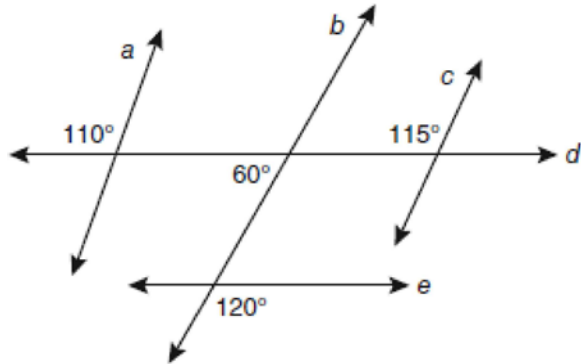


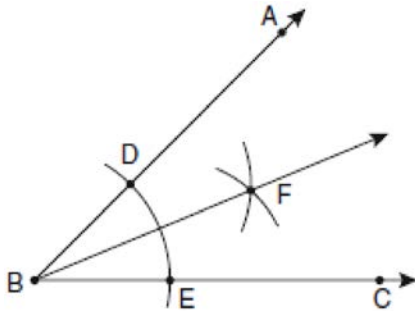
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- 1 Based on the diagram below, which statement is true?



- 1) $a \parallel b$
- 2) $a \parallel c$
- 3) $b \parallel c$
- 4) $d \parallel e$

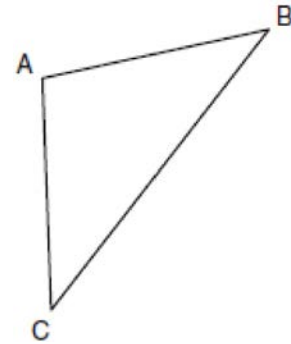
- 2 The diagram below shows the construction of the bisector of $\angle ABC$.



Which statement is *not* true?

- 1) $m\angle EBF = \frac{1}{2} m\angle ABC$
- 2) $m\angle DBF = \frac{1}{2} m\angle ABC$
- 3) $m\angle EBF = m\angle ABC$
- 4) $m\angle DBF = m\angle EBF$

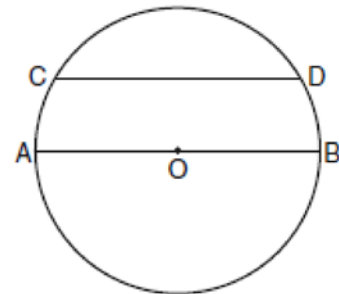
- 3 In the diagram of $\triangle ABC$ below, $\overline{AB} \cong \overline{AC}$. The measure of $\angle B$ is 40° .



What is the measure of $\angle A$?

- 1) 40°
- 2) 50°
- 3) 70°
- 4) 100°

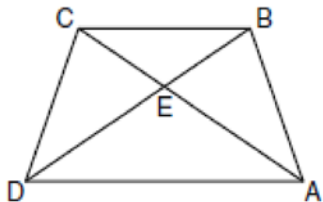
- 4 In the diagram of circle O below, chord \overline{CD} is parallel to diameter \overline{AOB} and $m\widehat{AC} = 30$.



What is $m\widehat{CD}$?

- 1) 150
- 2) 120
- 3) 100
- 4) 60

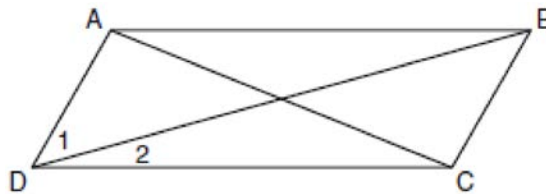
- 5 In the diagram of trapezoid $ABCD$ below, diagonals \overline{AC} and \overline{BD} intersect at E and $\triangle ABC \cong \triangle DCB$.



Which statement is true based on the given information?

