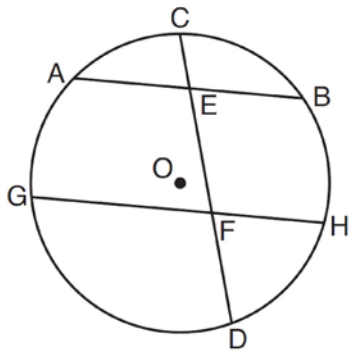
Geometry Regents Exam 0812
www.jmap.org

0812ge

1 In the diagram below of circle O, chord $\overline{AB}$ is parallel to chord $\overline{GH}$. Chord $\overline{CD}$ intersects $\overline{AB}$ at E and $\overline{GH}$ at F.



Which statement must always be true?

1) $\overset{\frown}{AC} \cong \overset{\frown}{CB}$
2) $\overset{\frown}{DH} \cong \overset{\frown}{BH}$
3) $\overset{\frown}{AB} \cong \overset{\frown}{GH}$
4) $\overset{\frown}{AG} \cong \overset{\frown}{BH}$

2 The vertices of parallelogram $ABCD$ are $A(2,0)$, $B(0,-3)$, $C(3,-3)$, and $D(5,0)$. If $ABCD$ is reflected over the x-axis, how many vertices remain invariant?

1) 1
2) 2
3) 3
4) 0

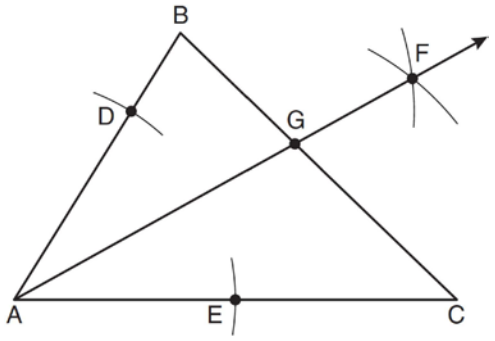
3 Point M is the midpoint of $\overline{AB}$. If the coordinates of A are $(-3,6)$ and the coordinates of M are $(-5,2)$, what are the coordinates of B?

1) $(1,2)$
2) $(7,10)$
3) $(-4,4)$
4) $(-7,-2)$

4 When a dilation is performed on a hexagon, which property of the hexagon will *not* be preserved in its image?

1) parallelism
2) orientation
3) length of sides
4) measure of angles

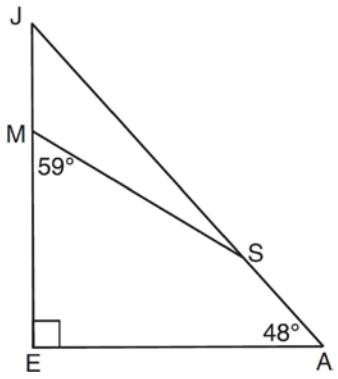
5 As shown in the diagram below of ΔABC, a compass is used to find points D and E, equidistant from point A. Next, the compass is used to find point F, equidistant from points D and E. Finally, a straightedge is used to draw $\overrightarrow{AF}$. Then, point G, the intersection of $\overrightarrow{AF}$ and side $\overline{BC}$ of ΔABC, is labeled.



Which statement must be true?

1) $\overrightarrow{AF}$ bisects side $\overline{BC}$
2) $\overrightarrow{AF}$ bisects $\angle BAC$
3) $\overrightarrow{AF} \perp \overline{BC}$
4) $\Delta ABG \sim \Delta ACG$

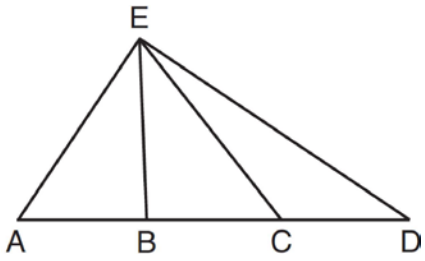
6 In the diagram of ΔJEA below, $m\angle JEA = 90$ and $m\angle EAJ = 48$. Line segment MS connects points M and S on the triangle, such that $m\angle EMS = 59$.



