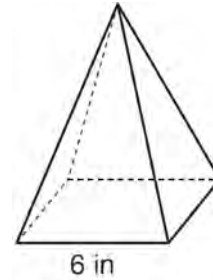
If the altitude of the pyramid measures 12 inches, its volume, in cubic inches, is
1) 72
2) 144
3) 288
4) 432

221 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.]
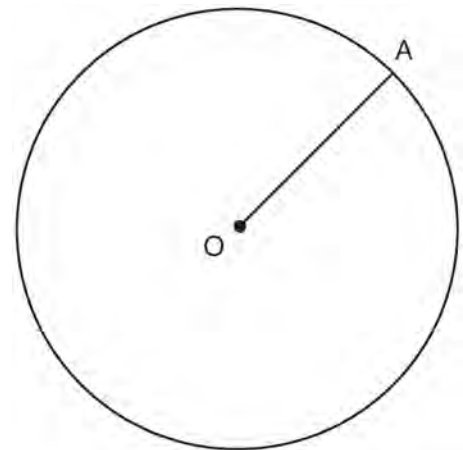
222 In the diagram of circle A shown below, chords $\overline{CD}$ and $\overline{EF}$ intersect at G, and chords $\overline{CE}$ and $\overline{FD}$ are drawn.
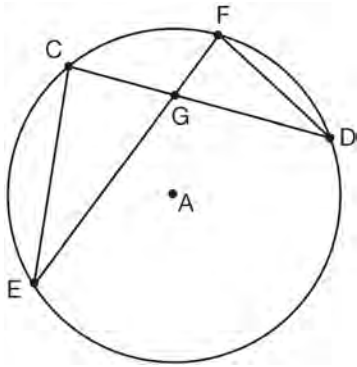
Which statement is *not* always true?

1) $\overline{CG} \cong \overline{FG}$
2) $\angle CEG \cong \angle FDG$
3) $\dfrac{CE}{EG} = \dfrac{FD}{DG}$
4) $\triangle CEG \sim \triangle FDG$

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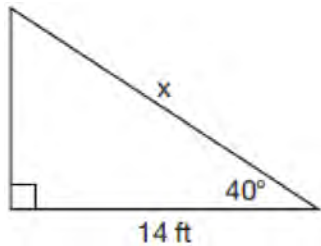
1) 11
2) 17
3) 18
4) 22

224 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

225 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.

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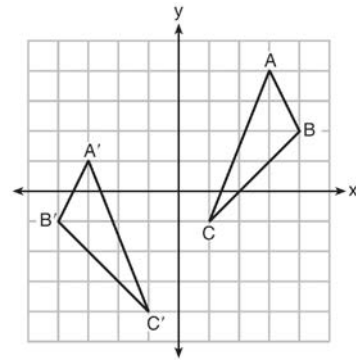
Is $\triangle A'B'C'$ congruent to $\triangle ABC$? Use the properties of rigid motion to explain your answer.

227 In the diagram below, $\overline{CD}$ is the image of $\overline{AB}$ after a dilation of scale factor k with center E.
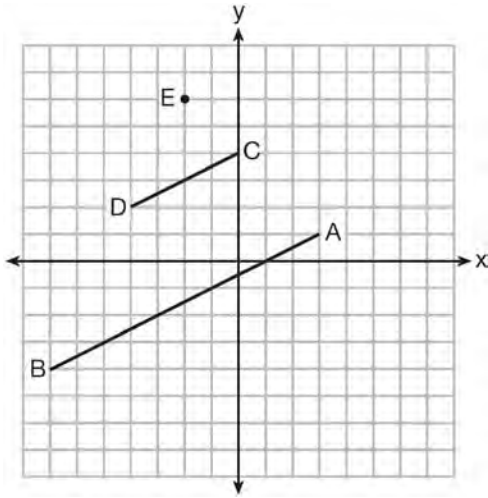
Which ratio is equal to the scale factor k of the dilation?

1) $\dfrac{EC}{EA}$

2) $\dfrac{BA}{EA}$

3) $\dfrac{EA}{BA}$

4) $\dfrac{EA}{EC}$

228 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 $= \sqrt{35}$

229 In the diagram below, $\triangle ABC \sim \triangle DEC$.
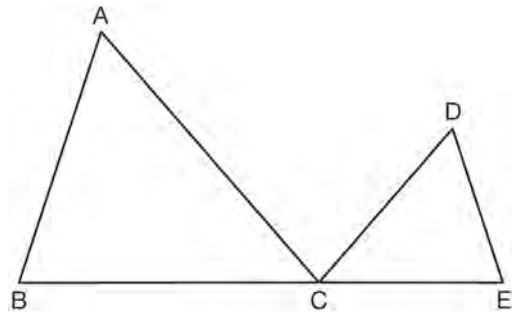
If $AC = 12$, $DC = 7$, $DE = 5$, and the perimeter of $\triangle ABC$ is 30, what is the perimeter of $\triangle DEC$?

1) 12.5
2) 14.0
3) 14.8
4) 17.5

230 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 $\dfrac{13\pi}{8}$.
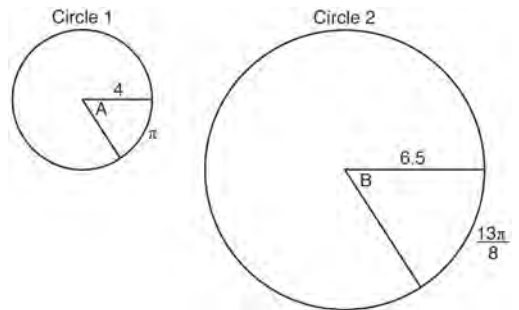
Dominic thinks that angles A and B have the same radian measure. State whether Dominic is correct or not. Explain why.