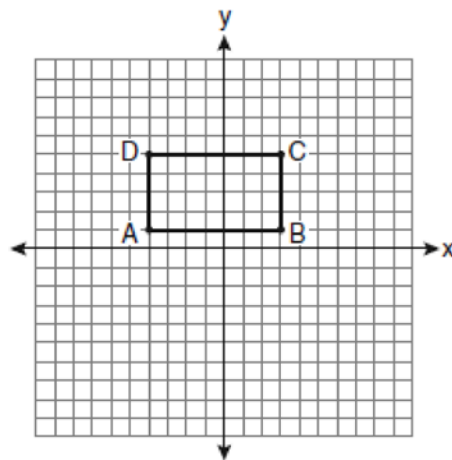
- 1) $\overline{AC} \cong \overline{BC}$
 - 2) $\overline{CD} \cong \overline{AD}$
 - 3) $\angle CDE \cong \angle BAD$
 - 4) $\angle CDB \cong \angle BAC$
- 6 Which transformation produces a figure similar but not congruent to the original figure?
- 1) $T_{1,3}$
 - 2) $D_{\frac{1}{2}}$
 - 3) R_{90°
 - 4) $r_{y=x}$

- 7 In the diagram below of parallelogram $ABCD$ with diagonals \overline{AC} and \overline{BD} , $m\angle 1 = 45$ and $m\angle DCB = 120$.



What is the measure of $\angle 2$?

- 1) 15°
 - 2) 30°
 - 3) 45°
 - 4) 60°
- 8 On the set of axes below, Geoff drew rectangle $ABCD$. He will transform the rectangle by using the translation $(x,y) \rightarrow (x+2,y+1)$ and then will reflect the translated rectangle over the x -axis.



What will be the area of the rectangle after these transformations?

- 1) exactly 28 square units
- 2) less than 28 square units
- 3) greater than 28 square units
- 4) It cannot be determined from the information given.

9 What is the equation of a line that is parallel to the line whose equation is $y = x + 2$?

- 1) $x + y = 5$
- 2) $2x + y = -2$
- 3) $y - x = -1$
- 4) $y - 2x = 3$

10 The endpoints of \overline{CD} are $C(-2, -4)$ and $D(6, 2)$.
What are the coordinates of the midpoint of \overline{CD} ?

- 1) $(2, 3)$
- 2) $(2, -1)$
- 3) $(4, -2)$
- 4) $(4, 3)$

11 What are the center and the radius of the circle whose equation is $(x - 3)^2 + (y + 3)^2 = 36$

- 1) center = $(3, -3)$; radius = 6
- 2) center = $(-3, 3)$; radius = 6
- 3) center = $(3, -3)$; radius = 36
- 4) center = $(-3, 3)$; radius = 36

12 Given the equations: $y = x^2 - 6x + 10$

$$y + x = 4$$

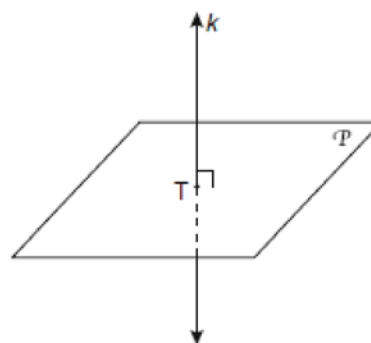
What is the solution to the given system of equations?

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

13 The diagonal \overline{AC} is drawn in parallelogram $ABCD$.
Which method can *not* be used to prove that $\triangle ABC \cong \triangle CDA$?

- 1) SSS
- 2) SAS
- 3) SSA
- 4) ASA

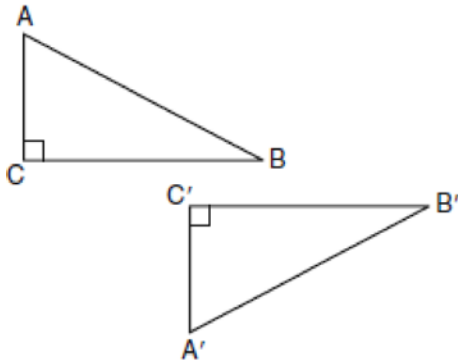
14 In the diagram below, line k is perpendicular to plane \mathcal{P} at point T .



Which statement is true?

- 1) Any point in plane \mathcal{P} also will be on line k .
- 2) Only one line in plane \mathcal{P} will intersect line k .
- 3) All planes that intersect plane \mathcal{P} will pass through T .
- 4) Any plane containing line k is perpendicular to plane \mathcal{P} .

