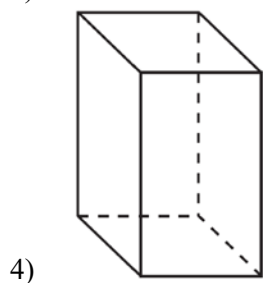
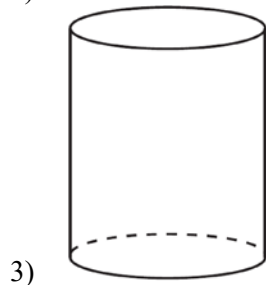
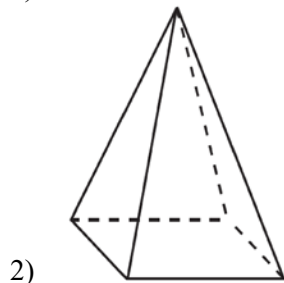
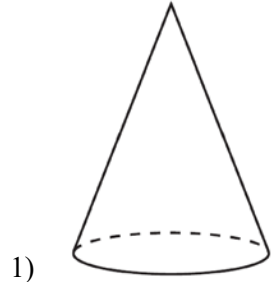


**0616geo**

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



- 2 A three-inch line segment is dilated by a scale factor of 6 and centered at its midpoint. What is the length of its image?

- 1) 9 inches
- 2) 2 inches
- 3) 15 inches
- 4) 18 inches

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

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

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

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

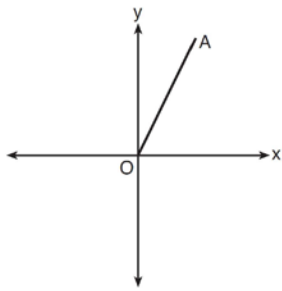
STEP 3  $(x + 2)^2 = -y^2 + 20 - 4$

STEP 4  $(x + 2)^2 + y^2 = 16$

In which step did he make an error in his work?

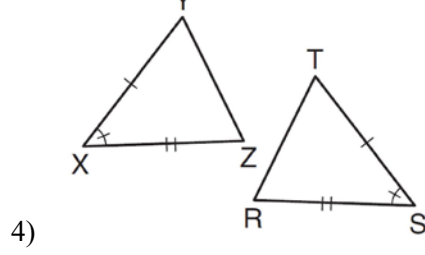
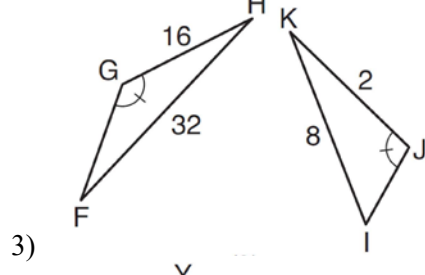
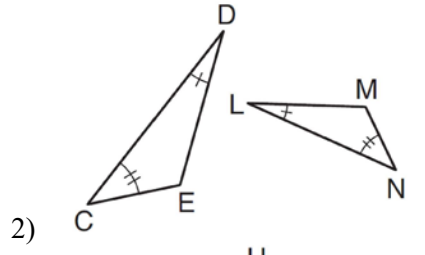
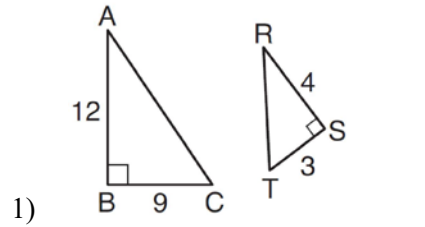
- 1) Step 1
- 2) Step 2
- 3) Step 3
- 4) Step 4

- 4 Which transformation of  $\overline{OA}$  would result in an image parallel to  $\overline{OA}$ ?