231 In the diagram below, triangles XYZ and UVZ are drawn such that $\angle X \cong \angle U$ and $\angle XZY \cong \angle UZV$.
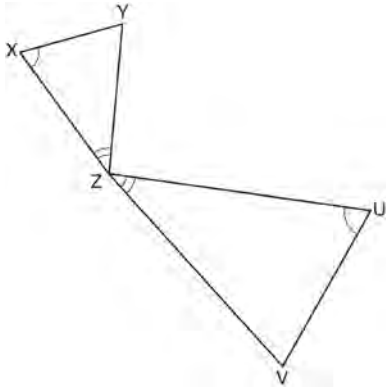
Describe a sequence of similarity transformations that shows $\triangle XYZ$ is similar to $\triangle UVZ$.

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

233 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) $(8.5)^3 - \frac{1}{3}\pi(8)^2(8)$
4) $(8.5)^3 - \frac{1}{3}\pi(4)^2(8)$

234 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 $EF = 11$.
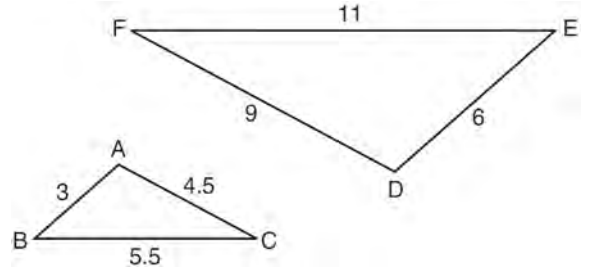
Which relationship must always be true?
1) $\dfrac{m\angle A}{m\angle D} = \dfrac{1}{2}$
2) $\dfrac{m\angle C}{m\angle F} = \dfrac{2}{1}$
3) $\dfrac{m\angle A}{m\angle C} = \dfrac{m\angle F}{m\angle D}$
4) $\dfrac{m\angle B}{m\angle E} = \dfrac{m\angle C}{m\angle F}$

235 In the diagram of $\triangle ABC$, points D and E are on $\overline{AB}$ and $\overline{CB}$, respectively, such that $\overline{AC} \parallel \overline{DE}$.
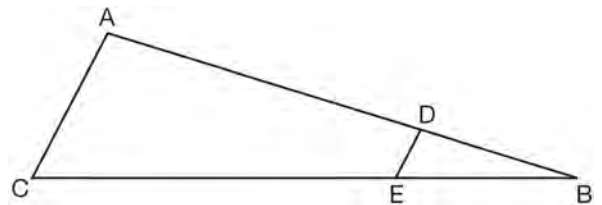
If $AD = 24$, $DB = 12$, and $DE = 4$, what is the length of $\overline{AC}$?
1) 8
2) 12
3) 16
4) 72

49

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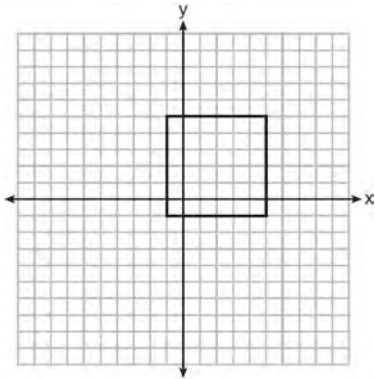
A reflection over which line does *not* carry the square onto itself?
1) $x = 5$
2) $y = 2$
3) $y = x$
4) $x + y = 4$

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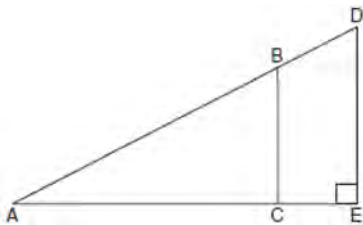
Which ratio is always equivalent to the sine of $\angle A$?
1) $\dfrac{AD}{DE}$
2) $\dfrac{AE}{AD}$
3) $\dfrac{BC}{AB}$
4) $\dfrac{AB}{AC}$

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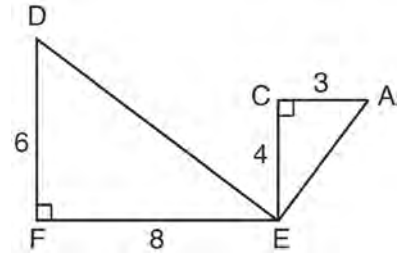
What is a correct sequence of similarity transformations that shows $\triangle AEC \sim \triangle DEF$?
1) a rotation of 180 degrees about point *E* followed by a horizontal translation
2) a counterclockwise rotation of 90 degrees about point *E* followed by a horizontal translation
3) a rotation of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

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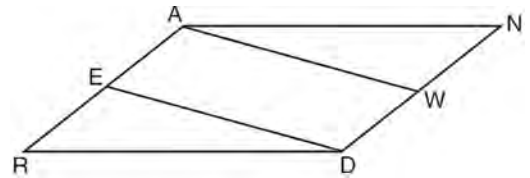
Prove that $\triangle ANW \cong \triangle DRE$. Prove that quadrilateral *AWDE* is a parallelogram.