- 15 In the diagram below, which transformation was used to map $\triangle ABC$ to $\triangle A'B'C'$?



- 1) dilation
 2) rotation
 3) reflection
 4) glide reflection
- 16 Which set of numbers represents the lengths of the sides of a triangle?
- 1) $\{5, 18, 13\}$
 2) $\{6, 17, 22\}$
 3) $\{16, 24, 7\}$
 4) $\{26, 8, 15\}$

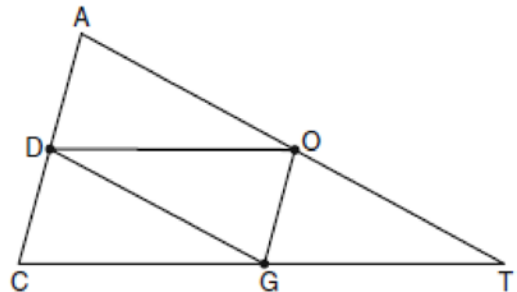
- 17 What is the slope of a line perpendicular to the line whose equation is $y = -\frac{2}{3}x - 5$?

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

- 18 A quadrilateral whose diagonals bisect each other and are perpendicular is a
- 1) rhombus
 2) rectangle
 3) trapezoid
 4) parallelogram

- 19 If the endpoints of \overline{AB} are $A(-4, 5)$ and $B(2, -5)$, what is the length of \overline{AB} ?
- 1) $2\sqrt{34}$
 2) 2
 3) $\sqrt{61}$
 4) 8

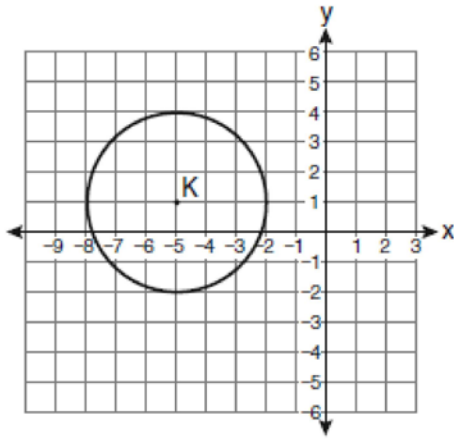
- 20 In the diagram below of $\triangle ACT$, D is the midpoint of \overline{AC} , O is the midpoint of \overline{AT} , and G is the midpoint of \overline{CT} .



If $AC = 10$, $AT = 18$, and $CT = 22$, what is the perimeter of parallelogram $CDOG$?

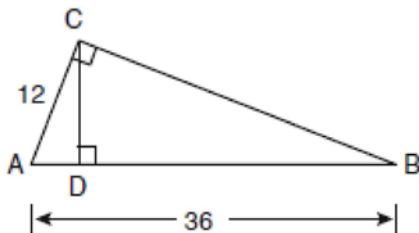
- 1) 21
 2) 25
 3) 32
 4) 40

- 21 Which equation represents circle K shown in the graph below?



- 1) $(x + 5)^2 + (y - 1)^2 = 3$
- 2) $(x + 5)^2 + (y - 1)^2 = 9$
- 3) $(x - 5)^2 + (y + 1)^2 = 3$
- 4) $(x - 5)^2 + (y + 1)^2 = 9$

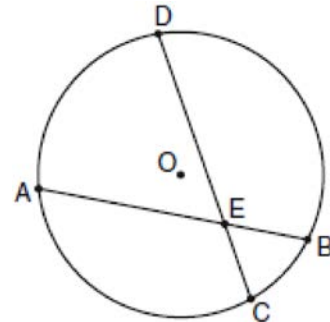
- 22 In the diagram below of right triangle ACB , altitude CD is drawn to hypotenuse AB .



If $AB = 36$ and $AC = 12$, what is the length of \overline{AD} ?

- 1) 32
- 2) 6
- 3) 3
- 4) 4

- 23 In the diagram of circle O below, chord \overline{AB} intersects chord \overline{CD} at E , $DE = 2x + 8$, $EC = 3$, $AE = 4x - 3$, and $EB = 4$.



