

0815geo

- 1 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

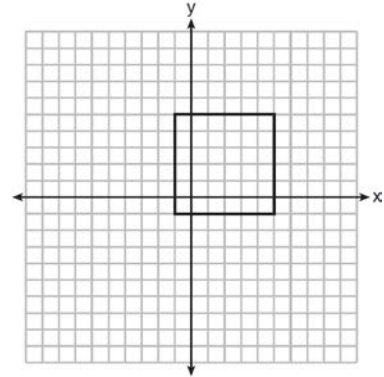
- 2 If $\triangle A'B'C'$ is the image of $\triangle ABC$, under which transformation will the triangles *not* be congruent?
 - 1) reflection over the x -axis
 - 2) translation to the left 5 and down 4
 - 3) dilation centered at the origin with scale factor 2
 - 4) rotation of 270° counterclockwise about the origin

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



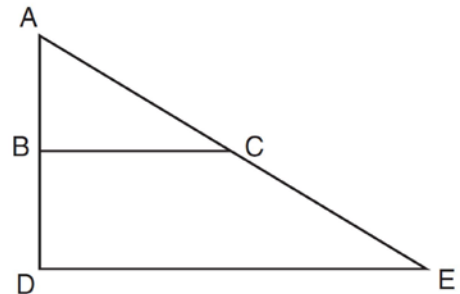
- 1) pyramid
 - 2) rectangular prism
 - 3) cone
 - 4) cylinder
-
- 4 Which expression is always equivalent to $\sin x$ when $0^\circ < x < 90^\circ$?
 - 1) $\cos(90^\circ - x)$
 - 2) $\cos(45^\circ - x)$
 - 3) $\cos(2x)$
 - 4) $\cos x$

- 5 In the diagram below, a square is graphed in the coordinate plane.



A reflection over which line does *not* carry the square onto itself?

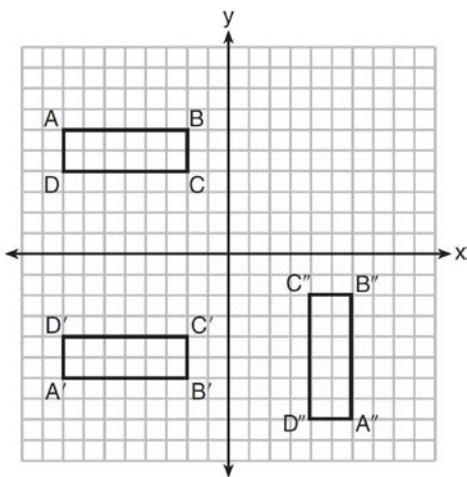
- 1) $x = 5$
 - 2) $y = 2$
 - 3) $y = x$
 - 4) $x + y = 4$
-
- 6 The image of $\triangle ABC$ after a dilation of scale factor k centered at point A is $\triangle ADE$, as shown in the diagram below.



Which statement is always true?

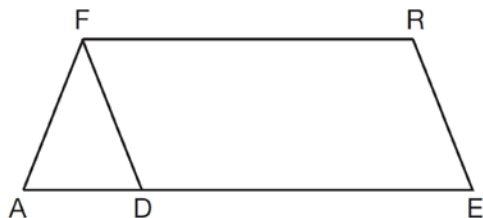
- 1) $\overline{2AB} = \overline{AD}$
- 2) $\overline{AD} \perp \overline{DE}$
- 3) $\overline{AC} = \overline{CE}$
- 4) $\overline{BC} \parallel \overline{DE}$

- 7 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
- 8 In the diagram of parallelogram $FRED$ shown below, \overline{ED} is extended to A , and \overline{AF} is drawn such that $\overline{AF} \cong \overline{DF}$.

