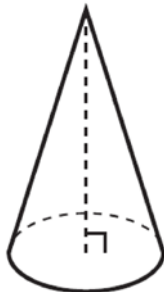






0116geo

- 1 William is drawing pictures of cross sections of the right circular cone below.

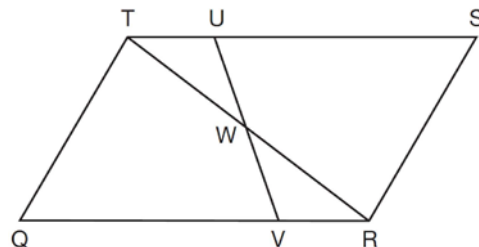


Which drawing can *not* be a cross section of a cone?

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

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

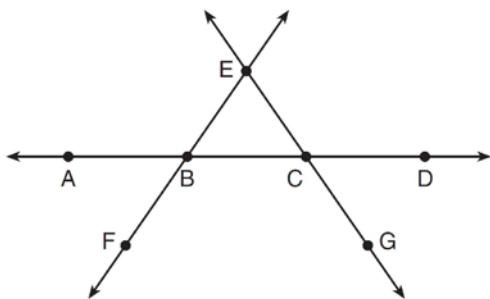
- 3 In parallelogram $QRST$ shown below, diagonal \overline{TR} is drawn, U and V are points on \overline{TS} and \overline{QR} , respectively, and \overline{UV} intersects \overline{TR} at W .



If $m\angle S = 60^\circ$, $m\angle SRT = 83^\circ$, and $m\angle TWU = 35^\circ$, what is $m\angle WVQ$?

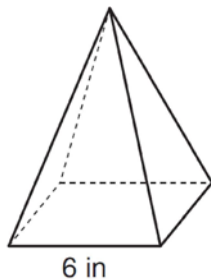
- 1) 37°
 - 2) 60°
 - 3) 72°
 - 4) 83°
- 4 A fish tank in the shape of a rectangular prism has dimensions of 14 inches, 16 inches, and 10 inches. The tank contains 1680 cubic inches of water. What percent of the fish tank is empty?
- 1) 10
 - 2) 25
 - 3) 50
 - 4) 75
- 5 Which transformation would result in the perimeter of a triangle being different from the perimeter of its image?
- 1) $(x, y) \rightarrow (y, x)$
 - 2) $(x, y) \rightarrow (x, -y)$
 - 3) $(x, y) \rightarrow (4x, 4y)$
 - 4) $(x, y) \rightarrow (x + 2, y - 5)$

- 6 In the diagram below, \overleftrightarrow{FE} bisects \overline{AC} at B , and \overleftrightarrow{GE} bisects \overline{BD} at C .



Which statement is always true?

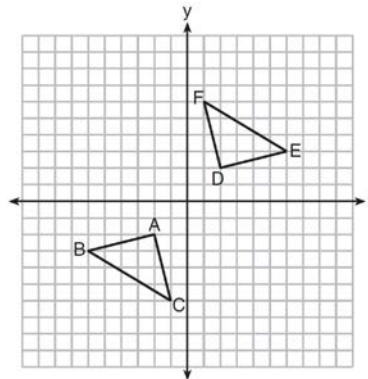
- 1) $\overline{AB} \cong \overline{DC}$
 - 2) $\overline{FB} \cong \overline{EB}$
 - 3) \overleftrightarrow{BD} bisects \overline{GE} at C .
 - 4) \overleftrightarrow{AC} bisects \overline{FE} at B .
- 7 As shown in the diagram below, a regular pyramid has a square base whose side measures 6 inches.



If the altitude of the pyramid measures 12 inches, its volume, in cubic inches, is

- 1) 72
- 2) 144
- 3) 288
- 4) 432

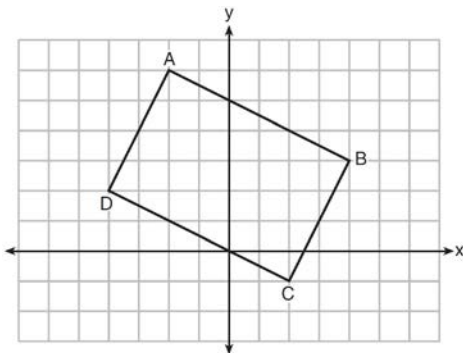
- 8 Triangle ABC and triangle DEF are graphed on the set of axes below.