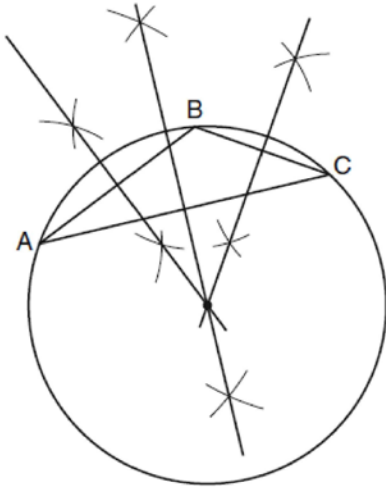
What is the value of x ?

- 1) 1
- 2) 3.6
- 3) 5
- 4) 10.25

- 24 What is the negation of the statement “Squares are parallelograms”?

- 1) Parallelograms are squares.
- 2) Parallelograms are not squares.
- 3) It is not the case that squares are parallelograms.
- 4) It is not the case that parallelograms are squares.

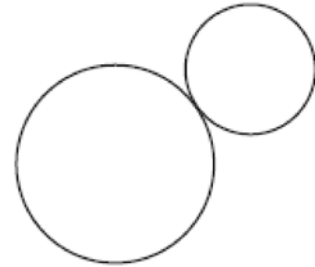
- 25 The diagram below shows the construction of the center of the circle circumscribed about $\triangle ABC$.



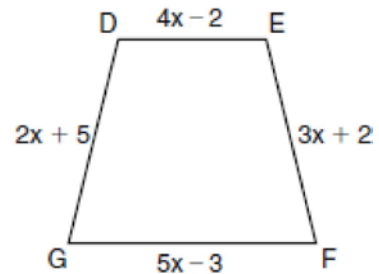
This construction represents how to find the intersection of

- 1) the angle bisectors of $\triangle ABC$
 - 2) the medians to the sides of $\triangle ABC$
 - 3) the altitudes to the sides of $\triangle ABC$
 - 4) the perpendicular bisectors of the sides of $\triangle ABC$
- 26 A right circular cylinder has a volume of 1,000 cubic inches and a height of 8 inches. What is the radius of the cylinder to the nearest tenth of an inch?
- 1) 6.3
 - 2) 11.2
 - 3) 19.8
 - 4) 39.8
- 27 If two different lines are perpendicular to the same plane, they are
- 1) collinear
 - 2) coplanar
 - 3) congruent
 - 4) consecutive

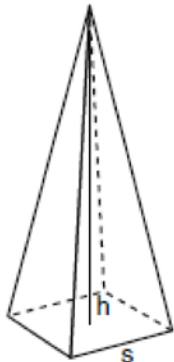
- 28 How many common tangent lines can be drawn to the two externally tangent circles shown below?



- 1) 1
 - 2) 2
 - 3) 3
 - 4) 4
- 29 In the diagram below of isosceles trapezoid $DEFG$, $\overline{DE} \parallel \overline{GF}$, $DE = 4x - 2$, $EF = 3x + 2$, $FG = 5x - 3$, and $GD = 2x + 5$. Find the value of x .

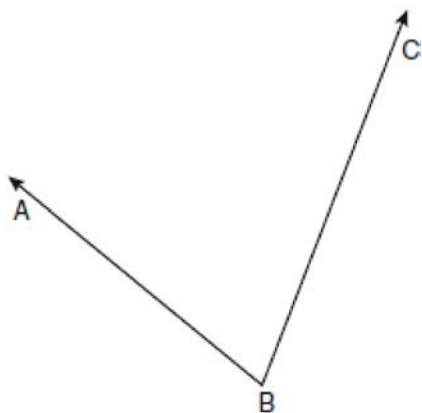


- 30 A regular pyramid with a square base is shown in the diagram below.



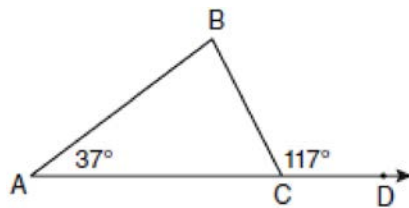
A side, s , of the base of the pyramid is 12 meters, and the height, h , is 42 meters. What is the volume of the pyramid in cubic meters?