- 1) a translation of two units down
- 2) a reflection over the  $x$ -axis
- 3) a reflection over the  $y$ -axis
- 4) a clockwise rotation of  $90^\circ$  about the origin

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



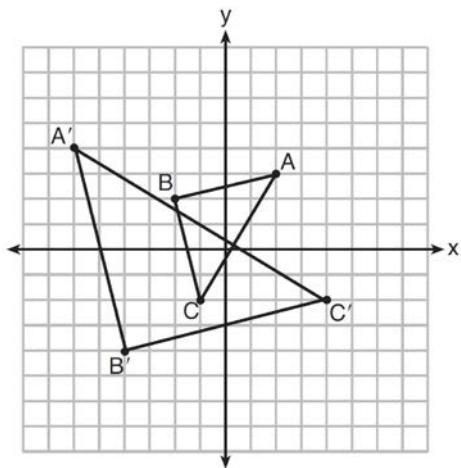
6 A company is creating an object from a wooden cube with an edge length of 8.5 cm. A right circular cone with a diameter of 8 cm and an altitude of 8 cm will be cut out of the cube. Which expression represents the volume of the remaining wood?

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

7 Two right triangles must be congruent if

- 1) an acute angle in each triangle is congruent
- 2) the lengths of the hypotenuses are equal
- 3) the corresponding legs are congruent
- 4) the areas are equal

8 Which sequence of transformations will map  $\triangle ABC$  onto  $\triangle A'B'C'$ ?

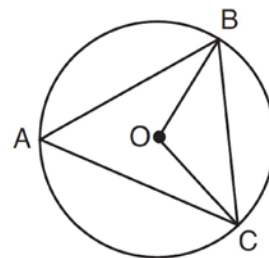


- 1) reflection and translation
- 2) rotation and reflection
- 3) translation and dilation
- 4) dilation and rotation

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

- 1)  $\overline{AC} \cong \overline{DB}$
- 2)  $\overline{AB} \cong \overline{BC}$
- 3)  $\overline{AC} \perp \overline{DB}$
- 4)  $AC$  bisects  $\angle DCB$

10 In the diagram below of circle  $O$ ,  $\overline{OB}$  and  $\overline{OC}$  are radii, and chords  $\overline{AB}$ ,  $\overline{BC}$ , and  $\overline{AC}$  are drawn.



Which statement must always be true?

- 1)  $\angle BAC \cong \angle BOC$
- 2)  $m\angle BAC = \frac{1}{2}m\angle BOC$
- 3)  $\triangle BAC$  and  $\triangle BOC$  are isosceles.
- 4) The area of  $\triangle BAC$  is twice the area of  $\triangle BOC$ .

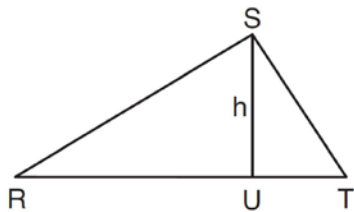
11 A 20-foot support post leans against a wall, making a  $70^\circ$  angle with the ground. To the *nearest tenth of a foot*, how far up the wall will the support post reach?

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

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

- 1)  $y + 1 = \frac{4}{3}(x + 3)$
- 2)  $y + 1 = -\frac{3}{4}(x + 3)$
- 3)  $y - 6 = \frac{4}{3}(x - 8)$
- 4)  $y - 6 = -\frac{3}{4}(x - 8)$

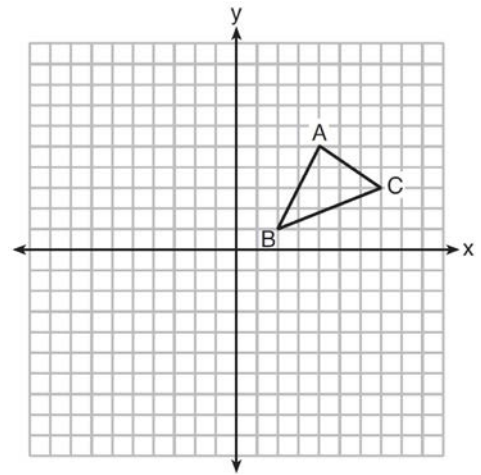
13 In  $\triangle RST$  shown below, altitude  $\overline{SU}$  is drawn to  $\overline{RT}$  at  $U$ .



If  $SU = h$ ,  $UT = 12$ , and  $RT = 42$ , which value of  $h$  will make  $\triangle RST$  a right triangle with  $\angle RST$  as a right angle?

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

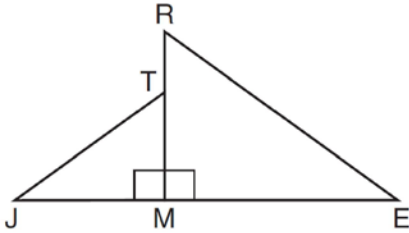
14 In the diagram below,  $\triangle ABC$  has vertices  $A(4,5)$ ,  $B(2,1)$ , and  $C(7,3)$ .



