Geometry CCSS Regents Exam 0123
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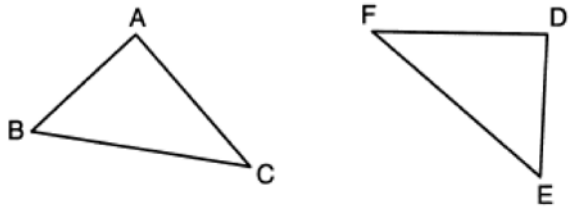
0123geo

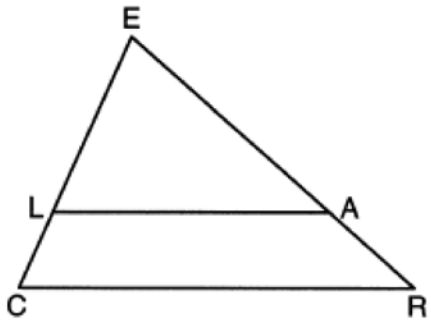
1 In the diagram below, a line reflection followed by a rotation maps $\triangle ABC$ onto $\triangle DEF$.



Which statement is always true?
1) $\overline{BC} \cong \overline{EF}$
2) $\overline{AC} \cong \overline{DE}$
3) $\angle A \cong \angle F$
4) $\angle B \cong \angle D$

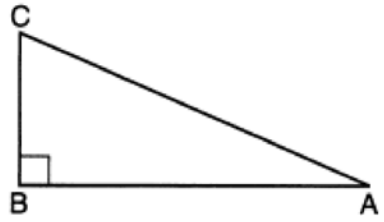
2 A circle is continuously rotated about its diameter. Which three-dimensional object will be formed?
1) cone
2) prism
3) sphere
4) cylinder

3 In the diagram below of $\triangle CER$, $\overline{LA} \parallel \overline{CR}$.



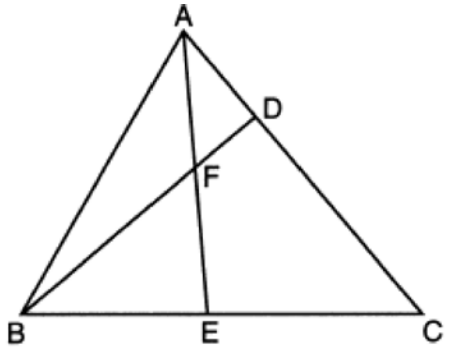
If $CL = 3.5$, $LE = 7.5$, and $EA = 9.5$, what is the length of $\overline{AR}$, to the *nearest tenth*?
1) 5.5
2) 4.4
3) 3.0
4) 2.8

4 Right triangle ABC is shown below.



Which trigonometric equation is always true for triangle ABC?
1) $\sin A = \cos C$
2) $\cos A = \sin A$
3) $\cos A = \cos C$
4) $\tan A = \tan C$

5 In the diagram of $\triangle ABC$ below, $\overline{AE}$ bisects angle BAC, and altitude $\overline{BD}$ is drawn.

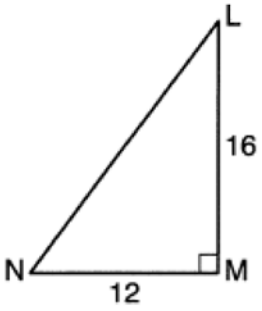


If $m\angle C = 50°$ and $m\angle ABC = 60°$, $m\angle FEB$ is
1) 35°
2) 40°
3) 55°
4) 85°

6 A jewelry company makes copper heart pendants. Each heart uses 0.75 in^3 of copper and there is 0.323 pound of copper per cubic inch. If copper costs \$3.68 per pound, what is the total cost for 24 copper hearts?

1) \$5.81
2) \$21.40
3) \$66.24
4) \$205.08

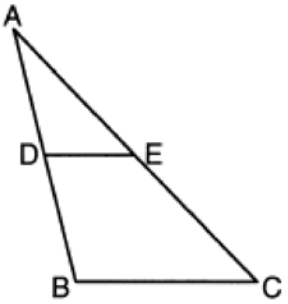
7 In right triangle LMN shown below, $m\angle M = 90°$, $MN = 12$, and $LM = 16$.



The ratio of $\cos N$ is

1) $\frac{12}{20}$
2) $\frac{16}{20}$
3) $\frac{12}{16}$
4) $\frac{16}{12}$

8 In $\triangle ABC$ below, $\overline{DE}$ is drawn such that D and E are on $\overline{AB}$ and $\overline{AC}$, respectively.