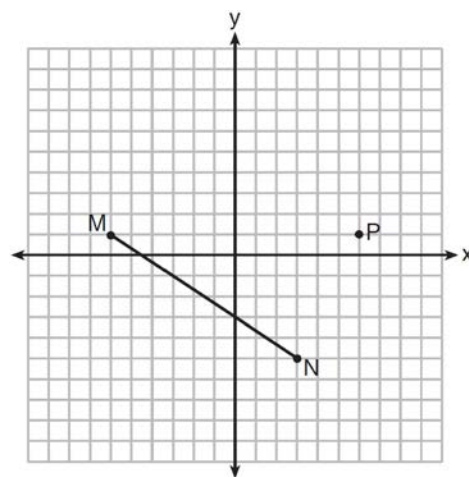


If $m\angle R = 124^\circ$, what is $m\angle AFD$?

- 1) 124°
- 2) 112°
- 3) 68°
- 4) 56°

- 9 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

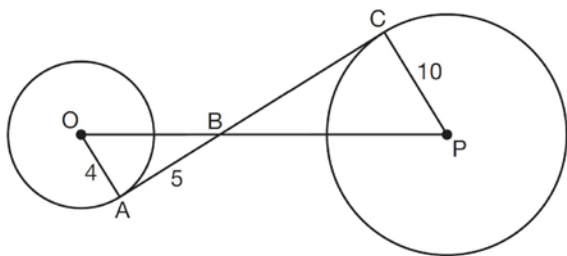
- 10 Given \overline{MN} shown below, with $M(-6, 1)$ and $N(3, -5)$, what is an equation of the line that passes through point $P(6, 1)$ and is parallel to \overline{MN} ?



- 1) $y = -\frac{2}{3}x + 5$
- 2) $y = -\frac{2}{3}x - 3$
- 3) $y = \frac{3}{2}x + 7$
- 4) $y = \frac{3}{2}x - 8$

- 11 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

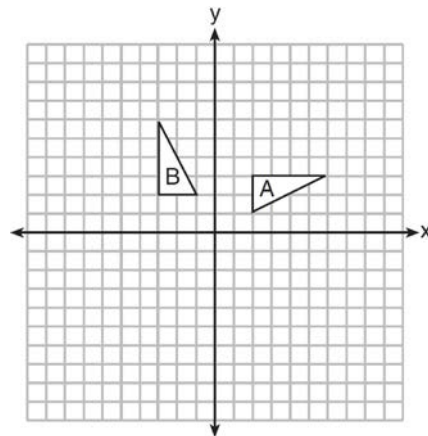
- 12 In the diagram shown below, \overline{AC} is tangent to circle O at A and to circle P at C , \overline{OP} intersects \overline{AC} at B , $OA = 4$, $AB = 5$, and $PC = 10$.



What is the length of \overline{BC} ?

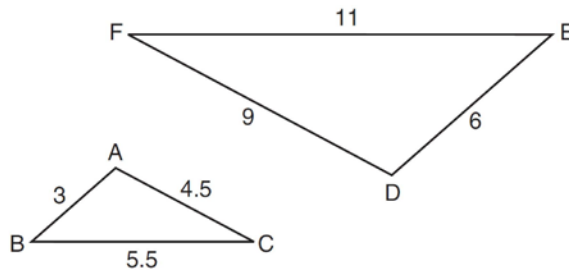
- 1) 6.4
- 2) 8
- 3) 12.5
- 4) 16

- 13 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

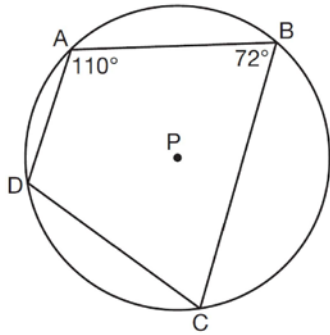
- 14 In the diagram below, $\triangle DEF$ is the image of $\triangle ABC$ after a clockwise rotation of 180° and a dilation where $AB = 3$, $BC = 5.5$, $AC = 4.5$, $DE = 6$, $FD = 9$, and $EF = 11$.



Which relationship must always be true?