Which sequence of transformations maps triangle ABC onto triangle DEF ?

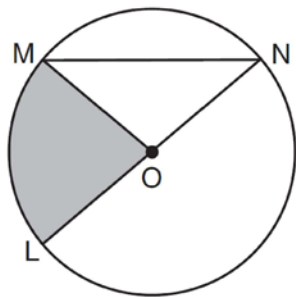
- 1) a reflection over the x -axis followed by a reflection over the y -axis
 - 2) a 180° rotation about the origin followed by a reflection over the line $y = x$
 - 3) a 90° clockwise rotation about the origin followed by a reflection over the y -axis
 - 4) a translation 8 units to the right and 1 unit up followed by a 90° counterclockwise rotation about the origin
- 9 In $\triangle ABC$, the complement of $\angle B$ is $\angle A$. Which statement is always true?
- 1) $\tan \angle A = \tan \angle B$
 - 2) $\sin \angle A = \sin \angle B$
 - 3) $\cos \angle A = \tan \angle B$
 - 4) $\sin \angle A = \cos \angle B$
- 10 A line that passes through the points whose coordinates are $(1, 1)$ and $(5, 7)$ is dilated by a scale factor of 3 and centered at the origin. The image of the line
- 1) is perpendicular to the original line
 - 2) is parallel to the original line
 - 3) passes through the origin
 - 4) is the original line

- 11 Quadrilateral $ABCD$ is graphed on the set of axes below.



When $ABCD$ is rotated 90° in a counterclockwise direction about the origin, its image is quadrilateral $A'B'C'D'$. Is distance preserved under this rotation, and which coordinates are correct for the given vertex?

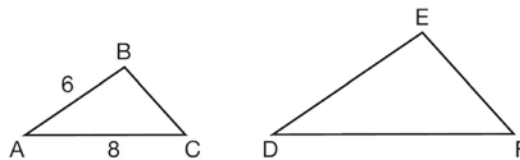
- 1) no and $C'(1,2)$
 - 2) no and $D'(2,4)$
 - 3) yes and $A'(6,2)$
 - 4) yes and $B'(-3,4)$
- 12 In the diagram below of circle O , the area of the shaded sector LOM is $2\pi \text{ cm}^2$.



If the length of \overline{NL} is 6 cm, what is $m\angle N$?

- 1) 10°
- 2) 20°
- 3) 40°
- 4) 80°

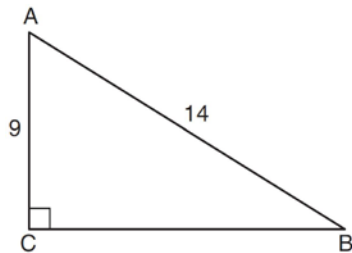
- 13 In the diagram below, $\triangle ABC \sim \triangle DEF$.



If $AB = 6$ and $AC = 8$, which statement will justify similarity by SAS?

- 1) $DE = 9$, $DF = 12$, and $\angle A \cong \angle D$
 - 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 $\angle C \cong \angle F$
- 14 The diameter of a basketball is approximately 9.5 inches and the diameter of a tennis ball is approximately 2.5 inches. The volume of the basketball is about how many times greater than the volume of the tennis ball?
- 1) 3591
 - 2) 65
 - 3) 55
 - 4) 4
- 15 The endpoints of one side of a regular pentagon are $(-1,4)$ and $(2,3)$. What is the perimeter of the pentagon?
- 1) $\sqrt{10}$
 - 2) $5\sqrt{10}$
 - 3) $5\sqrt{2}$
 - 4) $25\sqrt{2}$

- 16 In the diagram of right triangle ABC shown below, $AB = 14$ and $AC = 9$.

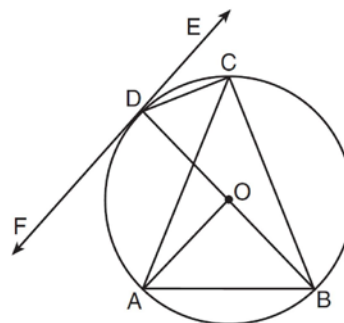


What is the measure of $\angle A$, to the nearest degree?