If $\overline{DE} \parallel \overline{BC}$, which equation will always be true?

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

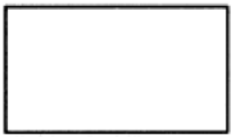
9 Which polygon does *not* always have congruent diagonals?

1) square
2) rectangle
3) rhombus
4) isosceles trapezoid

10 If the circumference of a standard lacrosse ball is 19.9 cm, what is the volume of this ball, to the *nearest cubic centimeter*?

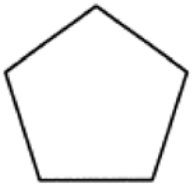
1) 42
2) 133
3) 415
4) 1065

11 Which polygon always has a minimum rotation of 180° about its center to carry it onto itself?

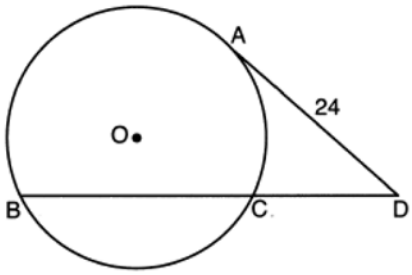
1) 
Rectangle

2) 
Square

3) 
Isosceles trapezoid

4) 
Regular pentagon

12 Circle O is drawn below with secant $\overline{BCD}$. The length of tangent $\overline{AD}$ is 24.



If the ratio of $DC:CB$ is 4:5, what is the length of $\overline{CB}$?

1) 36
2) 20
3) 16
4) 4

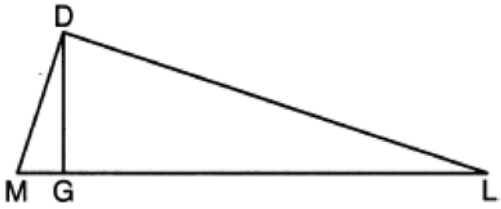
13 The equation of a line is $3x - 5y = 8$. All lines perpendicular to this line must have a slope of

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

14 What are the coordinates of the center and length of the radius of the circle whose equation is $x^2 + y^2 + 2x - 16y + 49 = 0$?

1) center $(1,-8)$ and radius 4
2) center $(-1,8)$ and radius 4
3) center $(1,-8)$ and radius 16
4) center $(-1,8)$ and radius 16

15 In the diagram below of right triangle MDL, altitude $\overline{DG}$ is drawn to hypotenuse $\overline{ML}$.



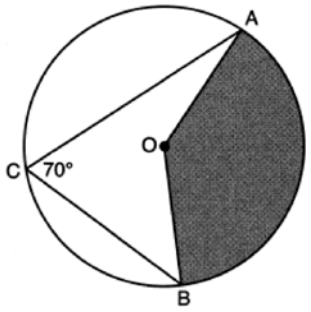
If $MG = 3$ and $GL = 24$, what is the length of $\overline{DG}$?

1) 8
2) 9
3) $\sqrt{63}$
4) $\sqrt{72}$

16 Segment AB is the perpendicular bisector of $\overline{CD}$ at point M. Which statement is always true?

1) $\overline{CB} \cong \overline{DB}$
2) $\overline{CD} \cong \overline{AB}$
3) $\triangle ACD \sim \triangle BCD$
4) $\triangle ACM \sim \triangle BCM$

17 In the diagram below of circle O, $\overline{AC}$ and $\overline{BC}$ are chords, and $m\angle ACB = 70°$.



If $OA = 9$, the area of the shaded sector AOB is
1) 3.5π
2) 7π
3) 15.75π
4) 31.5π

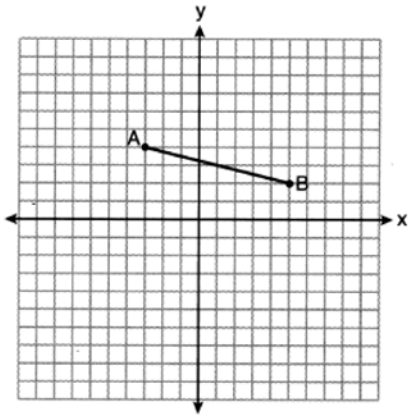
18 Quadrilateral $BEST$ has diagonals that intersect at point D. Which statement would *not* be sufficient to prove quadrilateral $BEST$ is a parallelogram?
1) $\overline{BD} \cong \overline{SD}$ and $\overline{ED} \cong \overline{TD}$
2) $\overline{BE} \cong \overline{ST}$ and $\overline{ES} \cong \overline{TB}$
3) $\overline{ES} \cong \overline{TB}$ and $\overline{BE} \parallel \overline{TS}$
4) $\overline{ES} \parallel \overline{BT}$ and $\overline{BE} \parallel \overline{TS}$