50

240 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

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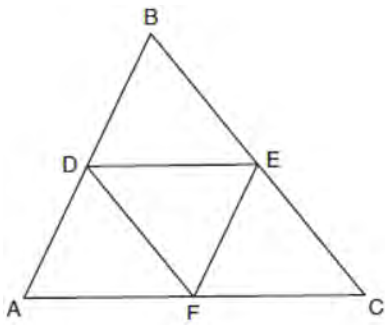
The perimeter of quadrilateral $ADEF$ is equivalent
to
1) $AB + BC + AC$
2) $\frac{1}{2} AB + \frac{1}{2} AC$
3) $2AB + 2AC$
4) $AB + AC$

242 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

243 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.
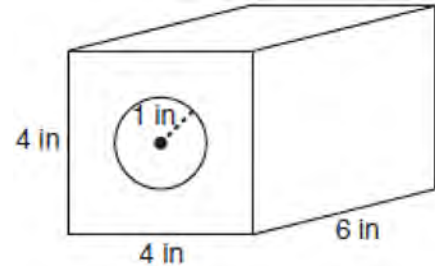
What is the approximate volume of the remaining
solid, in cubic inches?
1) 19
2) 77
3) 93
4) 96

Geometry Common Core State Standards Regents at Random
Answer Section

1 ANS:

$\tan 52.8 = \dfrac{h}{x}$ $\qquad\qquad\qquad$ $x\tan 52.8 = x\tan 34.9 + 8\tan 34.9$ $\tan 52.8 \approx \dfrac{h}{9}$ $\qquad$ $11.86 + 1.7 \approx 13.6$

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

$\qquad\qquad\qquad\qquad\qquad\qquad x(\tan 52.8 - \tan 34.9) = 8\tan 34.9$ $\qquad\qquad x \approx 11.86$

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

$\qquad h = (x+8)\tan 34.9$ $\qquad\qquad\qquad x = \dfrac{8\tan 34.9}{\tan 52.8 - \tan 34.9}$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad x \approx 9$

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

2 ANS:

$4x - .07 = 2x + .01$ SinA is the ratio of the opposite side and the hypotenuse while $\cos B$ is the ratio of the adjacent

$\qquad 2x = 0.8$

$\qquad x = 0.4$

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 $\qquad\qquad$ REF: fall1407geo $\qquad$ NAT: G.SRT.C.7 $\qquad$ TOP: Cofunctions

3 ANS: 2

$\dfrac{11}{1.2\,oz}\left(\dfrac{16\,oz}{1\,lb}\right) = \dfrac{13.\overline{3}1}{lb}$ $\dfrac{13.\overline{3}1}{lb}\left(\dfrac{1\,g}{3.785\,l}\right) \approx \dfrac{3.5\,g}{1\,lb}$

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

4 ANS: 2

$\sqrt{3 \cdot 21} = \sqrt{63} = 3\sqrt{7}$

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

5 ANS: 4

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

$\qquad 230 \approx s$

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

6 ANS: 2 $\qquad\qquad$ PTS: 2 $\qquad\qquad$ REF: 011610geo $\qquad$ NAT: G.SRT.A.1
TOP: Line Dilations

7 ANS: 4

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

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

8 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

9 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

10 ANS: 3

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

$x = 15$

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

11 ANS: 1

$\frac{1000}{20\pi} \approx 15.9$

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

12 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.8   TOP: Triangle Congruency

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

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

    PTS: 2   REF: 011604geo   NAT: G.GMD.A.3   TOP: Volume
    KEY: prisms
15 ANS: 4

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

    PTS: 2   REF: 011721geo   NAT: G.C.B.5   TOP: Sectors
16 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
17 ANS:
    $180 - 2(25) = 130$

    PTS: 2   REF: 011730geo   NAT: G.SRT.B.5   TOP: Isosceles Triangle Theorem
18 ANS:

$\dfrac{137.8}{6^3} \approx 0.638 \quad \text{Ash}$

    PTS: 2   REF: 081525geo   NAT: G.MG.A.2   TOP: Density
19 ANS: 1

$\dfrac{64}{4} = 16 \quad 16^2 = 256 \quad 2w + 2(w+2) = 64 \quad 15 \times 17 = 255 \quad 2w + 2(w+4) = 64 \quad 14 \times 18 = 252 \quad 2w + 2(w+6) = 64$
$\qquad\qquad\qquad\qquad\qquad\qquad\qquad w = 15 \qquad\qquad\qquad\qquad\qquad\qquad w = 14 \qquad\qquad\qquad\qquad\qquad\qquad w = 13$
$13 \times 19 = 247$

    PTS: 2   REF: 011708geo   NAT: G.MG.A.3   TOP: Area
20 ANS: 2
    $8(x + 8) = 6(x + 18)$

    $8x + 64 = 6x + 108$

    $\quad 2x = 44$

    $\quad\; x = 22$

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

21 ANS:
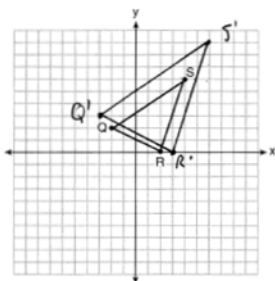
A dilation preserves slope, so the slopes of $\overline{QR}$ and $\overline{Q'R'}$ are equal. Because the slopes are equal, $Q'R' \parallel QR$.

PTS: 4   REF: 011732geo   NAT: G.SRT.A.2   TOP: Dilations
KEY: grids

22 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

23 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

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

1

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

25 ANS: 2
x is $\dfrac{1}{2}$ the circumference. $\dfrac{C}{2} = \dfrac{10\pi}{2} \approx 16$

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

26 ANS:
$\dfrac{152 - 56}{2} = 48$

PTS: 2   REF: 011728geo   NAT: G.C.A.2   TOP: Chords, Secants and Tangents
KEY: secant and tangent drawn from common point, angle

27 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). $m\angle BDC = \frac{1}{2} m\overparen{BC}$ (The measure of an inscribed angle is half the measure of the intercepted arc). $m\angle CBA = \frac{1}{2} m\overparen{BC}$ (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