- 1) 33
 - 2) 40
 - 3) 50
 - 4) 57
- 17 What are the coordinates of the center and length of the radius of the circle whose equation is $x^2 + 6x + y^2 - 4y = 23$?
- 1) $(3, -2)$ and 36
 - 2) $(3, -2)$ and 6
 - 3) $(-3, 2)$ and 36
 - 4) $(-3, 2)$ and 6
- 18 The coordinates of the vertices of $\triangle RST$ are $R(-2, -3)$, $S(8, 2)$, and $T(4, 5)$. Which type of triangle is $\triangle RST$?
- 1) right
 - 2) acute
 - 3) obtuse
 - 4) equiangular
- 19 Molly wishes to make a lawn ornament in the form of a solid sphere. The clay being used to make the sphere weighs .075 pound per cubic inch. If the sphere's radius is 4 inches, what is the weight of the sphere, to the nearest pound?
- 1) 34
 - 2) 20
 - 3) 15
 - 4) 4

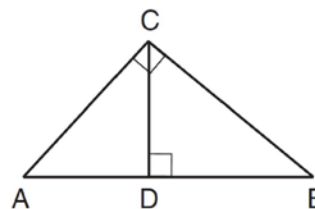
- 20 The ratio of similarity of $\triangle BOY$ to $\triangle GRL$ is 1:2. If $BO = x + 3$ and $GR = 3x - 1$, then the length of \overline{GR} is
- 1) 5
 - 2) 7
 - 3) 10
 - 4) 20

- 21 In the diagram below, \overline{DC} , \overline{AC} , \overline{DOB} , \overline{CB} , and \overline{AB} are chords of circle O , \overleftrightarrow{FDE} is tangent at point D , and radius \overline{AO} is drawn. Sam decides to apply this theorem to the diagram: "An angle inscribed in a semi-circle is a right angle."



Which angle is Sam referring to?

- 1) $\angle AOB$
 - 2) $\angle BAC$
 - 3) $\angle DCB$
 - 4) $\angle FDB$
- 22 In the diagram below, \overline{CD} is the altitude drawn to the hypotenuse \overline{AB} of right triangle ABC .



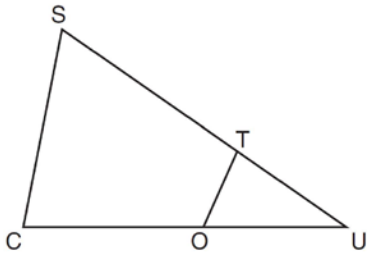
Which lengths would *not* produce an altitude that measures $6\sqrt{2}$?

- 1) $AD = 2$ and $DB = 36$
- 2) $AD = 3$ and $AB = 24$
- 3) $AD = 6$ and $DB = 12$
- 4) $AD = 8$ and $AB = 17$

- 23 A designer needs to create perfectly circular necklaces. The necklaces each need to have a radius of 10 cm. What is the largest number of necklaces that can be made from 1000 cm of wire?

- 1) 15
- 2) 16
- 3) 31
- 4) 32

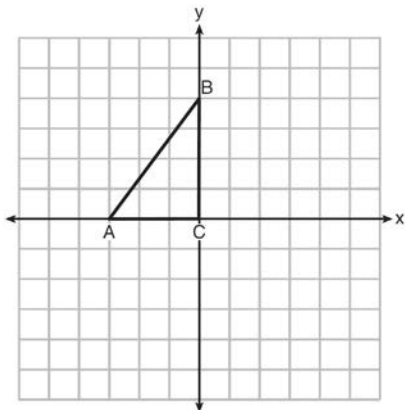
- 24 In $\triangle SCU$ shown below, points T and O are on \overline{SU} and \overline{CU} , respectively. Segment OT is drawn so that $\angle C \cong \angle OTU$.



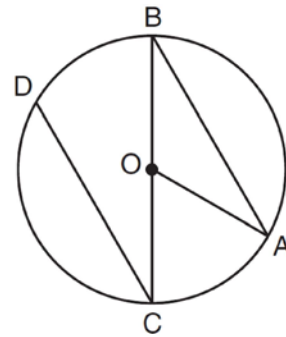
If $TU = 4$, $OU = 5$, and $OC = 7$, what is the length of ST ?

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

- 25 Triangle ABC is graphed on the set of axes below. Graph and label $\triangle A'B'C'$, the image of $\triangle ABC$ after a reflection over the line $x = 1$.