19 The equation of line t is $3x - y = 6$. Line m is the image of line t after a dilation with a scale factor of $\frac{1}{2}$ centered at the origin. What is an equation of the line m?
1) $y = \frac{3}{2}x - 3$
2) $y = \frac{3}{2}x - 6$
3) $y = 3x + 3$
4) $y = 3x - 3$

20 A cylindrical pool has a diameter of 16 feet and height of 4 feet. The pool is filled to $\frac{1}{2}$ foot below the top. How much water does the pool contain, to the *nearest gallon*? [1 ft^3 = 7.48 gallons]
1) 704
2) 804
3) 5264
4) 6016

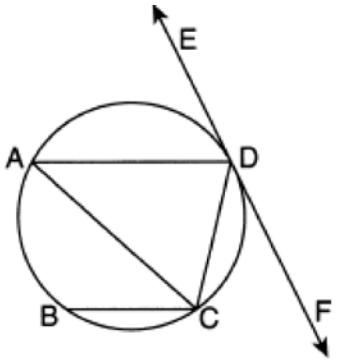
21 The area of $\triangle TAP$ is 36 cm^2. A second triangle, JOE, is formed by connecting the midpoints of each side of $\triangle TAP$. What is the area of JOE, in square centimeters?
1) 9
2) 12
3) 18
4) 27

22 On the set of axes below, the endpoints of $\overline{AB}$ have coordinates $A(-3,4)$ and $B(5,2)$.



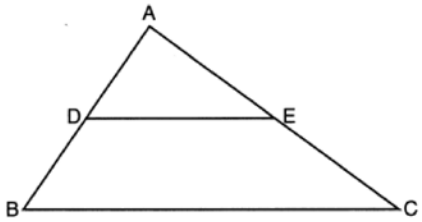
If $\overline{AB}$ is dilated by a scale factor of 2 centered at $(3,5)$, what are the coordinates of the endpoints of its image, $\overline{A'B'}$?
1) $A'(-7,5)$ and $B'(9,1)$
2) $A'(-1,6)$ and $B'(7,4)$
3) $A'(-6,8)$ and $B'(10,4)$
4) $A'(-9,3)$ and $B'(7,-1)$

23 In the circle below, $\overline{AD}$, $\overline{AC}$, $\overline{BC}$, and $\overline{DC}$ are chords, $\overleftrightarrow{EDF}$ is tangent at point D, and $\overline{AD} \parallel \overline{BC}$.



Which statement is always true?
1) $\angle ADE \cong \angle CAD$
2) $\angle CDF \cong \angle ACB$
3) $\angle BCA \cong \angle DCA$
4) $\angle ADC \cong \angle ADE$

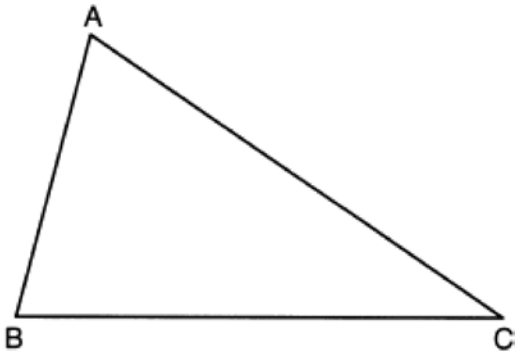
24 In the diagram below of $\triangle ABC$, D and E are the midpoints of $\overline{AB}$ and $\overline{AC}$, respectively, and $\overline{DE}$ is drawn.