- 1) $\frac{m\angle A}{m\angle D} = \frac{1}{2}$
- 2) $\frac{m\angle C}{m\angle F} = \frac{2}{1}$
- 3) $\frac{m\angle A}{m\angle C} = \frac{m\angle F}{m\angle D}$
- 4) $\frac{m\angle B}{m\angle E} = \frac{m\angle C}{m\angle F}$

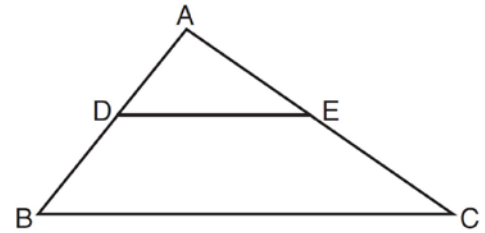
- 15 In the diagram below, quadrilateral $ABCD$ is inscribed in circle P .



What is $m\angle ADC$?

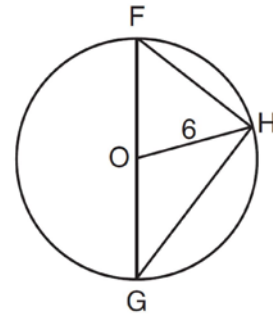
- 1) 70°
 - 2) 72°
 - 3) 108°
 - 4) 110°
- 16 A hemispherical tank is filled with water and has a diameter of 10 feet. If water weighs 62.4 pounds per cubic foot, what is the total weight of the water in a full tank, to the nearest pound?
- 1) 16,336
 - 2) 32,673
 - 3) 130,690
 - 4) 261,381

- 17 In the diagram below, $\triangle ABC \sim \triangle ADE$.



Which measurements are justified by this similarity?

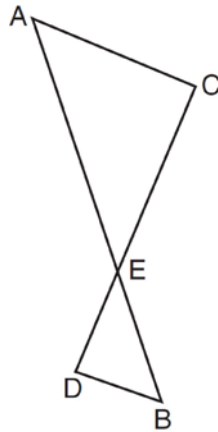
- 1) $AD = 3$, $AB = 6$, $AE = 4$, and $AC = 12$
 - 2) $AD = 5$, $AB = 8$, $AE = 7$, and $AC = 10$
 - 3) $AD = 3$, $AB = 9$, $AE = 5$, and $AC = 10$
 - 4) $AD = 2$, $AB = 6$, $AE = 5$, and $AC = 15$
- 18 Triangle FGH is inscribed in circle O , the length of radius \overline{OH} is 6, and $\overline{FH} \cong \overline{OG}$.



What is the area of the sector formed by angle FOH ?

- 1) 2π
- 2) $\frac{3}{2}\pi$
- 3) 6π
- 4) 24π

- 19 As shown in the diagram below, \overline{AB} and \overline{CD} intersect at E , and $\overline{AC} \parallel \overline{BD}$.

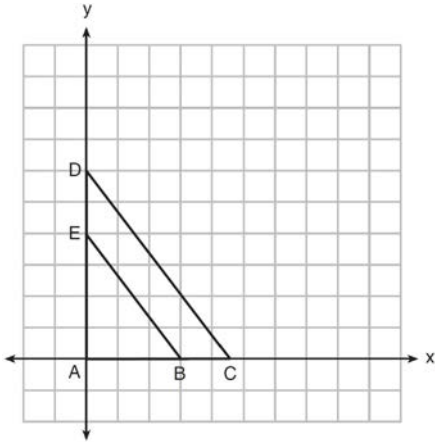


Given $\triangle AEC \sim \triangle BED$, which equation is true?

- 1) $\frac{CE}{DE} = \frac{EB}{EA}$
 - 2) $\frac{AE}{BE} = \frac{AC}{BD}$
 - 3) $\frac{EC}{AE} = \frac{BE}{ED}$
 - 4) $\frac{ED}{EC} = \frac{AC}{BD}$
- 20 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.

- 21 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
- 22 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

- 23 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 $E(0,4)$.