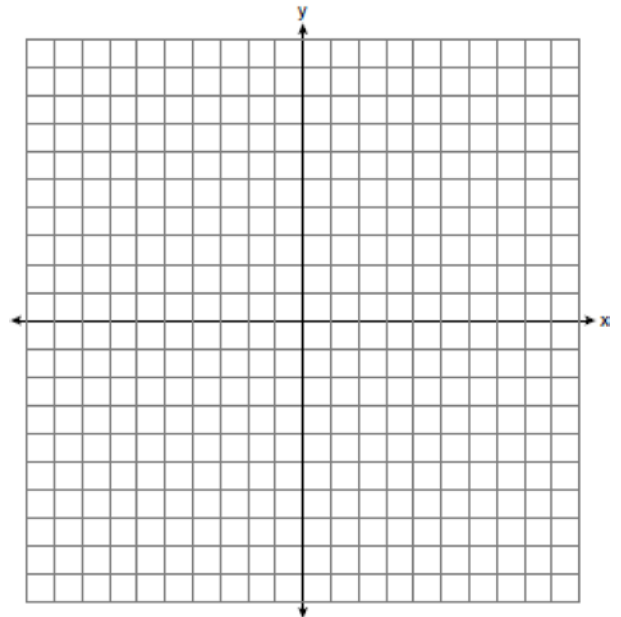


- 26 In the diagram below of circle O with diameter \overline{BC} and radius \overline{OA} , chord \overline{DC} is parallel to chord \overline{BA} .

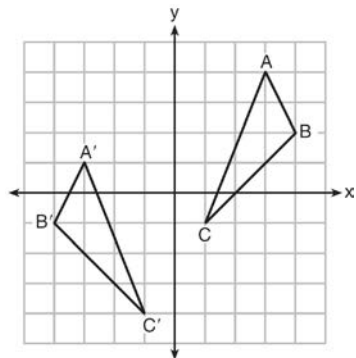


If $m\angle BCD = 30^\circ$, determine and state $m\angle AOB$.

- 27 Directed line segment \overline{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.]

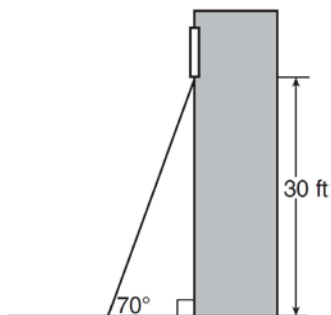


- 28 As graphed on the set of axes below, $\triangle A'B'C'$ is the image of $\triangle ABC$ after a sequence of transformations.

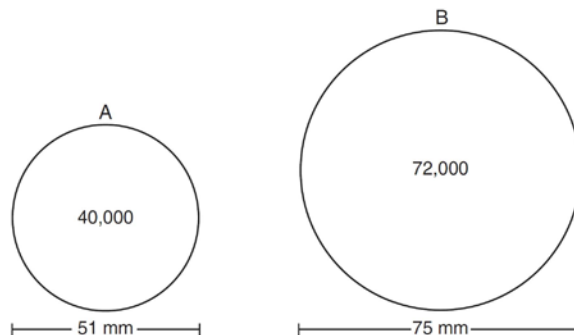


Is $\triangle A'B'C'$ congruent to $\triangle ABC$? Use the properties of rigid motion to explain your answer.

- 29 A carpenter leans an extension ladder against a house to reach the bottom of a window 30 feet above the ground. As shown in the diagram below, the ladder makes a 70° angle with the ground. To the *nearest foot*, determine and state the length of the ladder.



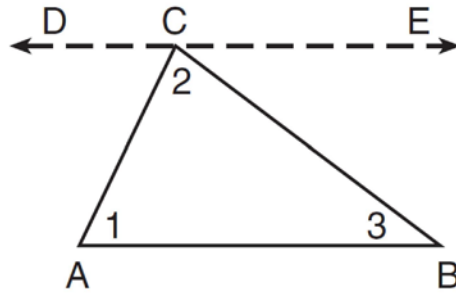
- 30 During an experiment, the same type of bacteria is grown in two petri dishes. Petri dish *A* has a diameter of 51 mm and has approximately 40,000 bacteria after 1 hour. Petri dish *B* has a diameter of 75 mm and has approximately 72,000 bacteria after 1 hour.