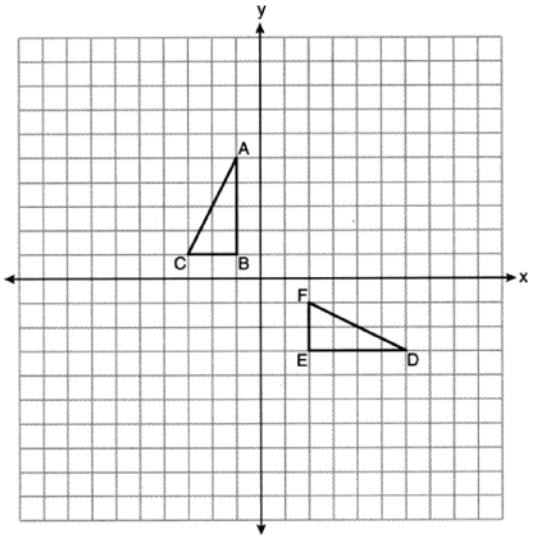
I. AA similarity
II. SSS similarity
III. SAS similarity

Which methods could be used to prove $\triangle ABC \sim \triangle ADE$?
1) I and II, only
2) II and III, only
3) I and III, only
4) I, 11, and III

25 Using a compass and straightedge, construct the angle bisector of $\angle ABC$. [Leave all construction marks.]

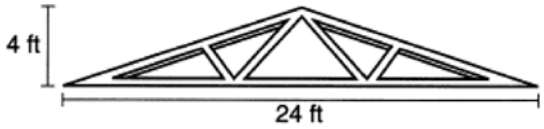


26 On the set of axes below, $\triangle ABC$ and $\triangle DEF$ are graphed.



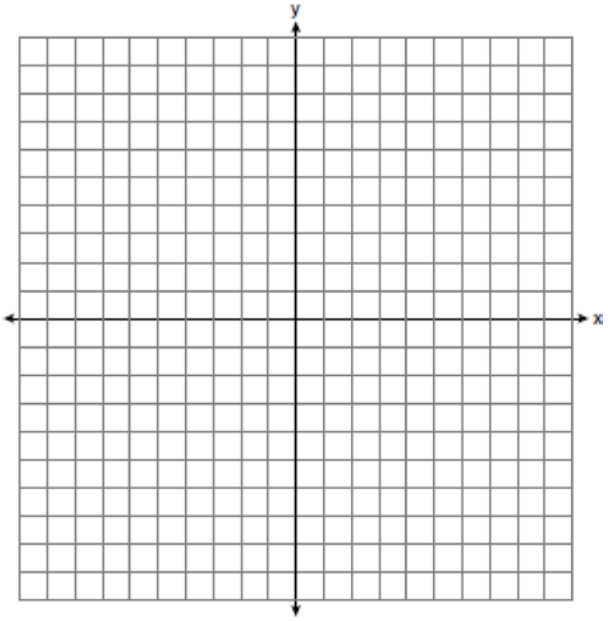
Describe a sequence of rigid motions that would map $\triangle ABC$ onto $\triangle DEF$.

27 As shown in the diagram below, a symmetrical roof frame rises 4 feet above a house and has a width of 24 feet.



Determine and state, to the *nearest degree*, the angle of elevation of the roof frame.

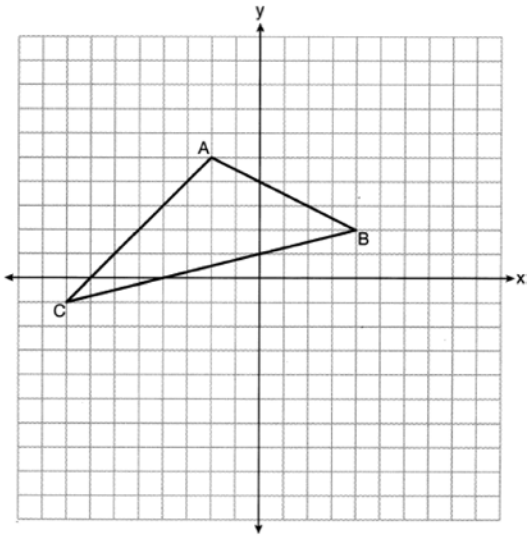
28 Directed line segment AB has endpoints whose coordinates are $A(-2,5)$ and $B(8,-1)$. Determine and state the coordinates of P, the point which divides the segment in the ratio 3:2. [The use of the set of axes below is optional.]



29 In $\triangle ABC$, $AB = 5$, $AC = 12$, and $m\angle A = 90°$. In $\triangle DEF$, $m\angle D = 90°$, $DF = 12$, and $EF = 13$. Brett claims $\triangle ABC \cong \triangle DEF$ and $\triangle ABC \sim \triangle DEF$. Is Brett correct? Explain why.