28 ANS: 3
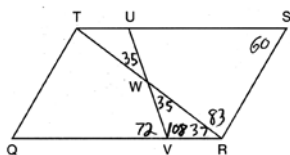
PTS: 2   REF: 011603geo   NAT: G.CO.C.11   TOP: Parallelograms

29 ANS:

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

$$x \approx 68$$

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

30 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

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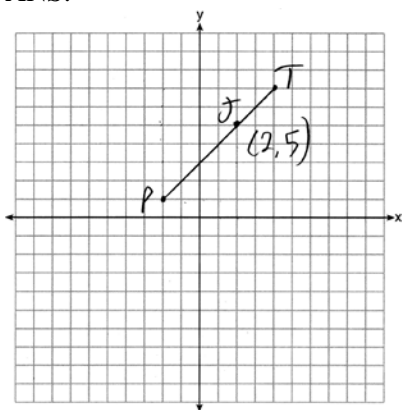
$$x = \frac{2}{3}(4--2) = 4 \quad -2+4 = 2 \quad J(2,5)$$

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

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

32 ANS: 2
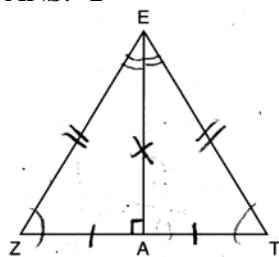
PTS: 2　　　REF: 061619geo　　NAT: G.SRT.B.4　　TOP: Triangle Proofs

33 ANS: 3　　　PTS: 2　　　REF: 011710geo　　NAT: G.CO.A.3
TOP: Mapping a Polygon onto Itself

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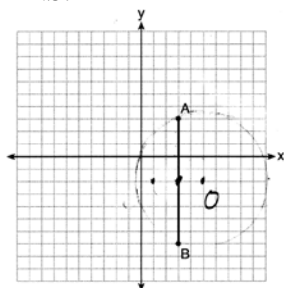
Since the midpoint of $\overline{AB}$ is $(3,-2)$, the center must be either $(5,-2)$ or $(1,-2)$.

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

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

35 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

6

36 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

37 ANS: 4   PTS: 2   REF: 081503geo   NAT: G.GMD.B.4
TOP: Rotations of Two-Dimensional Objects

38 ANS:

$\dfrac{360}{6} = 60$

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

39 ANS:
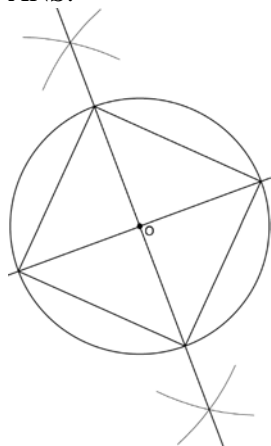
Since the square is inscribed, each vertex of the square is on the circle and the diagonals of the square are diameters of the circle. Therefore, each angle of the square is an inscribed angle in the circle that intercepts the circle at the endpoints of the diameters. Each angle of the square, which 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

40 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

41 ANS: 4

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

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

7

42 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

43 ANS:

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

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

44 ANS:

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

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

$$x = 120$$

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

45 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

46 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

47 ANS: 1

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

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

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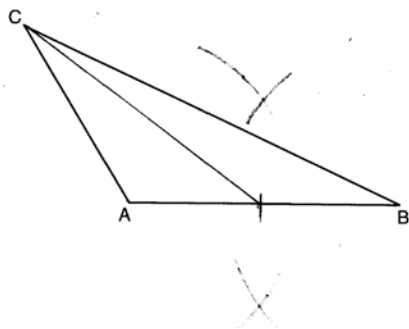
PTS: 2   REF: 081628geo   NAT: G.CO.D.12   TOP: Constructions
KEY: line bisector

49 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

50 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. $\tan 6 = \dfrac{112 - 1.5}{x}$ $\tan(49 + 6) = \dfrac{112 - 1.5}{y}$ $\dfrac{1051.3 - 77.4}{5} \approx 195$

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

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

51 ANS:
The transformation is a rotation, which is a rigid motion.

PTS: 2   REF: 081530geo   NAT: G.CO.B.8   TOP: Triangle Congruency

52 ANS: 4   PTS: 2   REF: 061504geo   NAT: G.CO.A.5
TOP: Compositions of Transformations   KEY: identify

53 ANS: 4   PTS: 2   REF: 061502geo   NAT: G.CO.A.2
TOP: Identifying Transformations   KEY: basic

54 ANS: 1
$\dfrac{6}{8} = \dfrac{9}{12}$

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

55 ANS: 3
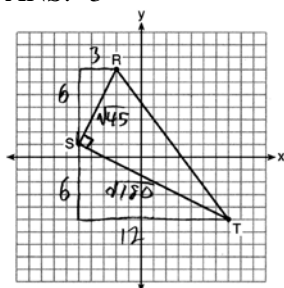
$$\sqrt{45} = 3\sqrt{5} \quad a = \frac{1}{2}\left(3\sqrt{5}\right)\left(6\sqrt{5}\right) = \frac{1}{2}(18)(5) = 45$$
$$\sqrt{180} = 6\sqrt{5}$$

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

56 ANS: 1   PTS: 2   REF: 081603geo   NAT: G.GMD.B.4
TOP: Rotations of Two-Dimensional Objects

57 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 90º about point C such that point L maps onto point D.