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

- 31 Line ℓ is mapped onto line m by a dilation centered at the origin with a scale factor of 2. The equation of line ℓ is $3x - y = 4$. Determine and state an equation for line m .
- 32 The aspect ratio (the ratio of screen width to height) of a rectangular flat-screen television is 16:9. The length of the diagonal of the screen is the television's screen size. Determine and state, to the *nearest inch*, the screen size (diagonal) of this flat-screen television with a screen height of 20.6 inches.

- 33 Given the theorem, “The sum of the measures of the interior angles of a triangle is 180° ,” complete the proof for this theorem.



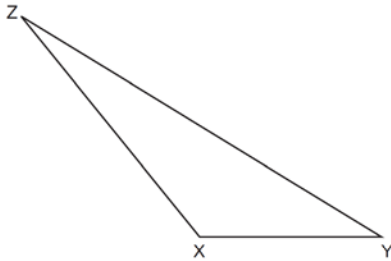
Given: $\triangle ABC$

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

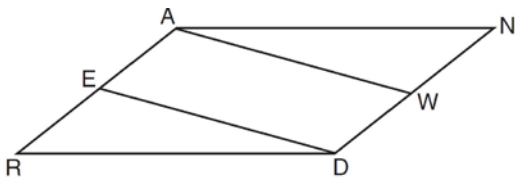
Fill in the missing reasons below.

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) $m\angle ACD + m\angle 2 + m\angle BCE = 180^\circ$	(4) _____ _____ _____
(5) $m\angle 1 + m\angle 2 + m\angle 3 = 180^\circ$	(5) _____ _____ _____

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

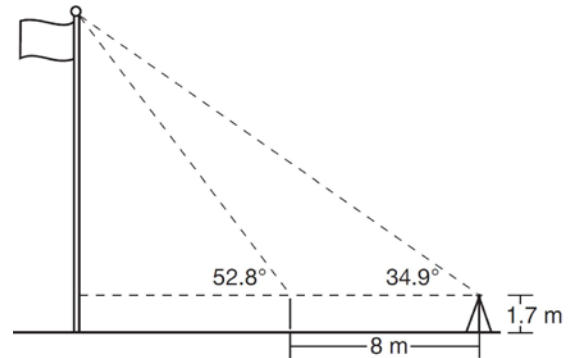


- 35 Given: Parallelogram $ANDR$ with \overline{AW} and \overline{DE} bisecting \overline{NWD} and \overline{REA} at points W and E , respectively



Prove that $\triangle ANW \cong \triangle DRE$. Prove that quadrilateral $AWDE$ is a parallelogram.

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



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

0116geo

Answer Section

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

2 ANS: 4

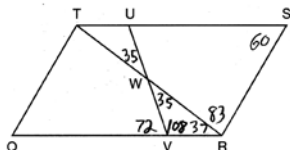
$$m = -\frac{1}{2} \quad -4 = 2(6) + b$$

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

$$-16 = b$$

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

3 ANS: 3



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

4 ANS: 2

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

PTS: 2 REF: 011604geo NAT: G.GMD.A.3 TOP: Volume

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

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

7 ANS: 2

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

PTS: 2 REF: 011607geo NAT: G.GMD.A.3 TOP: Volume

8 ANS: 1 PTS: 2 REF: 011608geo NAT: G.CO.A.5
TOP: Compositions of Transformations KEY: identify

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

10 ANS: 2 PTS: 2 REF: 011610geo NAT: G.SRT.A.1
TOP: Line Dilations

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

12 ANS: 3

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

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

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

13 ANS: 1

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

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

KEY: basic

14 ANS: 3

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

PTS: 2 REF: 011614geo NAT: G.MG.A.1 TOP: Volume

15 ANS: 2

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

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

16 ANS: 3

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

$$A \approx 50^\circ$$

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

17 ANS: 4

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

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

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

18 ANS: 1

$$m_{\overline{RT}} = \frac{5-3}{4-2} = \frac{2}{2} = 1 \quad m_{\overline{ST}} = \frac{5-2}{4-8} = \frac{3}{-4} = -\frac{3}{4}$$

Slopes are opposite reciprocals, so lines form a right angle.