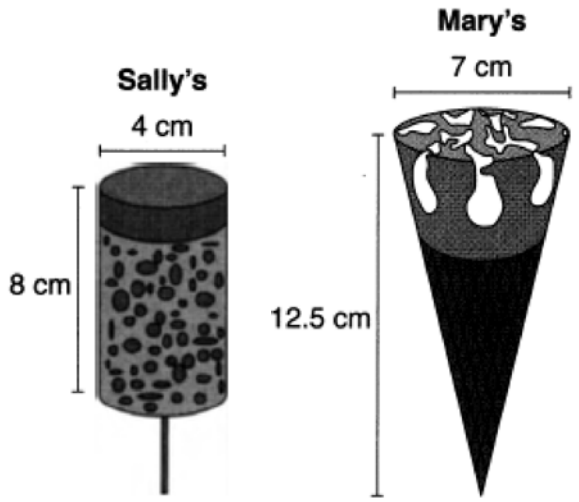
30 The volume of a triangular prism is 70 in^3. The base of the prism is a right triangle with one leg whose measure is 5 inches. If the height of the prism is 4 inches, determine and state the length, in inches, of the other leg of the triangle.

31 Triangle ABC with coordinates $A(-2,5)$, $B(4,2)$, and $C(-8,-1)$ is graphed on the set of axes below.



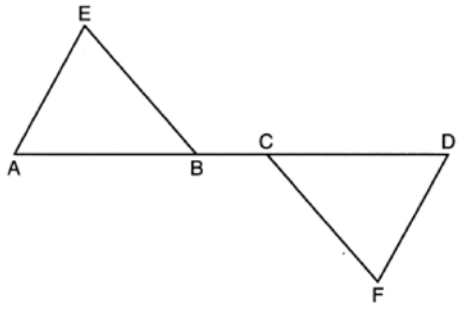
Determine and state the area of $\triangle ABC$.

32 Sally and Mary both get ice cream from an ice cream truck. Sally's ice cream is served as a cylinder with a diameter of 4 cm and a total height of 8 cm. Mary's ice cream is served as a cone with a diameter of 7 cm and a total height of 12.5 cm. Assume that ice cream fills Sally's cylinder and Mary's cone.



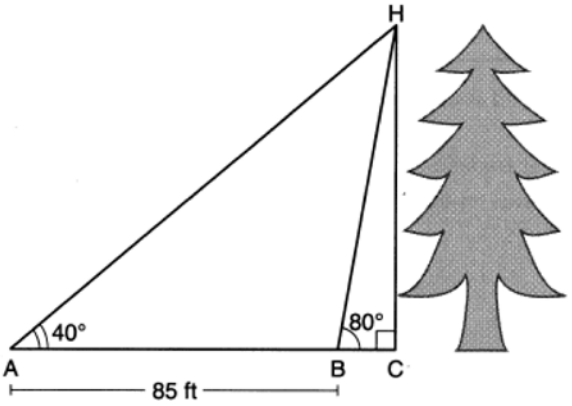
Who was served more ice cream, Sally or Mary? Justify your answer. Determine and state how much more is served in the larger ice cream than the smaller ice cream, to the *nearest cubic centimeter*.

33 Given: $\triangle AEB$ and $\triangle DFC$, $\overline{ABCD}$, $\overline{AE} \parallel \overline{DF}$, $\overline{EB} \parallel \overline{FC}$, $\overline{AC} \cong \overline{DB}$



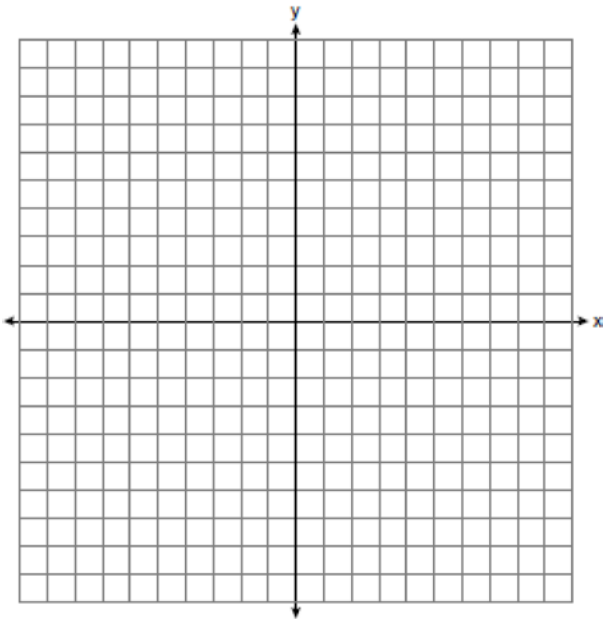
Prove: $\triangle EAB \cong \triangle FDC$

34 Barry wants to find the height of a tree that is modeled in the diagram below, where $\angle C$ is a right angle. The angle of elevation from point A on the ground to the top of the tree, H, is 40°. The angle of elevation from point B on the ground to the top of the tree, H, is 80°. The distance between points A and B is 85 feet.