PTS: 4   REF: spr1408geo   NAT: G.SRT.B.4   TOP: Triangle Proofs

58 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

59 ANS:

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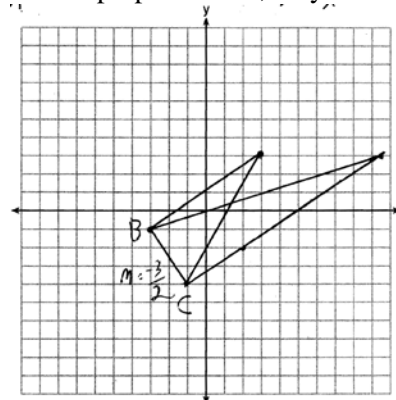
and a right triangle. $m_{\overline{BC}} = -\dfrac{3}{2}$ $-1 = \dfrac{2}{3}(-3) + b$ or $-4 = \dfrac{2}{3}(-1) + b$

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

$-1 = -2 + b$

$1 = b$

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

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

$3 = x$

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

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

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

$9 = 2x - 10$

$19 = 2x$

$9.5 = x$

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

60 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

61 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

62 ANS: 4

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

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

63 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, $\frac{3}{2}$, can be applied to the y-intercept, $(0, -4)$. Therefore, $\left(0 \cdot \frac{3}{2}, -4 \cdot \frac{3}{2}\right) \to (0, -6)$. So the equation of the dilated line is $y = 2x - 6$.

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

64 ANS:

$M\left(\frac{4+0}{2}, \frac{6-1}{2}\right) = M\left(2, \frac{5}{2}\right) \quad m = \frac{6--1}{4-0} = \frac{7}{4} \quad m_\perp = -\frac{4}{7} \quad y - 2.5 = -\frac{4}{7}(x-2)$ 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

65 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

66 ANS: 4   PTS: 2   REF: 061512geo   NAT: G.SRT.C.7
TOP: Cofunctions

67 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

68 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.
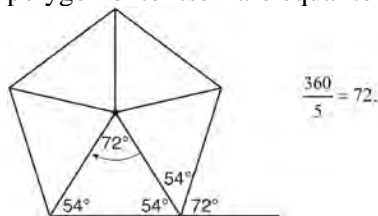
PTS: 2   REF: spr1402geo   NAT: G.CO.A.3   TOP: Mapping a Polygon onto Itself

69 ANS:

Reflections are rigid motions that preserve distance.

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

70 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

71 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

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

73 ANS: 3

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

$9x = 46$

$x \approx 5.1$

PTS: 2   REF: 061511geo   NAT: G.SRT.B.5   TOP: Side Splitter Theorem

74 ANS: 1

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

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

75 ANS:
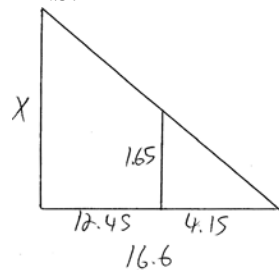
$\dfrac{1.65}{4.15} = \dfrac{x}{16.6}$

$4.15x = 27.39$

$x = 6.6$

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

76 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
77 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.CO.C.10　TOP: Triangle Proofs
78 ANS: 3
$$\dfrac{AB}{BC} = \dfrac{DE}{EF}$$

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

$$90 = 90$$

PTS: 2　　　REF: 061515geo　NAT: G.SRT.B.5　TOP: Similarity
KEY: basic
79 ANS: 3　　　PTS: 2　　　REF: 061601geo　NAT: G.GMD.B.4
TOP: Rotations of Two-Dimensional Objects
80 ANS: 1
$$m = -\dfrac{2}{3}　1 = \left(-\dfrac{2}{3}\right)6 + b$$

$$1 = -4 + b$$

$$5 = b$$

PTS: 2　　　REF: 081510geo　NAT: G.GPE.B.5　TOP: Parallel and Perpendicular Lines
KEY: write equation of parallel line
81 ANS: 1
$180 - (68 \cdot 2)$

PTS: 2　　　REF: 081624geo　NAT: G.CO.C.11　TOP: Parallelograms

82 ANS:
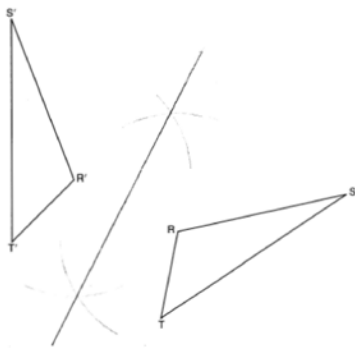
PTS: 2   REF: 011725geo   NAT: G.CO.D.12   TOP: Constructions
KEY: line bisector

83 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

84 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

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

86 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.8   TOP: Triangle Congruency

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

88 ANS: 1

$$\frac{360°}{45°} = 8$$

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

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

90 ANS:
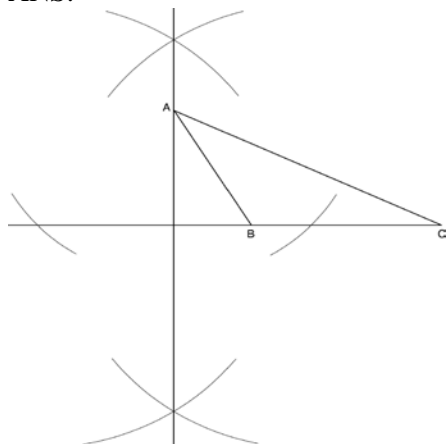
PTS: 2   REF: fall1409geo   NAT: G.CO.D.12   TOP: Constructions
KEY: parallel and perpendicular lines

91 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

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

93 ANS: 4   PTS: 2   REF: 061501geo   NAT: G.GMD.B.4
TOP: Rotations of Two-Dimensional Objects

94 ANS:

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

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

95 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

96 ANS: 4   PTS: 2   REF: 011723geo   NAT: G.GMD.B.4
TOP: Cross-Sections of Three-Dimensional Objects

97 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

98 ANS: 1

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

$$m_{\overline{EM}} = 1 \quad \begin{array}{l} 1 = 1(2) + b \\ -1 = b \end{array}$$