- 31 Write an equation of the line that passes through the point $(6, -5)$ and is parallel to the line whose equation is $2x - 3y = 11$.
- 32 Using a compass and straightedge, construct the angle bisector of $\angle ABC$ shown below. [Leave all construction marks.]



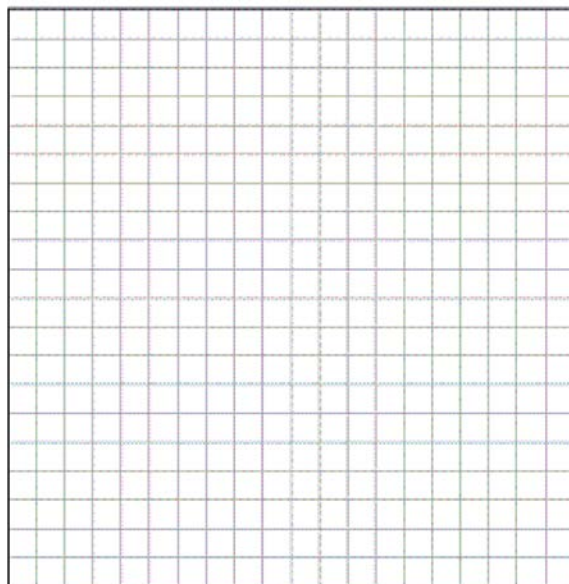
- 33 The degree measures of the angles of $\triangle ABC$ are represented by x , $3x$, and $5x - 54$. Find the value of x .

- 34 In the diagram below of $\triangle ABC$ with side \overline{AC} extended through D , $m\angle A = 37$ and $m\angle BCD = 117$. Which side of $\triangle ABC$ is the longest side? Justify your answer.

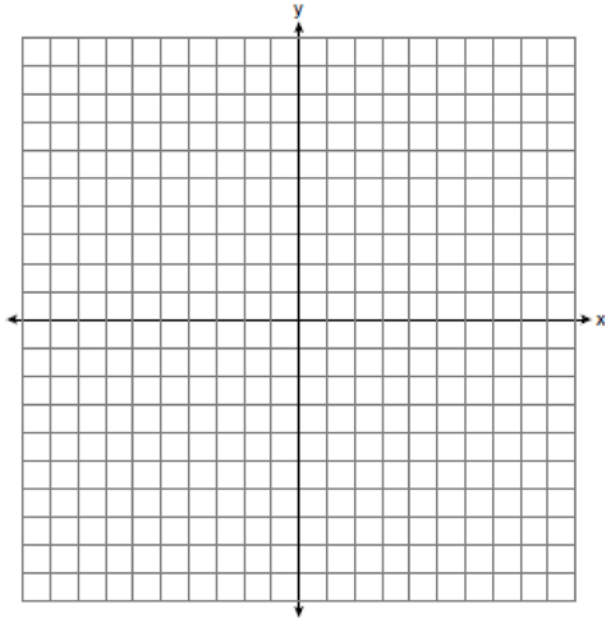


(Not drawn to scale)

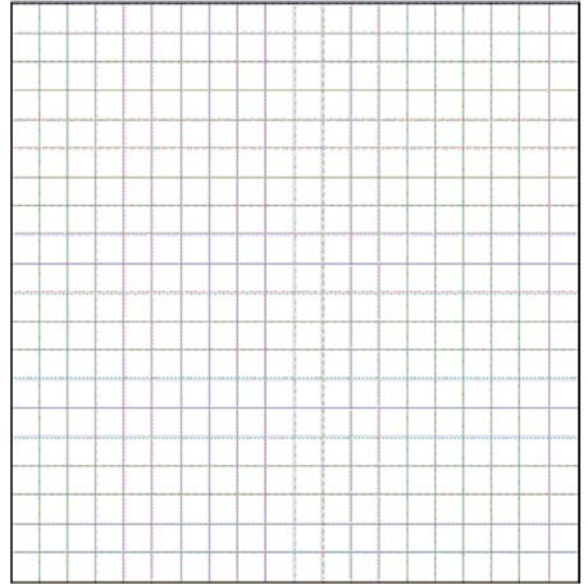
- 35 Write an equation of the perpendicular bisector of the line segment whose endpoints are $(-1, 1)$ and $(7, -5)$. [The use of the grid below is optional]