What is $m\angle JSM$?

1) 163
2) 121
3) 42
4) 17

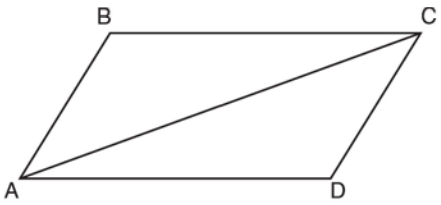
7 In ΔAED with $\overline{ABCD}$ shown in the diagram below, $\overline{EB}$ and $\overline{EC}$ are drawn.



If $\overline{AB} \cong \overline{CD}$, which statement could always be proven?

1) $\overline{AC} \cong \overline{DB}$
2) $\overline{AE} \cong \overline{ED}$
3) $\overline{AB} \cong \overline{BC}$
4) $\overline{EC} \cong \overline{EA}$

8 Given that $ABCD$ is a parallelogram, a student wrote the proof below to show that a pair of its opposite angles are congruent.



Statement	Reason
1. ABCD is a parallelogram.	1. Given
2. $\overline{BC} \cong \overline{AD}$ $\overline{AB} \cong \overline{DC}$	2. Opposite sides of a parallelogram are congruent.
3. $\overline{AC} \cong \overline{CA}$	3. Reflexive Postulate of Congruency
4. $\triangle ABC \cong \triangle CDA$	4. Side-Side-Side
5. $\angle B \cong \angle D$	5. _____

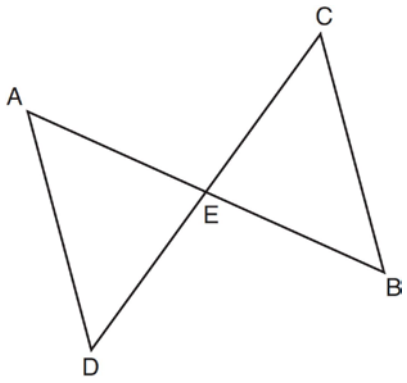
What is the reason justifying that $\angle B \cong \angle D$?

1) Opposite angles in a quadrilateral are congruent.
2) Parallel lines have congruent corresponding angles.
3) Corresponding parts of congruent triangles are congruent.
4) Alternate interior angles in congruent triangles are congruent.

9 The equation of a circle with its center at $(-3, 5)$ and a radius of 4 is

1) $(x+3)^2 + (y-5)^2 = 4$
2) $(x-3)^2 + (y+5)^2 = 4$
3) $(x+3)^2 + (y-5)^2 = 16$
4) $(x-3)^2 + (y+5)^2 = 16$

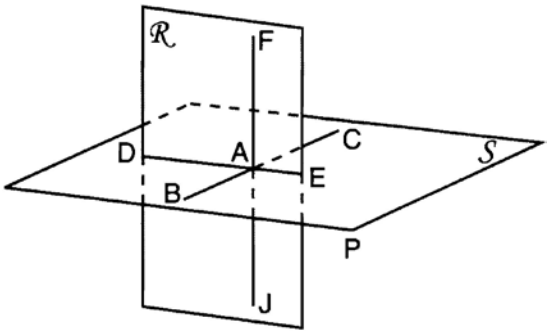
10 In the diagram below of ΔDAE and ΔBCE, $\overline{AB}$ and $\overline{CD}$ intersect at E, such that $\overline{AE} \cong \overline{CE}$ and $\angle BCE \cong \angle DAE$.