What is the slope of the altitude drawn from  $A$  to  $\overline{BC}$ ?

- 1)  $\frac{2}{5}$
- 2)  $\frac{3}{2}$
- 3)  $-\frac{1}{2}$
- 4)  $-\frac{5}{2}$

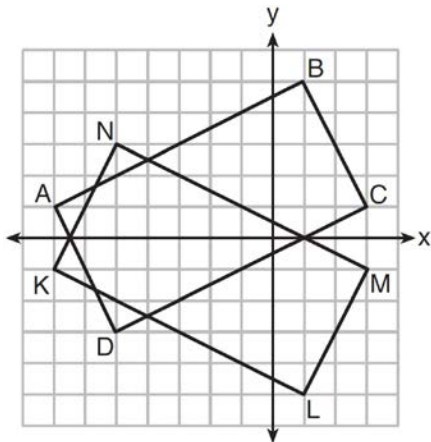
- 15 In the diagram below,  $\triangle ERM \sim \triangle JTM$ .



Which statement is always true?

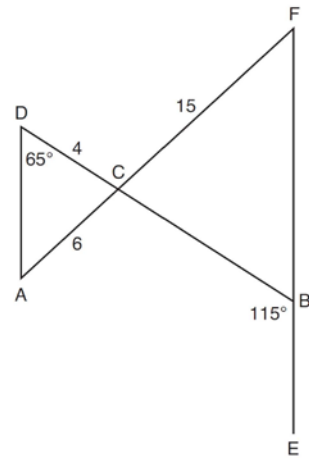
- 1)  $\cos J = \frac{RM}{RE}$
- 2)  $\cos R = \frac{JM}{JT}$
- 3)  $\tan T = \frac{RM}{EM}$
- 4)  $\tan E = \frac{TM}{JM}$

- 16 On the set of axes below, rectangle  $ABCD$  can be proven congruent to rectangle  $KLMN$  using which transformation?



- 1) rotation
- 2) translation
- 3) reflection over the  $x$ -axis
- 4) reflection over the  $y$ -axis

- 17 In the diagram below,  $\overline{DB}$  and  $\overline{AF}$  intersect at point  $C$ , and  $\overline{AD}$  and  $\overline{FBE}$  are drawn.



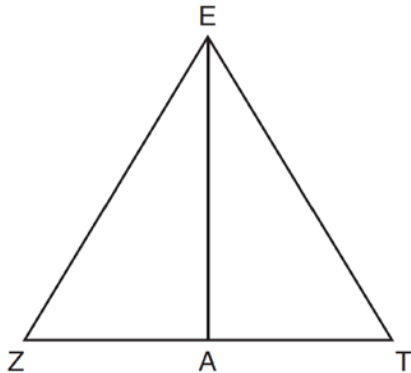
If  $AC = 6$ ,  $DC = 4$ ,  $FC = 15$ ,  $m\angle D = 65^\circ$ , and  $m\angle CBE = 115^\circ$ , what is the length of  $CB$ ?

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

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

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

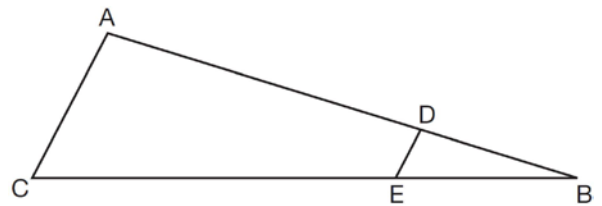
- 19 Line segment  $\overline{EA}$  is the perpendicular bisector of  $\overline{ZT}$ , and  $\overline{ZE}$  and  $\overline{TE}$  are drawn.



Which conclusion can *not* be proven?