Barry claims that $\triangle ABH$ is isosceles. Explain why Barry is correct. Determine and state, to the *nearest foot*, the height of the tree.

35 Given: Triangle DUC with coordinates $D(-3,-1)$, $U(-1,8)$, and $C(8,6)$
Prove: $\triangle DUC$ is a right triangle
Point U is reflected over $\overline{DC}$ to locate its image point, U', forming quadrilateral $DUCU'$.
Prove quadrilateral $DUCU'$ is a square.
[The use of the set of axes below is optional.]



0123geo
Answer Section

1 ANS: 1
The lengths of the sides of a triangle remain the same after all rotations and reflections because rotations and reflections are rigid motions which preserve distance.

PTS: 2 REF: 012301geo NAT: G.CO.B.6 TOP: Properties of Transformations
KEY: graphics

2 ANS: 3 PTS: 2 REF: 012302geo NAT: G.GMD.B.4
TOP: Rotations of Two-Dimensional Objects

3 ANS: 2

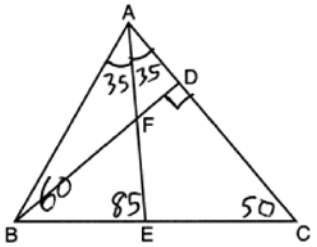
$$\frac{7.5}{3.5} = \frac{9.5}{x}$$

$$x \approx 4.4$$

PTS: 2 REF: 012303geo NAT: G.SRT.B.5 TOP: Side Splitter Theorem

4 ANS: 1 PTS: 2 REF: 012304geo NAT: G.SRT.C.7
TOP: Cofunctions

5 ANS: 4



PTS: 2 REF: 012305geo NAT: G.CO.C.10 TOP: Interior and Exterior Angles of Triangles

6 ANS: 2

$$24\ \text{ht}\left(\frac{0.75\ \text{in}^3}{\text{ht}}\right)\left(\frac{0.323\ \text{lb}}{1\ \text{in}^3}\right)\left(\frac{\$3.68}{\text{lb}}\right) \approx \$21.40$$

PTS: 2 REF: 012306geo NAT: G.MG.A.2 TOP: Density

7 ANS: 1

$$\sin N = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{12}{20}$$

PTS: 2 REF: 012307geo NAT: G.SRT.C.6 TOP: Trigonometric Ratios

8 ANS: 2
$\triangle ACB \sim \triangle AED$

PTS: 2 REF: 012308geo NAT: G.SRT.B.5 TOP: Similarity
KEY: basic

9 ANS: 3 PTS: 2 REF: 012309geo NAT: G.CO.C.11
TOP: Special Quadrilaterals

10 ANS: 2

$19.9 = \pi d \quad \frac{4}{3}\pi\left(\frac{19.9}{2\pi}\right)^3 \approx 133$

$\frac{19.9}{\pi} = d$

PTS: 2 REF: 012310geo NAT: G.GMD.A.3 TOP: Volume
KEY: spheres

11 ANS: 1

2) 90°; 3) 360°; 4) 72°

PTS: 2 REF: 012311geo NAT: G.CO.A.3 TOP: Mapping a Polygon onto Itself

12 ANS: 2

$24^2 = 4x \cdot 9x \quad 5 \cdot 4 = 20$

$576 = 36x^2$

$16 = x^2$

$4 = x$

PTS: 2 REF: 012312geo NAT: G.C.A.2 TOP: Chords, Secants and Tangents
KEY: secant and tangent drawn from common point, length

13 ANS: 4

The slope of a line in standard form is $-\frac{A}{B}$ so the slope of this line is $\frac{3}{5}$ Perpendicular lines have slope that are the opposite and reciprocal of each other.