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

19 ANS: 2

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

PTS: 2

REF: 011619geo

NAT: G.MG.A.2

TOP: Density

20 ANS: 4

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

$$3x - 1 = 2x + 6$$

$$x = 7$$

PTS: 2

REF: 011620geo

NAT: G.SRT.B.5

TOP: Similarity

KEY: basic

21 ANS: 3

PTS: 2

REF: 011621geo

NAT: G.C.A.2

TOP: Chords, Secants and Tangents

22 ANS: 2

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

PTS: 2

REF: 011622geo

NAT: G.SRT.B.5

TOP: Similarity

KEY: altitude

23 ANS: 1

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

PTS: 2

REF: 011623geo

NAT: G.MG.A.3

TOP: Properties of Circles

24 ANS: 3

$$\frac{12}{4} = \frac{x}{5} \quad 15 - 4 = 11$$

$$x = 15$$

PTS: 2

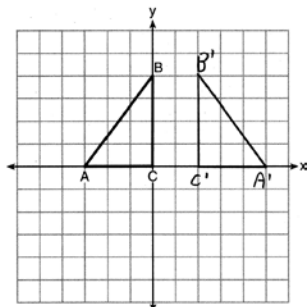
REF: 011624geo

NAT: G.SRT.B.5

TOP: Similarity

KEY: basic

25 ANS:



PTS: 2

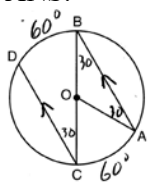
REF: 011625geo

NAT: G.CO.A.5

TOP: Reflections

KEY: grids

26 ANS:



$$180 - 2(30) = 120$$

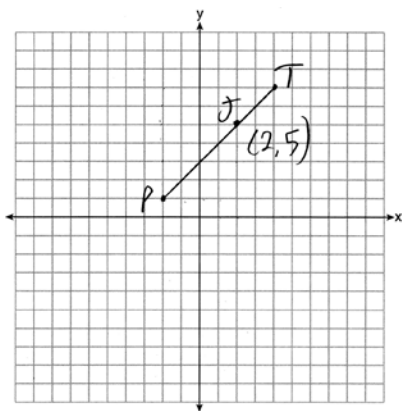
PTS: 2

REF: 011626geo

NAT: G.C.A.2

TOP: Chords, Secants and Tangents

27 ANS:



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

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

PTS: 2

REF: 011627geo

NAT: G.GPE.B.6

TOP: Directed Line Segments

28 ANS:

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

PTS: 2

REF: 011628geo

NAT: G.CO.B.8

TOP: Triangle Congruency

29 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

30 ANS:

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

PTS: 2

REF: 011630geo

NAT: G.MG.A.2

TOP: Density

- 31 ANS:
 $l: y = 3x - 4$
 $m: y = 3x - 8$

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

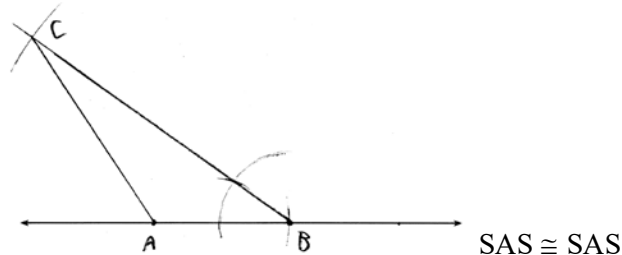
- 32 ANS:
 $\frac{16}{9} = \frac{x}{20.6} \quad D = \sqrt{36.6^2 + 20.6^2} \approx 42$
 $x \approx 36.6$

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

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

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

- 34 ANS:



PTS: 4 REF: 011634geo NAT: G.CO.D.12 TOP: Constructions

- 35 ANS:
 Parallelogram $ANDR$ with \overline{AW} and \overline{DE} bisecting \overline{NWD} and \overline{REA} at points W and E (Given). $\overline{AN} \cong \overline{RD}$, $\overline{AR} \cong \overline{DN}$ (Opposite sides of a parallelogram are congruent). $AE = \frac{1}{2}AR$, $WD = \frac{1}{2}DN$, 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). $RE = \frac{1}{2}AR$, $NW = \frac{1}{2}DN$, 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.CO.C.11 TOP: Quadrilateral Proofs

36 ANS:

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

$$h = x \tan 52.8$$

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

$$x \approx 11.86$$

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

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

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

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

$$x \approx 9$$

PTS: 6

REF: 011636geo

NAT: G.SRT.C.8

TOP: Using Trigonometry to Find a Side