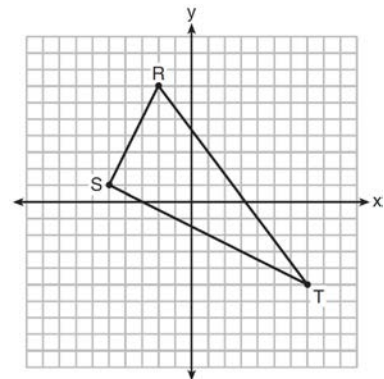
- 1)  $\overline{EA}$  bisects angle  $ZET$ .
  - 2) Triangle  $EZT$  is equilateral.
  - 3)  $\overline{EA}$  is a median of triangle  $EZT$ .
  - 4) Angle  $Z$  is congruent to angle  $T$ .
- 20 A hemispherical water tank has an inside diameter of 10 feet. If water has a density of 62.4 pounds per cubic foot, what is the weight of the water in a full tank, to the *nearest pound*?
- 1) 16,336
  - 2) 32,673
  - 3) 130,690
  - 4) 261,381

- 21 In the diagram of  $\triangle ABC$ , points  $D$  and  $E$  are on  $\overline{AB}$  and  $\overline{CB}$ , respectively, such that  $\overline{AC} \parallel \overline{DE}$ .



If  $AD = 24$ ,  $DB = 12$ , and  $DE = 4$ , what is the length of  $\overline{AC}$ ?

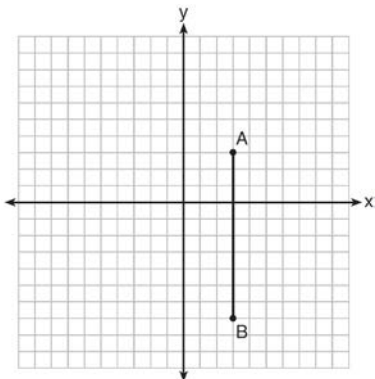
- 1) 8
  - 2) 12
  - 3) 16
  - 4) 72
- 22 Triangle  $RST$  is graphed on the set of axes below.



How many square units are in the area of  $\triangle RST$ ?

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

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

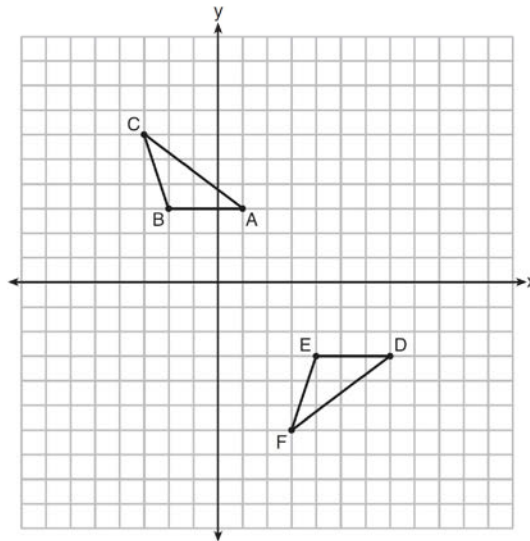


What could be a correct equation for circle  $O$ ?

- 1)  $(x - 1)^2 + (y + 2)^2 = 29$
  - 2)  $(x + 5)^2 + (y - 2)^2 = 29$
  - 3)  $(x - 1)^2 + (y - 2)^2 = 25$
  - 4)  $(x - 5)^2 + (y + 2)^2 = 25$
- 24 What is the area of a sector of a circle with a radius of 8 inches and formed by a central angle that measures  $60^\circ$ ?

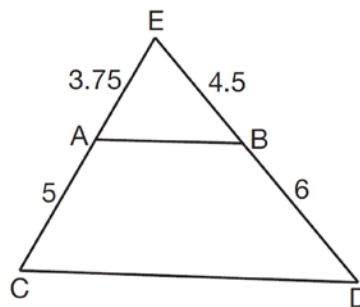
- 1)  $\frac{8\pi}{3}$
- 2)  $\frac{16\pi}{3}$
- 3)  $\frac{32\pi}{3}$
- 4)  $\frac{64\pi}{3}$

- 25 Describe a sequence of transformations that will map  $\triangle ABC$  onto  $\triangle DEF$  as shown below.



- 26 Point  $P$  is on segment  $AB$  such that  $AP:PB$  is  $4:5$ . If  $A$  has coordinates  $(4,2)$ , and  $B$  has coordinates  $(22,2)$ , determine and state the coordinates of  $P$ .