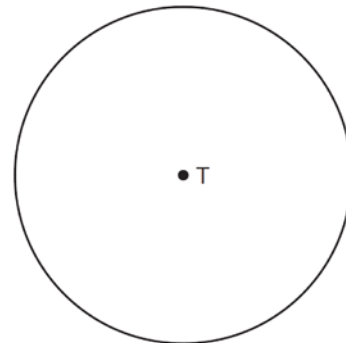
The ratio of the lengths of \overline{BE} to \overline{CD} is

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

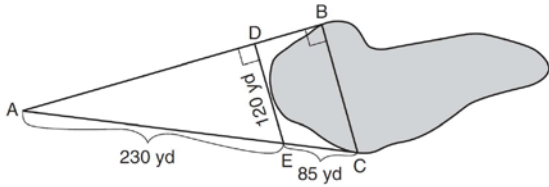
- 25 A wooden cube has an edge length of 6 centimeters and a mass of 137.8 grams. Determine the density of the cube, to the *nearest thousandth*. State which type of wood the cube is made of, using the density table below.

Type of Wood	Density (g/cm ³)
Pine	0.373
Hemlock	0.431
Elm	0.554
Birch	0.601
Ash	0.638
Maple	0.676
Oak	0.711

- 26 Construct an equilateral triangle inscribed in circle T shown below. [Leave all construction marks.]

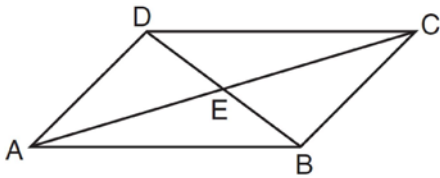


- 27 To find the distance across a pond from point B to point C , a surveyor drew the diagram below. The measurements he made are indicated on his diagram.



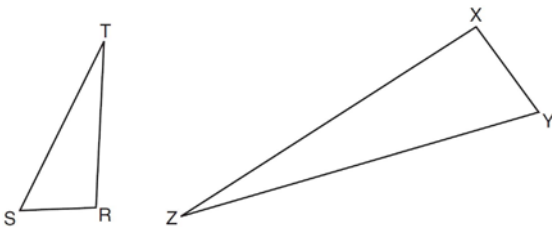
Use the surveyor's information to determine and state the distance from point B to point C , to the nearest yard.

- 28 In parallelogram $ABCD$ shown below, diagonals AC and BD intersect at E .

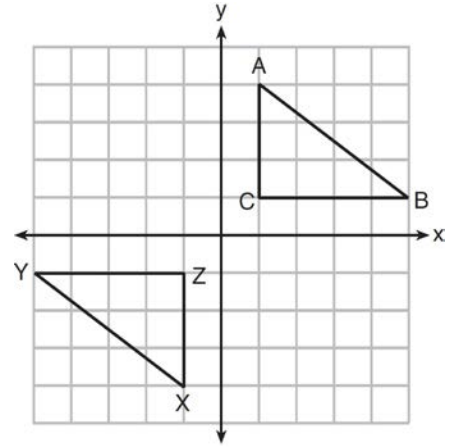


Prove: $\angle ACD \cong \angle CAB$

- 29 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.



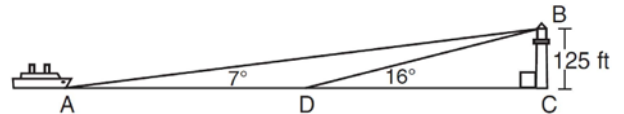
- 30 In the diagram below, $\triangle ABC$ and $\triangle XYZ$ are graphed.



Use the properties of rigid motions to explain why $\triangle ABC \cong \triangle XYZ$.

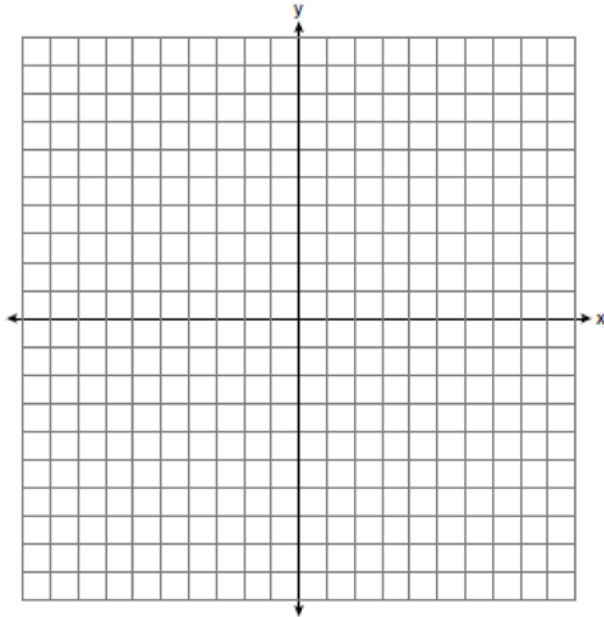
- 31 The endpoints of \overline{DEF} are $D(1, 4)$ and $F(16, 14)$. Determine and state the coordinates of point E , if $DE:EF = 2:3$.