PTS: 2 REF: 012313geo NAT: G.GPE.B.5 TOP: Parallel and Perpendicular Lines
KEY: find slope of perpendicular line

14 ANS: 2

$x^2 + 2x + 1 + y^2 - 16y + 64 = -49 + 1 + 64$

$(x+1)^2 + (y-8)^2 = 16$

PTS: 2 REF: 012314geo NAT: G.GPE.A.1 TOP: Equations of Circles
KEY: completing the square

15 ANS: 4

$x^2 = 3 \times 24$

$x = \sqrt{72}$

PTS: 2 REF: 012315geo NAT: G.SRT.B.5 TOP: Similarity
KEY: altitude

16 ANS: 1 PTS: 2 REF: 012316geo NAT: G.CO.C.10
TOP: Medians, Altitudes and Bisectors

17 ANS: 4

$\frac{140}{360} \cdot 9^2 \pi = 31.5\pi$

PTS: 2 REF: 012317geo NAT: G.C.B.5 TOP: Sectors

18 ANS: 3

3) Could be an isosceles trapezoid.

PTS: 2 REF: 012318geo NAT: G.CO.C.11 TOP: Parallelograms

19 ANS: 4

Another equation of line t is $y = 3x - 6$. $-6 \bullet \frac{1}{2} = -3$

PTS: 2 REF: 012319geo NAT: G.SRT.A.1 TOP: Line Dilations

20 ANS: 3

$V = \pi(8)^2(4 - 0.5)(7.48) \approx 5264$

PTS: 2 REF: 012320geo NAT: G.GMD.A.3 TOP: Volume

KEY: cylinders

21 ANS: 1

$\frac{36}{4} = 9$

PTS: 2 REF: 012321geo NAT: G.CO.C.10 TOP: Midsegments

22 ANS: 4

A: $(-3-3, 4-5) \rightarrow (-6,-1) \rightarrow (-12,-2) \rightarrow (-12+3, -2+5)$

B: $(5-3, 2-5) \rightarrow (2,-3) \rightarrow (4,-6) \rightarrow (4+3, -6+5)$

PTS: 2 REF: 012322geo NAT: G.SRT.A.1 TOP: Line Dilations

23 ANS: 2

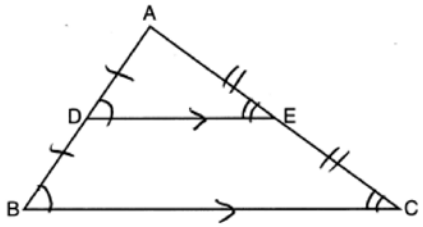
Since $\overline{AD} \parallel \overline{BC}$, $\overset{\frown}{AB} \cong \overset{\frown}{CD}$. $\text{m}\angle ACB = \frac{1}{2}\text{m}\overset{\frown}{AB}$

$\text{m}\angle CDF = \frac{1}{2}\text{m}\overset{\frown}{CD}$

PTS: 2 REF: 012323geo NAT: G.C.A.2 TOP: Chords, Secants and Tangents

KEY: chords and tangents

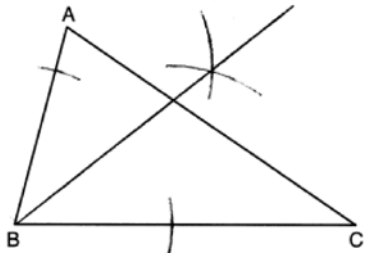
24 ANS: 4



AA from diagram; SSS as the three corresponding sides are proportional; SAS as two corresponding sides are proportional and an angle is equal.

PTS: 2 REF: 012324geo NAT: G.SRT.A.3 TOP: Similarity Proofs

25 ANS:



PTS: 2 REF: 012325geo NAT: G.CO.D.12 TOP: Constructions
KEY: angle bisector

26 ANS:

Rotate 90° clockwise about *B* and translate down 4 and right 3.

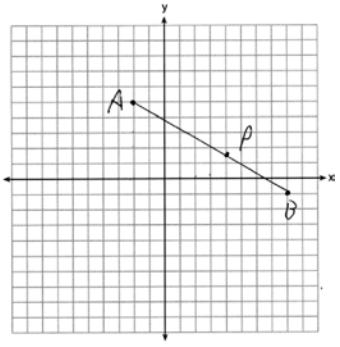
PTS: 2 REF: 012326geo NAT: G.CO.A.5 TOP: Compositions of Transformations
KEY: identify

27 ANS:

$\tan^{-1}\left(\frac{4}{12}\right) \approx 18$

PTS: 2 REF: 012327geo NAT: G.SRT.C.8 TOP: Using Trigonometry to Find an Angle

28 ANS:



$x = -2 + \frac{3}{5}(8+2) = -2 + 6 = 4$

$y = 5 + \frac{3}{5}(-1-5) = \frac{25}{5} - \frac{18}{5} = \frac{7}{5}$

PTS: 2 REF: 012328geo NAT: G.GPE.B.6 TOP: Directed Line Segments

29 ANS:
Yes. $\triangle ABC$ and $\triangle DEF$ are both 5-12-13 triangles and therefore congruent by SSS. All congruent triangles are similar.