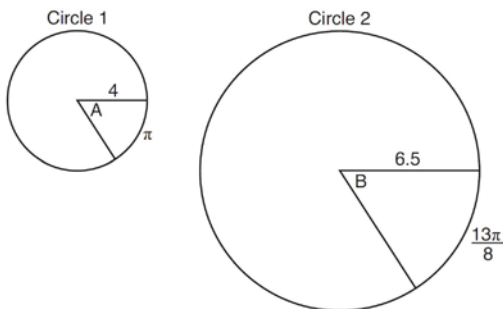
- 27 In  $\triangle CED$  as shown below, points  $A$  and  $B$  are located on sides  $CE$  and  $ED$ , respectively. Line segment  $AB$  is drawn such that  $AE = 3.75$ ,  $AC = 5$ ,  $EB = 4.5$ , and  $BD = 6$ .



Explain why  $\overline{AB}$  is parallel to  $\overline{CD}$ .

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

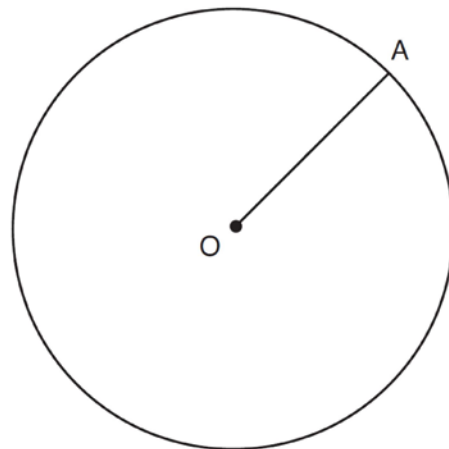
29 In the diagram below, Circle 1 has radius 4, while Circle 2 has radius 6.5. Angle  $A$  intercepts an arc of length  $\pi$ , and angle  $B$  intercepts an arc of length  $\frac{13\pi}{8}$ .



Dominic thinks that angles  $A$  and  $B$  have the same radian measure. State whether Dominic is correct or not. Explain why.

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

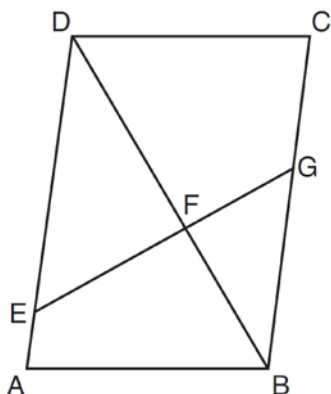
31 In the diagram below, radius  $\overline{OA}$  is drawn in circle  $O$ . Using a compass and a straightedge, construct a line tangent to circle  $O$  at point  $A$ . [Leave all construction marks.]



32 A barrel of fuel oil is a right circular cylinder where the inside measurements of the barrel are a diameter of 22.5 inches and a height of 33.5 inches. There are 231 cubic inches in a liquid gallon. Determine and state, to the *nearest tenth*, the gallons of fuel that are in a barrel of fuel oil.

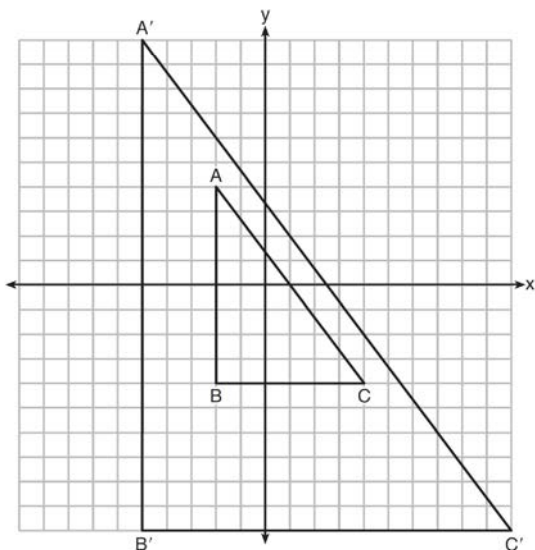


- 33 Given: Parallelogram  $ABCD$ ,  $\overline{EFG}$ , and diagonal  $\overline{DFB}$



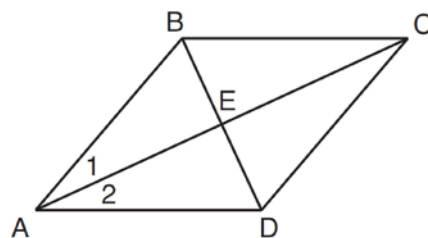
Prove:  $\triangle DEF \sim \triangle BGF$

- 34 In the diagram below,  $\triangle A'B'C'$  is the image of  $\triangle ABC$  after a transformation.