- 32 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° .

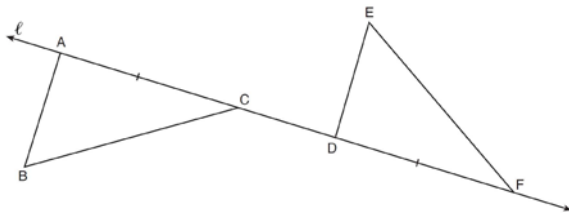


To the nearest foot, determine and state how far the ship traveled from point A to point D .

- 33 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.]

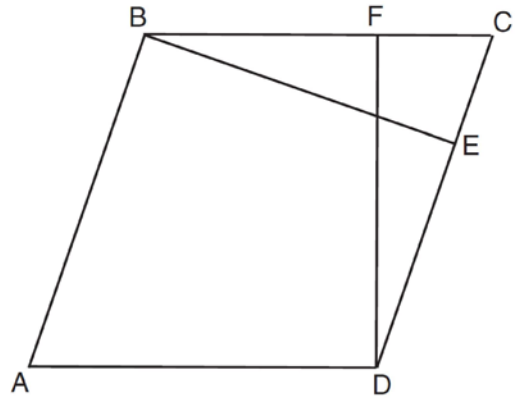


- 34 In the diagram below, $\overline{AC} \cong \overline{DF}$ and points A , C , D , and F are collinear on line ℓ .



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.

- 35 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.

- 36 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?

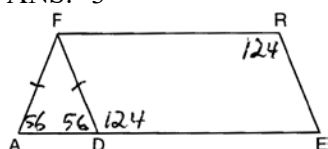


Walter goes to a hobby store to buy the wax for his candles. The wax costs \$0.10 per ounce. If the weight of the wax is 0.52 ounce per cubic inch, how much will it cost Walter to buy the wax for 100 candles? If Walter spent a total of \$37.83 for the molds and charges \$1.95 for each candle, what is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

0815geo

Answer Section

- 1 ANS: 2 PTS: 2 REF: 081501geo NAT: G.CO.C.11
TOP: Parallelograms
- 2 ANS: 3 PTS: 2 REF: 081502geo NAT: G.CO.A.2
TOP: Identifying Transformations KEY: basic
- 3 ANS: 4 PTS: 2 REF: 081503geo NAT: G.GMD.B.4
TOP: Rotations of Two-Dimensional Objects
- 4 ANS: 1 PTS: 2 REF: 081504geo NAT: G.SRT.C.7
TOP: Cofunctions
- 5 ANS: 1 PTS: 2 REF: 081505geo NAT: G.CO.A.3
TOP: Mapping a Polygon onto Itself
- 6 ANS: 4 PTS: 2 REF: 081506geo NAT: G.SRT.A.2
TOP: Similarity
- 7 ANS: 1 PTS: 2 REF: 081507geo NAT: G.CO.A.5
TOP: Compositions of Transformations KEY: identify
- 8 ANS: 3



- PTS: 2 REF: 081508geo NAT: G.CO.C.11 TOP: Parallelograms
- 9 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
- 10 ANS: 1

$$m = -\frac{2}{3} \quad 1 = \left(-\frac{2}{3}\right)6 + b$$

$$1 = -4 + b$$

$$5 = b$$
- PTS: 2 REF: 081510geo NAT: G.GPE.B.5 TOP: Parallel and Perpendicular Lines
KEY: write equation of parallel line