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

99 ANS: 2
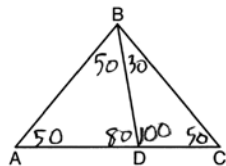
PTS: 2   REF: 081604geo   NAT: G.CO.C.10   TOP: Interior and Exterior Angles of Triangles

100 ANS: 1

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

$$f = 10$$

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

101 ANS: 2   PTS: 2   REF: 081601geo   NAT: G.CO.C.9
TOP: Lines and Angles

102 ANS: 3

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

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

103 ANS: 3   PTS: 2   REF: 011605geo   NAT: G.CO.A.2
TOP: Analytical Representations of Transformations   KEY: basic

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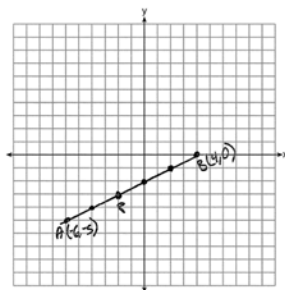
$-6 + \dfrac{2}{5}(4 - -6)$ $-5 + \dfrac{2}{5}(0 - -5)$ $(-2, -3)$

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

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

-2 -3

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

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

106 ANS:

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

$126 = 126$

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

107 ANS: 3
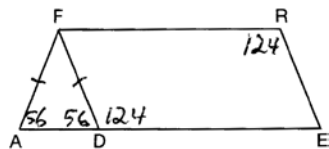
PTS: 2   REF: 081508geo   NAT: G.CO.C.11   TOP: Parallelograms

108 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

109 ANS: 1
Alternate interior angles

PTS: 2   REF: 061517geo   NAT: G.CO.C.9   TOP: Lines and Angles

110 ANS:

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

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

$$x \approx 15.5$$

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

111 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

112 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

113 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

114 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

115 ANS:

$\ell: y = 3x - 4$

$m: y = 3x - 8$

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

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

117 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

118 ANS: 1   PTS: 2   REF: 011606geo   NAT: G.CO.C.9
TOP: Lines and Angles

119 ANS: 3   PTS: 2   REF: 081502geo   NAT: G.CO.A.2
TOP: Identifying Transformations   KEY: basic

120 ANS: 2

$$\frac{4}{3}\pi \cdot 4^3 + 0.075 \approx 20$$

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

121 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

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

123 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

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

125 ANS: 4   PTS: 2   REF: 081506geo   NAT: G.SRT.A.2
TOP: Dilations

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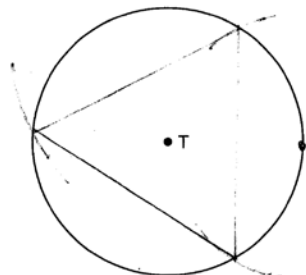
     PTS: 2   REF: 081526geo   NAT: G.CO.D.13   TOP: Constructions

127 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

128 ANS: 4   PTS: 2   REF: 011609geo   NAT: G.SRT.C.7
TOP: Cofunctions

129 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

130 ANS:

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

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

131 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

132 ANS: 1   PTS: 2   REF: 081504geo   NAT: G.SRT.C.7
TOP: Cofunctions

133 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

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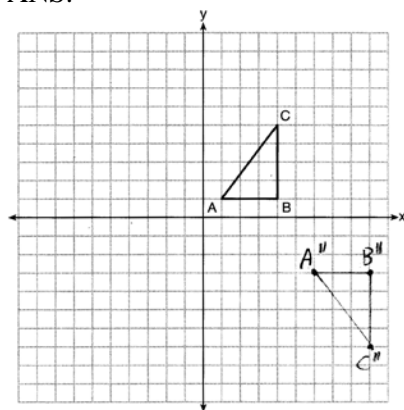
PTS: 2   REF: 081626geo   NAT: G.CO.A.5   TOP: Compositions of Transformations
KEY: grids

135 ANS:

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

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

136 ANS:

C: $V = \pi(26.7)^2(750) - \pi(24.2)^2(750) = 95,437.5\pi$

$95,437.5\pi \text{ cm}^3 \left(\dfrac{2.7 \text{ g}}{\text{cm}^3} \right) \left(\dfrac{1 \text{ kg}}{1000 \text{ g}} \right) \left(\dfrac{\$0.38}{\text{kg}} \right) = \$307.62$

P: $V = 40^2(750) - 35^2(750) = 281,250$ $\qquad\qquad$ $\$307.62 - 288.56 = \$19.06$

$281,250 \text{ cm}^3 \left(\dfrac{2.7 \text{ g}}{\text{cm}^3} \right) \left(\dfrac{1 \text{ kg}}{1000 \text{ g}} \right) \left(\dfrac{\$0.38}{\text{kg}} \right) = \$288.56$

PTS: 6 $\qquad$ REF: 011736geo $\qquad$ NAT: G.MG.A.2 $\qquad$ TOP: Density

137 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.
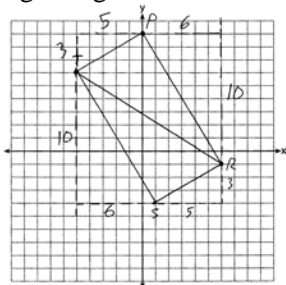
PTS: 6 $\qquad$ REF: 061536geo $\qquad$ NAT: G.GPE.B.4 $\qquad$ TOP: Quadrilaterals in the Coordinate Plane
KEY: grids