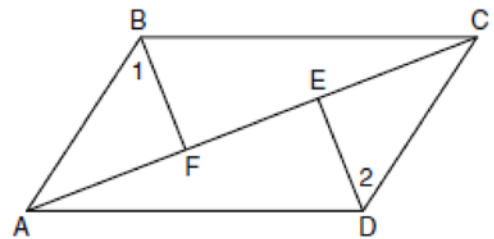
- 36 On the set of axes below, sketch the points that are 5 units from the origin and sketch the points that are 2 units from the line $y = 3$. Label with an **X** all points that satisfy both conditions.



- 37 Triangle DEG has the coordinates $D(1,1)$, $E(5,1)$, and $G(5,4)$. Triangle DEG is rotated 90° about the origin to form $\triangle D'E'G'$. On the grid below, graph and label $\triangle DEG$ and $\triangle D'E'G'$. State the coordinates of the vertices D' , E' , and G' . Justify that this transformation preserves distance.



- 38 Given: Quadrilateral $ABCD$, diagonal \overline{AFEC} , $\overline{AE} \cong \overline{FC}$, $\overline{BF} \perp \overline{AC}$, $\overline{DE} \perp \overline{AC}$, $\angle 1 \cong \angle 2$
 Prove: $ABCD$ is a parallelogram.



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Answer Section

1 ANS: 4

The marked 60° angle and the angle above it are on the same straight line and supplementary. This unmarked supplementary angle is 120° . Because the unmarked 120° angle and the marked 120° angle are alternate exterior angles and congruent, $d \parallel e$.

PTS: 2 REF: 080901ge STA: G.G.35 TOP: Parallel Lines and Transversals

2 ANS: 3 PTS: 2 REF: 080902ge STA: G.G.17

TOP: Constructions

3 ANS: 4

$$180 - (40 + 40) = 100$$

PTS: 2 REF: 080903ge STA: G.G.31 TOP: Isosceles Triangle Theorem

4 ANS: 2

Parallel chords intercept congruent arcs. $\widehat{mAC} = \widehat{mBD} = 30$. $180 - 30 - 30 = 120$.

PTS: 2 REF: 080904ge STA: G.G.52 TOP: Chords

5 ANS: 4 PTS: 2 REF: 080905ge STA: G.G.29

TOP: Triangle Congruency

6 ANS: 2

A dilation affects distance, not angle measure.

PTS: 2 REF: 080906ge STA: G.G.60 TOP: Identifying Transformations

7 ANS: 1

$\angle DCB$ and $\angle ADC$ are supplementary adjacent angles of a parallelogram. $180 - 120 = 60$. $\angle 2 = 60 - 45 = 15$.

PTS: 2 REF: 080907ge STA: G.G.38 TOP: Parallelograms

8 ANS: 1

Translations and reflections do not affect distance.

PTS: 2 REF: 080908ge STA: G.G.59 TOP: Properties of Transformations

9 ANS: 3

The slope of $y = x + 2$ is 1. The slope of $y - x = -1$ is $\frac{-A}{B} = \frac{-(-1)}{1} = 1$.

PTS: 2 REF: 080909ge STA: G.G.63 TOP: Parallel and Perpendicular Lines

10 ANS: 2

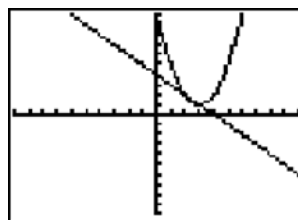
$$M_x = \frac{-2+6}{2} = 2. \quad M_y = \frac{-4+2}{2} = -1$$