11 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

12 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

13 ANS: 2

TOP: Identifying Transformations

PTS: 2

REF: 081513geo

KEY: graphics

NAT: G.CO.A.2

14 ANS: 4

TOP: Similarity

PTS: 2

REF: 081514geo

NAT: G.SRT.A.2

15 ANS: 3

TOP: Inscribed Quadrilaterals

PTS: 2

REF: 081515geo

NAT: G.C.A.3

16 ANS: 1

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

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

17 ANS: 4

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

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

18 ANS: 3

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

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

19 ANS: 2

TOP: Similarity

PTS: 2

REF: 081519geo

NAT: G.SRT.B.5

20 ANS: 1

$$3^2 = 9$$

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

21 ANS: 4

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

$$230 \approx s$$

PTS: 2 REF: 081521geo NAT: G.GMD.A.3 TOP: Volume

22 ANS: 4

$$\frac{-2-1}{-1-3} = \frac{-3}{2} \quad \frac{3-2}{0-5} = \frac{1}{-5} \quad \frac{3-1}{0-3} = \frac{2}{-3} \quad \frac{2-2}{5-1} = \frac{0}{4} = \frac{0}{4}$$

PTS: 2 REF: 081522geo NAT: G.GPE.B.4 TOP: Polygons in the Coordinate Plane

23 ANS: 1

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

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

24 ANS: 4

The line $y = 3x - 1$ passes through the center of dilation, so the dilated line is not distinct.

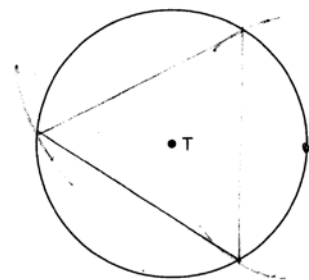
PTS: 2 REF: 081524geo NAT: G.SRT.A.1 TOP: Line Dilations

25 ANS:

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

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

26 ANS:



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

27 ANS:

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

$$x = 164$$

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

KEY: basic

28 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

29 ANS:

$$\frac{6}{14} = \frac{9}{21} \text{ SAS}$$

$$126 = 126$$

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

KEY: basic

30 ANS:

The transformation is a rotation, which is a rigid motion.

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

31 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

32 ANS:

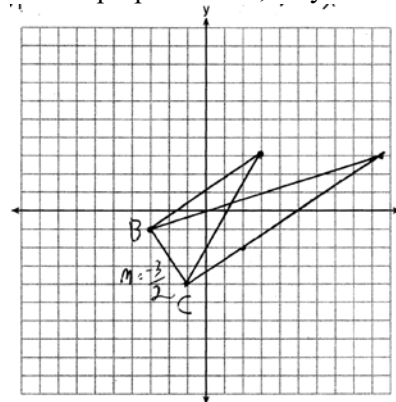
$$\tan 7 = \frac{125}{x} \quad \tan 16 = \frac{125}{y} \quad 1018 - 436 \approx 582$$

$$x \approx 1018 \quad y \approx 436$$

PTS: 4 REF: 081532geo NAT: G.SRT.C.8 TOP: Using Trigonometry to Find a Side

33 ANS:

The slopes of perpendicular lines are opposite reciprocals. Since the lines are perpendicular, they form right angles



and a right triangle. $m_{\overline{BC}} = -\frac{3}{2}$ $-1 = \frac{2}{3}(-3) + b$ or $-4 = \frac{2}{3}(-1) + b$

$$\begin{array}{rcl}
 m_{\perp} = \frac{2}{3} & -1 = -2 + b & \frac{-12}{3} = \frac{-2}{3} + b \\
 & 1 = b & \\
 & 3 = \frac{2}{3}x + 1 & -\frac{10}{3} = b \\
 & 2 = \frac{2}{3}x & 3 = \frac{2}{3}x - \frac{10}{3} \\
 & 3 = x & 9 = 2x - 10 \\
 & & 19 = 2x \\
 & & 9.5 = x
 \end{array}$$

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

34 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

35 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.CO.C.11 TOP: Quadrilateral Proofs

36 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