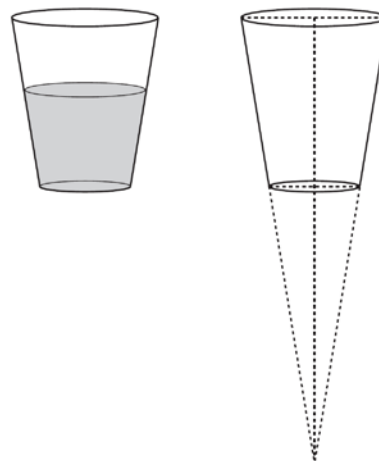
Describe the transformation that was performed.  
Explain why  $\triangle A'B'C' \sim \triangle ABC$ .

- 35 Given: Quadrilateral  $ABCD$  with diagonals  $\overline{AC}$  and  $\overline{BD}$  that bisect each other, and  $\angle 1 \cong \angle 2$



Prove:  $\triangle ACD$  is an isosceles triangle and  $\triangle AEB$  is a right triangle

- 36 A water glass can be modeled by a truncated right cone (a cone which is cut parallel to its base) as shown below.



The diameter of the top of the glass is 3 inches, the diameter at the bottom of the glass is 2 inches, and the height of the glass is 5 inches. The base with a diameter of 2 inches must be parallel to the base with a diameter of 3 inches in order to find the height of the cone. Explain why. Determine and state, in inches, the height of the larger cone. Determine and state, to the nearest tenth of a cubic inch, the volume of the water glass.

## 0616geo

## Answer Section

- 1 ANS: 3 PTS: 2 REF: 061601geo NAT: G.GMD.B.4  
TOP: Rotations of Two-Dimensional Objects
- 2 ANS: 4  
 $3 \times 6 = 18$   
  
PTS: 2 REF: 061602geo NAT: G.SRT.A.1 TOP: Line Dilations
- 3 ANS: 2 PTS: 2 REF: 061603geo NAT: G.GPE.A.1  
TOP: Equations of Circles KEY: find center and radius | completing the square
- 4 ANS: 1 PTS: 2 REF: 061604geo NAT: G.CO.A.2  
TOP: Identifying Transformations KEY: graphics
- 5 ANS: 3  
1)  $\frac{12}{9} = \frac{4}{3}$  2) AA 3)  $\frac{32}{16} \neq \frac{8}{2}$  4) SAS  
  
PTS: 2 REF: 061605geo NAT: G.SRT.B.5 TOP: Similarity  
KEY: basic
- 6 ANS: 4 PTS: 2 REF: 061606geo NAT: G.GMD.A.3  
TOP: Volume KEY: compositions
- 7 ANS: 3  
1) only proves AA; 2) need congruent legs for HL; 3) SAS; 4) only proves product of altitude and base is equal  
  
PTS: 2 REF: 061607geo NAT: G.SRT.B.5 TOP: Triangle Proofs  
KEY: statements
- 8 ANS: 4 PTS: 2 REF: 061608geo NAT: G.SRT.A.2  
TOP: Compositions of Transformations KEY: grids
- 9 ANS: 1  
1) opposite sides; 2) adjacent sides; 3) perpendicular diagonals; 4) diagonal bisects angle  
  
PTS: 2 REF: 061609geo NAT: G.CO.C.11 TOP: Special Quadrilaterals
- 10 ANS: 2 PTS: 2 REF: 061610geo NAT: G.C.A.2  
TOP: Chords, Secants and Tangents KEY: inscribed
- 11 ANS: 4  
 $\sin 70 = \frac{x}{20}$   
 $x \approx 18.8$   
  
PTS: 2 REF: 061611geo NAT: G.SRT.C.8 TOP: Using Trigonometry to Find a Side  
KEY: without graphics
- 12 ANS: 1  
 $m = \left( \frac{-11+5}{2}, \frac{5+-7}{2} \right) = (-3, -1)$   $m = \frac{5--7}{-11-5} = \frac{12}{-16} = -\frac{3}{4}$   $m_{\perp} = \frac{4}{3}$   
  