138 ANS: 4 $\qquad$ PTS: 2 $\qquad$ REF: 011705geo $\qquad$ NAT: G.CO.C.11
TOP: Special Quadrilaterals

139 ANS:

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

$x + 5 = 1.5x$

$5 = .5x$

$10 = x$

$10 + 5 = 15$

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

140 ANS:
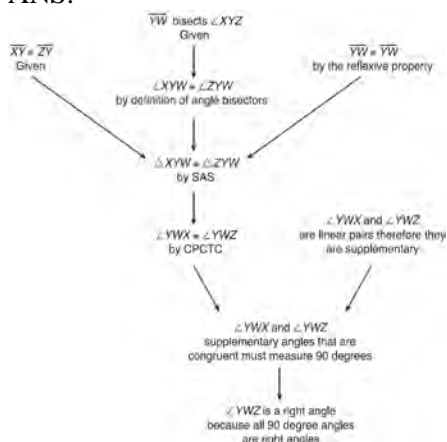
$\triangle XYZ$, $\overline{XY} \cong \overline{ZY}$, and $\overline{YW}$ bisects $\angle XYZ$ (Given). $\triangle XYZ$ is isosceles (Definition of isosceles triangle). $\overline{YW}$ is an altitude of $\triangle XYZ$ (The angle bisector of the vertex of an isosceles triangle is also the altitude of 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

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

142 ANS: 4

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

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

$-5 + 6$ $-4 + 3$

1 -1

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

143 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

144 ANS:

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

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

145 ANS: 2   PTS: 2   REF: 081619geo   NAT: G.C.B.5
TOP: Sectors

146 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

147 ANS: 2   PTS: 2   REF: 061603geo   NAT: G.GPE.A.1
TOP: Equations of Circles

148 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

149 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

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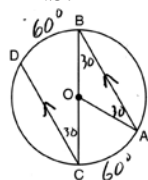
$180 - 2(30) = 120$

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

151 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

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

153 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

154 ANS:

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

$\qquad R = 17$

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

155 ANS:

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

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

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

157 ANS:

$\dfrac{3.75}{5} = \dfrac{4.5}{6}$ $\overline{AB}$ 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

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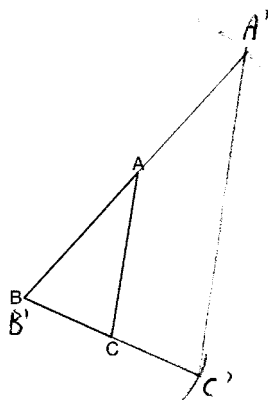
The length of $\overline{A'C'}$ is twice $\overline{AC}$.

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

159 ANS: 1   PTS: 2   REF: 081606geo   NAT: G.SRT.C.7
TOP: Cofunctions

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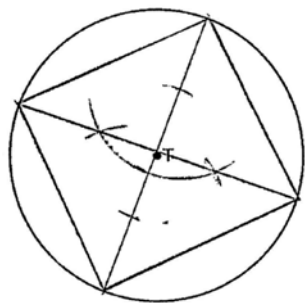
PTS: 2   REF: 061525geo   NAT: G.CO.D.13   TOP: Constructions

161 ANS: 4

$$\sin 70 = \frac{x}{20}$$

$$x \approx 18.8$$

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

162 ANS:

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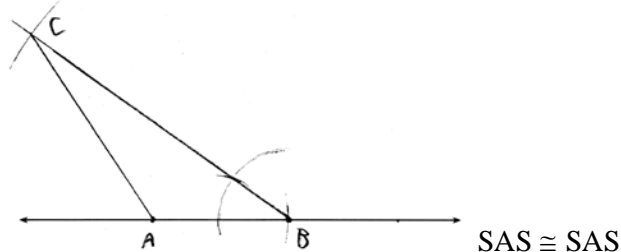
PTS: 4   REF: 011634geo   NAT: G.CO.D.12   TOP: Constructions
KEY: congruent and similar figures

163 ANS:

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

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

164 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

165 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

166 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

167 ANS: 3 PTS: 2 REF: 081622geo NAT: G.CO.B.8
TOP: Triangle Congruency

168 ANS: 4

$m = -\dfrac{1}{2}$ $\quad -4 = 2(6) + b$

$m_\perp = 2$ $\quad -4 = 12 + b$

$\quad\quad\quad -16 = b$

PTS: 2 REF: 011602geo NAT: G.GPE.B.5 TOP: Parallel and Perpendicular Lines
KEY: write equation of perpendicular line

169 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

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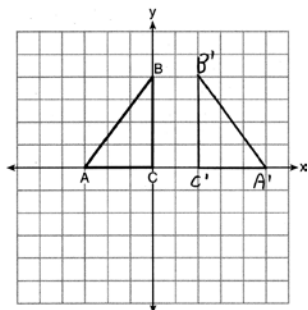
PTS: 2 REF: 011625geo NAT: G.CO.A.5 TOP: Reflections
KEY: grids

171 ANS: 3
(3) Could be a trapezoid.

PTS: 2 REF: 081607geo NAT: G.CO.C.11 TOP: Parallelograms

172 ANS: 2   PTS: 2   REF: 061506geo   NAT: G.GMD.B.4
TOP: Cross-Sections of Three-Dimensional Objects

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

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

174 ANS: 1   PTS: 2   REF: 081605geo   NAT: G.CO.A.5
TOP: Rotations   KEY: grids

175 ANS: 4   PTS: 2   REF: 011611geo   NAT: G.CO.B.6
TOP: Properties of Transformations   KEY: graphics

176 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

177 ANS:
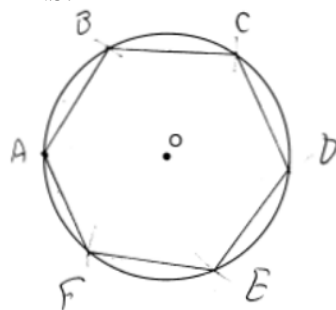
Right triangle because $\angle CBF$ is inscribed in a semi-circle.

PTS: 4   REF: 011733geo   NAT: G.CO.D.13   TOP: Constructions

178 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.8   TOP: Triangle Congruency