PTS: 2 REF: 012329geo NAT: G.SRT.B.5 TOP: Triangle Proofs
KEY: statements

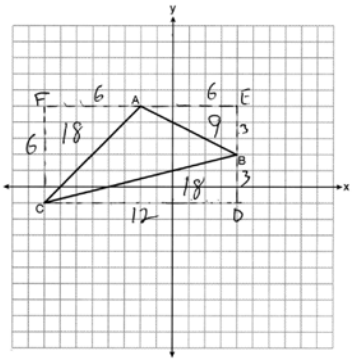
30 ANS:
$\frac{1}{2}(5)(L)(4) = 70$

$10L = 70$

$L = 7$

PTS: 2 REF: 012330geo NAT: G.GMD.A.3 TOP: Volume
KEY: prisms

31 ANS:



$6 \times 12 - \frac{1}{2}(12 \times 3) - \frac{1}{2}(6 \times 6) - \frac{1}{2}(6 \times 3) = 27$

PTS: 2 REF: 012331geo NAT: G.GPE.B.7 TOP: Polygons in the Coordinate Plane

32 ANS:
Mary. Sally: $V = \pi \cdot 2^2 \cdot 8 \approx 100.5$ Mary: $V = \frac{1}{3}\pi \cdot 3.5^2 \cdot 12.5 \approx 160.4$ $160.4 - 100.5 \approx 60$

PTS: 4 REF: 012332geo NAT: G.GMD.A.3 TOP: Volume
KEY: cones

33 ANS:
$\triangle AEB$ and $\triangle DFC$, $\overline{ABCD}$, $\overline{AE} \parallel \overline{DF}$, $\overline{EB} \parallel \overline{FC}$, $\overline{AC} \cong \overline{DB}$ (given); $\angle A \cong \angle D$ (Alternate interior angles formed by parallel lines and a transversal are congruent); $\angle EBA \cong \angle FCD$ (Alternate exterior angles formed by parallel lines and a transversal are congruent); $\overline{BC} \cong \overline{BC}$ (reflexive); $\overline{AB} \cong \overline{CD}$ (segment subtraction); $\triangle EAB \cong \triangle FDC$ (ASA)

PTS: 4 REF: 012333geo NAT: G.SRT.B.5 TOP: Triangle Proofs
KEY: proof

34 ANS:

Since $\angle ABH$ is 100°, $\angle AHB$ is 40°. An isosceles triangle has two congruent angles. $\cos 80 = \frac{x}{85}$

$$x \approx 14.8$$

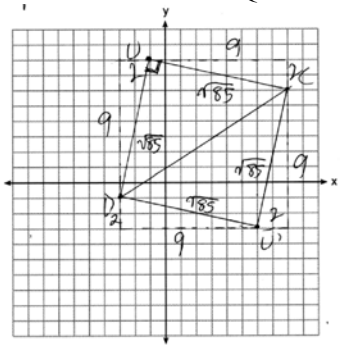
$$\tan 40 = \frac{y}{85 + 14.8}$$

$$y \approx 84$$

PTS: 4 REF: 012334geo NAT: G.SRT.C.8 TOP: Using Trigonometry to Find a Side

35 ANS:

$m_{\overline{DU}} = \frac{9}{2}$ $m_{\overline{UC}} = -\frac{2}{9}$ Since the slopes of $\overline{DU}$ and $\overline{UC}$ are opposite reciprocals, they are perpendicular and form a right angle. $\triangle DUC$ is a right triangle because $\angle DUC$ is a right angle. Each side of quadrilateral $DUCU'$ is $\sqrt{9^2 + 2^2} = \sqrt{85}$. Quadrilateral $DUCU'$ is a square because all four side are congruent and it has a right angle.



PTS: 6 REF: 012335geo NAT: G.GPE.B.4 TOP: Quadrilaterals in the Coordinate Plane