PTS: 2 REF: 061612geo NAT: G.GPE.B.5 TOP: Parallel and Perpendicular Lines  
KEY: perpendicular bisector

13 ANS: 2  
 $h^2 = 30 \cdot 12$   
 $h^2 = 360$   
 $h = 6\sqrt{10}$

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

14 ANS: 4  
 The slope of  $\overline{BC}$  is  $\frac{2}{5}$ . 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

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

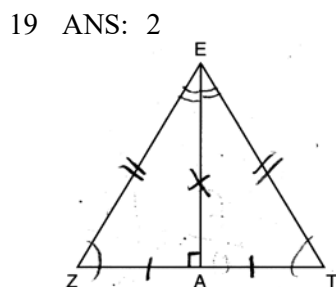
16 ANS: 3 PTS: 2 REF: 061616geo NAT: G.CO.A.2  
 TOP: Identifying Transformations KEY: graphics

17 ANS: 1  
 $\frac{f}{4} = \frac{15}{6}$   
 $f = 10$

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

18 ANS: 2  
 $\frac{11}{1.2 \text{ oz}} \left( \frac{16 \text{ oz}}{1 \text{ lb}} \right) = \frac{13.\bar{3}1}{\text{lb}} \frac{13.\bar{3}1}{\text{lb}} \left( \frac{1 \text{ g}}{3.7851} \right) \approx \frac{3.5 \text{ g}}{1 \text{ lb}}$

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



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

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

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

21 ANS: 2

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

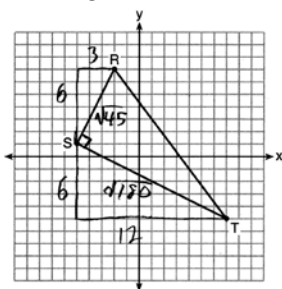
$$12x = 144$$

$$x = 12$$

PTS: 2

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

22 ANS: 3



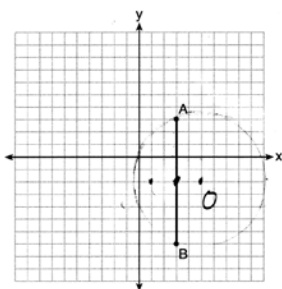
$$\sqrt{45} = 3\sqrt{5} \quad a = \frac{1}{2} (3\sqrt{5})(6\sqrt{5}) = \frac{1}{2} (18)(5) = 45$$

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

PTS: 2

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

23 ANS: 1



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

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

PTS: 2

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

KEY: other

24 ANS: 3

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

PTS: 2

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

25 ANS:

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

PTS: 2

REF: 061625geo NAT: G.CO.A.5 TOP: Compositions of Transformations

KEY: identify

26 ANS:

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

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

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

$$12 \quad 2$$

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

27 ANS:

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

$$39.375 = 39.375$$

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

28 ANS:

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

$$R = 17$$

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

29 ANS:

$$s = \theta \cdot r \quad s = \theta \cdot r \quad \text{Yes, both angles are equal.}$$

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

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

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

KEY: arc length

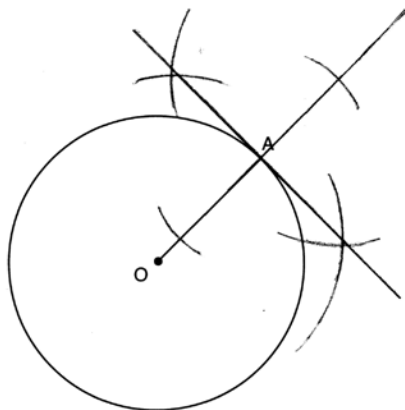
30 ANS:

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

$$x \approx 68$$

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

31 ANS:



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

32 ANS:

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

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

33 ANS:

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

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

34 ANS:

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

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

35 ANS:

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

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

36 ANS:

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

$$x + 5 = 1.5x$$

$$5 = .5x$$

$$10 = x$$

$$10 + 5 = 15$$

PTS: 6

REF: 061636geo NAT: G.GMD.A.3 TOP: Volume

KEY: cones