Triangle DAE can be proved congruent to triangle BCE by

1) ASA
2) SAS
3) SSS
4) HL

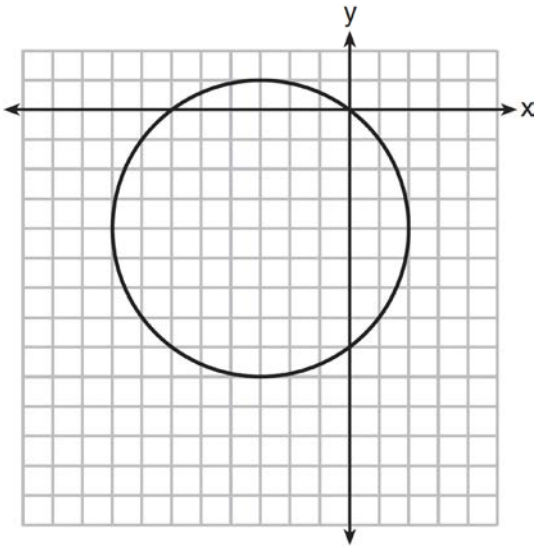
11 As shown in the diagram below, $\overline{FJ}$ is contained in plane $\mathcal{R}$, $\overline{BC}$ and $\overline{DE}$ are contained in plane $\mathcal{S}$, and $\overline{FJ}$, $\overline{BC}$, and $\overline{DE}$ intersect at A.



Which fact is sufficient to show that planes $\mathcal{R}$ and $\mathcal{S}$ are perpendicular?

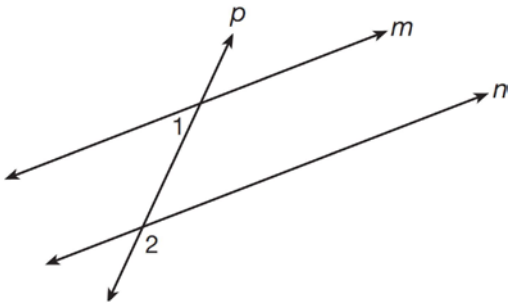
1) $\overline{FA} \perp \overline{DE}$
2) $\overline{AD} \perp \overline{AF}$
3) $\overline{BC} \perp \overline{FJ}$
4) $\overline{DE} \perp \overline{BC}$

12 What is an equation of the circle shown in the graph below?



1) $(x-3)^2 + (y-4)^2 = 25$
2) $(x+3)^2 + (y+4)^2 = 25$
3) $(x-3)^2 + (y-4)^2 = 10$
4) $(x+3)^2 + (y+4)^2 = 10$

13 As shown in the diagram below, lines m and n are cut by transversal p.



If $m\angle 1 = 4x + 14$ and $m\angle 2 = 8x + 10$, lines m and n are parallel when x equals

1) 1
2) 6
3) 13
4) 17

14 The angle formed by the radius of a circle and a tangent to that circle has a measure of
1) 45°
2) 90°
3) 135°
4) 180°

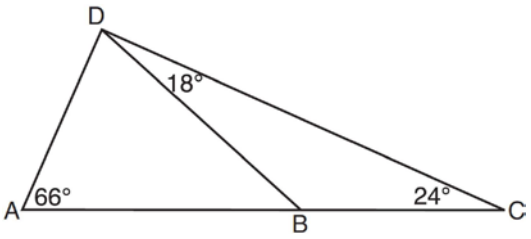
15 A sphere is inscribed inside a cube with edges of 6 cm. In cubic centimeters, what is the volume of the sphere, in terms of π?
1) 12π
2) 36π
3) 48π
4) 288π

16 Scalene triangle ABC is similar to triangle DEF. Which statement is *false*?
1) $AB:BC=DE:EF$
2) $AC:DF=BC:EF$
3) $\angle ACB \cong \angle DFE$
4) $\angle ABC \cong \angle EDF$

17 Which equation represents a line that is parallel to the line whose equation is $y = \frac{3}{2}x - 3$ and passes through the point $(1, 2)$?
1) $y = \frac{3}{2}x + \frac{1}{2}$
2) $y = \frac{2}{3}x + \frac{4}{3}$
3) $y = \frac{3}{2}x - 2$
4) $y = -\frac{2}{3}x + \frac{8}{3}$