PTS: 2 REF: 080910ge STA: G.G.66 TOP: Midpoint

11 ANS: 1 PTS: 2 REF: 080911ge STA: G.G.73

TOP: Equations of Circles

12 ANS: 4



$$y + x = 4 \quad x^2 - 6x + 10 = -x + 4 \quad y + x = 4 \quad y + 2 = 4$$

$$y = -x + 4 \quad x^2 - 5x + 6 = 0 \quad y + 3 = 4 \quad y = 2$$

$$(x - 3)(x - 2) = 0 \quad y = 1$$

$$x = 3 \text{ or } 2$$

PTS: 2 REF: 080912ge STA: G.G.70 TOP: Quadratic-Linear Systems

13 ANS: 3 PTS: 2 REF: 080913ge STA: G.G.28
TOP: Triangle Congruency14 ANS: 4 PTS: 2 REF: 080914ge STA: G.G.7
TOP: Planes15 ANS: 4 PTS: 2 REF: 080915ge STA: G.G.56
TOP: Identifying Transformations16 ANS: 2
 $6 + 17 > 22$

PTS: 2 REF: 080916ge STA: G.G.33 TOP: Triangle Inequality Theorem

17 ANS: 4

The slope of $y = -\frac{2}{3}x - 5$ is $-\frac{2}{3}$. Perpendicular lines have slope that are opposite reciprocals.

PTS: 2 REF: 080917ge STA: G.G.62 TOP: Parallel and Perpendicular Lines

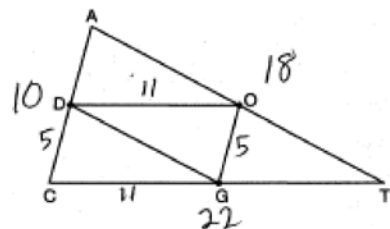
18 ANS: 1 PTS: 2 REF: 080918ge STA: G.G.41
TOP: Special Quadrilaterals

19 ANS: 1

$$d = \sqrt{(-4 - 2)^2 + (5 - (-5))^2} = \sqrt{36 + 100} = \sqrt{136} = \sqrt{4} \cdot \sqrt{34} = 2\sqrt{34}.$$

PTS: 2 REF: 080919ge STA: G.G.67 TOP: Distance

20 ANS: 3



PTS: 2 REF: 080920ge STA: G.G.42 TOP: Midsegments

21 ANS: 2 PTS: 2 REF: 080921ge STA: G.G.72
TOP: Equations of Circles

22 ANS: 4

$$\text{Let } \overline{AD} = x. \quad 36x = 12^2$$

$$x = 4$$

PTS: 2

REF: 080922ge

STA: G.G.47

TOP: Similarity

KEY: leg

23 ANS: 2

$$4(4x - 3) = 3(2x + 8)$$

$$16x - 12 = 6x + 24$$

$$10x = 36$$

$$x = 3.6$$

PTS: 2

REF: 080923ge

STA: G.G.53

TOP: Segments Intercepted by Circle

KEY: two chords

24 ANS: 3

PTS: 2

REF: 080924ge

STA: G.G.24

TOP: Negations

25 ANS: 4

PTS: 2

REF: 080925ge

STA: G.G.21

TOP: Centroid, Orthocenter, Incenter and Circumcenter

26 ANS: 1

$$V = \pi r^2 h$$

$$1000 = \pi r^2 \cdot 8$$

$$r^2 = \frac{1000}{8\pi}$$

$$r \approx 6.3$$

PTS: 2

REF: 080926ge

STA: G.G.14

TOP: Volume and Lateral Area

27 ANS: 2

PTS: 2

REF: 080927ge

STA: G.G.4

TOP: Planes

28 ANS: 3

PTS: 2

REF: 080928ge

STA: G.G.50

TOP: Tangents

KEY: common tangency

29 ANS:

3. The non-parallel sides of an isosceles trapezoid are congruent. $2x + 5 = 3x + 2$

$$x = 3$$

PTS: 2

REF: 080929ge

STA: G.G.40

TOP: Trapezoids

30 ANS:

$$2016. \quad V = \frac{1}{3} Bh = \frac{1}{3} s^2 h = \frac{1}{3} 12^2 \cdot 42 = 2016$$