179 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

180 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

181 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

182 ANS:

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

$$x = 164$$

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

183 ANS: 1 PTS: 2 REF: 081507geo NAT: G.CO.A.5
TOP: Compositions of Transformations KEY: identify

184 ANS: 1 PTS: 2 REF: 061520geo NAT: G.C.A.2
TOP: Chords, Secants and Tangents KEY: mixed

185 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:

$x \approx 9.115$

$V = \dfrac{1}{2}\left(\dfrac{4}{3}\pi(8.5)^3\right) \approx 1286.3$ $689.6 + 5674.5 + 1286.3 \approx 7650$ 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

186 ANS: 2 PTS: 2 REF: 081602geo NAT: G.CO.A.2
TOP: Identifying Transformations KEY: basic

187 ANS: 4 PTS: 2 REF: 081611geo NAT: G.CO.C.9
TOP: Lines and Angles

188 ANS: 1

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

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

189 ANS:
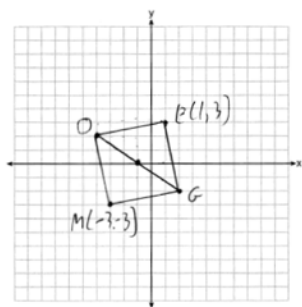
PTS: 2   REF: 011731geo   NAT: G.GPE.B.4   TOP: Quadrilaterals in the Coordinate Plane
KEY: grids

190 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

191 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

192 ANS: 3

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

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

193 ANS:

ABC − point of reflection → $(-y, x)$ + 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

194 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 $-\dfrac{2}{3}$.

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

195 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

196 ANS: 4   PTS: 2   REF: 061513geo   NAT: G.CO.C.11

TOP: Parallelograms

197 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

198 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

199 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

200 ANS:

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

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

    $4 + 8$ $2 + 0$

     12   2

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

201 ANS: 1

$3^2 = 9$

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

202 ANS: 4

$3 \times 6 = 18$

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

203 ANS: 2   PTS: 2   REF: 081513geo   NAT: G.CO.A.2

TOP: Identifying Transformations   KEY: graphics

204 ANS:

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

$$L \approx 32$$

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

205 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

206 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

207 ANS:
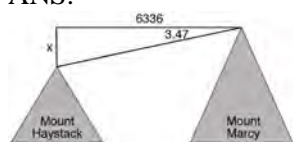
$$\tan 3.47 = \frac{M}{6336}$$

$$M \approx 384$$

$$4960 + 384 = 5344$$

$$\tan 0.64 = \frac{A}{20,493}$$

$$A \approx 229$$

$$5344 - 229 = 5115$$

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

208 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

209 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

210 ANS: 1   PTS: 2   REF: 011608geo   NAT: G.CO.A.5

TOP: Compositions of Transformations   KEY: identify

211 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

212 ANS: 2

$\tan \theta = \dfrac{2.4}{x}$

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

$x = 5.6$

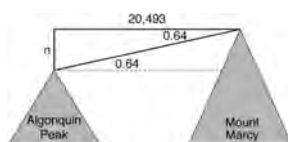PTS: 2   REF: 011707geo   NAT: G.SRT.C.8   TOP: Using Trigonometry to Find a Side

213 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: Parallelograms

214 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

215 ANS:

Yes, because 28º and 62º 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

216 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

217 ANS: 2   PTS: 2   REF: 061516geo   NAT: G.SRT.A.2
TOP: Dilations

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

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

220 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

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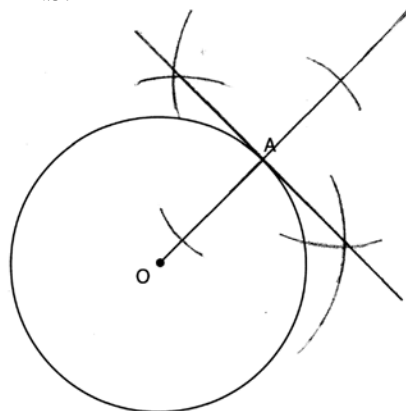
PTS: 2   REF: 061631geo   NAT: G.CO.D.12 TOP: Constructions
KEY: parallel and perpendicular lines

222 ANS: 1   PTS: 2   REF: 061508geo   NAT: G.C.A.2
TOP: Chords, Secants and Tangents   KEY: inscribed

223 ANS: 3

$$\cos 40 = \frac{14}{x}$$

$$x \approx 18$$

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

224 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

225 ANS:

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

$$x \approx 36.6$$

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

226 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.8   TOP: Triangle Congruency

227 ANS: 1   PTS: 2   REF: 061518geo   NAT: G.SRT.A.1
TOP: Line Dilations

228 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

229 ANS: 4
$$\frac{7}{12} \cdot 30 = 17.5$$

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

230 ANS:
$$s = \theta \cdot r \qquad s = \theta \cdot r \qquad \text{Yes, both angles are equal.}$$

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

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

$$\frac{\pi}{4} = B$$

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

231 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

232 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

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

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

235 ANS: 2
$\dfrac{12}{4} = \dfrac{36}{x}$

$12x = 144$

$x = 12$

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

236 ANS: 1   PTS: 2   REF: 081505geo   NAT: G.CO.A.3
TOP: Mapping a Polygon onto Itself

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

238 ANS: 4   PTS: 2   REF: 081609geo   NAT: G.SRT.A.2
TOP: Compositions of Transformations   KEY: grids

239 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

240 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

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

242 ANS: 2   PTS: 2   REF: 081501geo   NAT: G.CO.C.11
TOP: Special Quadrilaterals

243 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