PTS: 2

REF: 080930ge

STA: G.G.13

TOP: Volume

31 ANS:

$$y = \frac{2}{3}x - 9. \text{ The slope of } 2x - 3y = 11 \text{ is } -\frac{A}{B} = \frac{-2}{-3} = \frac{2}{3}. -5 = \left(\frac{2}{3}\right)(6) + b$$

$$-5 = 4 + b$$

$$b = -9$$

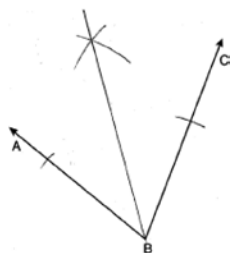
PTS: 2

REF: 080931ge

STA: G.G.65

TOP: Parallel and Perpendicular Lines

32 ANS:



PTS: 2

REF: 080932ge

STA: G.G.17

TOP: Constructions

33 ANS:

$$26. x + 3x + 5x - 54 = 180$$

$$9x = 234$$

$$x = 26$$

PTS: 2

REF: 080933ge

STA: G.G.30

TOP: Interior and Exterior Angles of Triangles

34 ANS:

\overline{AC} . $m\angle BCA = 63$ and $m\angle ABC = 80$. \overline{AC} is the longest side as it is opposite the largest angle.

PTS: 2

REF: 080934ge

STA: G.G.34

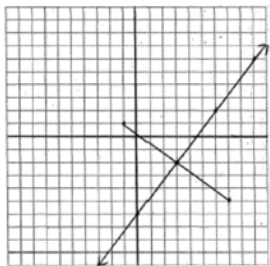
TOP: Angle Side Relationship

35 ANS:

$y = \frac{4}{3}x - 6$. $M_x = \frac{-1+7}{2} = 3$ The perpendicular bisector goes through $(3, -2)$ and has a slope of $\frac{4}{3}$.

$$M_y = \frac{1+(-5)}{2} = -2$$

$$m = \frac{1-(-5)}{-1-7} = -\frac{3}{4}$$



$$y - y_M = m(x - x_M).$$

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

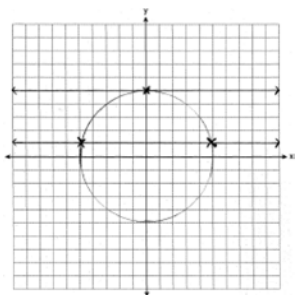
PTS: 4

REF: 080935ge

STA: G.G.68

TOP: Perpendicular Bisector

36 ANS:



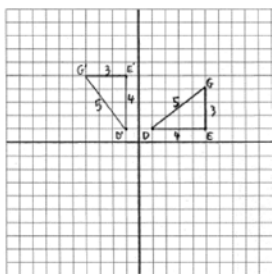
PTS: 4

REF: 080936ge

STA: G.G.23

TOP: Locus

37 ANS:



$D'(-1, 1), E'(-5, 1), G'(-4, 5)$

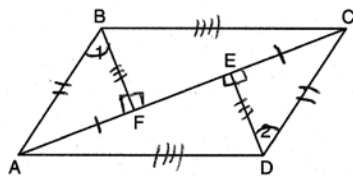
PTS: 4

REF: 080937ge

STA: G.G.55

TOP: Properties of Transformations

38 ANS:



$\overline{FE} \cong \overline{FE}$ (Reflexive Property); $\overline{AE} - \overline{FE} \cong \overline{FC} - \overline{EF}$ (Line Segment Subtraction Theorem); $\overline{AF} \cong \overline{CE}$ (Substitution); $\angle BFA \cong \angle DEG$ (All right angles are congruent); $\triangle BFA \cong \triangle DEG$ (AAS); $\overline{AB} \cong \overline{CD}$ and $\overline{BF} \cong \overline{DG}$ (CPCTC); $\angle BFG \cong \angle DGE$ (All right angles are congruent); $\triangle BFG \cong \triangle DGE$ (SAS); $\overline{AD} \cong \overline{CB}$ (CPCTC); $ABCD$ is a parallelogram (opposite sides of quadrilateral $ABCD$ are congruent)

PTS: 6

REF: 080938ge

STA: G.G.27

TOP: Quadrilateral Proofs