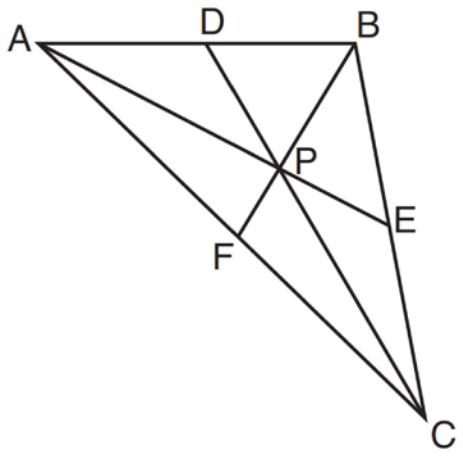
18 Lines a and b intersect at point P. Line c passes through P and is perpendicular to the plane containing lines a and b. Which statement must be true?
1) Lines a, b, and c are coplanar.
2) Line a is perpendicular to line b.
3) Line c is perpendicular to both line a and line b.
4) Line c is perpendicular to line a or line b, but not both.

19 As shown in the diagram of ΔACD below, B is a point on $\overline{AC}$ and $\overline{DB}$ is drawn.



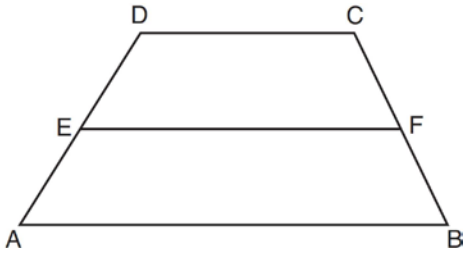
If $m\angle A = 66$, $m\angle CDB = 18$, and $m\angle C = 24$, what is the longest side of ΔABD?
1) $\overline{AB}$
2) $\overline{DC}$
3) $\overline{AD}$
4) $\overline{BD}$

20 In ΔABC shown below, P is the centroid and $BF = 18$.



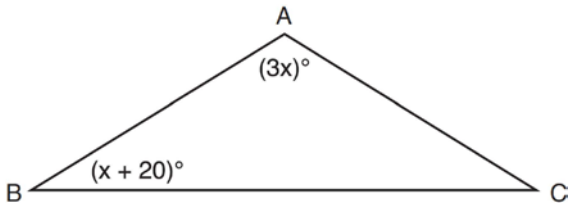
What is the length of $\overline{BP}$?
1) 6
2) 9
3) 3
4) 12

21 In the diagram below, $\overline{EF}$ is the median of trapezoid $ABCD$.



If $AB = 5x - 9$, $DC = x + 3$, and $EF = 2x + 2$, what is the value of x?
1) 5
2) 2
3) 7
4) 8

22 In the diagram below of ΔABC, $\overline{AB} \cong \overline{AC}$, $m\angle A = 3x$, and $m\angle B = x + 20$.



What is the value of x?
1) 10
2) 28
3) 32
4) 40

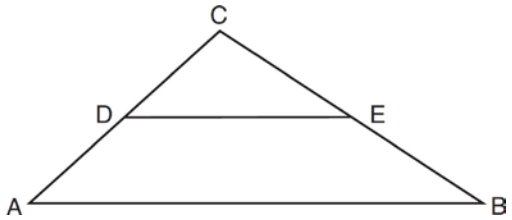
23 For which polygon does the sum of the measures of the interior angles equal the sum of the measures of the exterior angles?
1) hexagon
2) pentagon
3) quadrilateral
4) triangle

24 For a triangle, which two points of concurrence could be located outside the triangle?
1) incenter and centroid
2) centroid and orthocenter
3) incenter and circumcenter
4) circumcenter and orthocenter

25 The slope of line ℓ is $-\frac{1}{3}$. What is an equation of a line that is perpendicular to line ℓ?
1) $y + 2 = \frac{1}{3}x$
2) $-2x + 6 = 6y$
3) $9x - 3y = 27$
4) $3x + y = 0$

26 Which type of triangle can be drawn using the points $(-2, 3)$, $(-2, -7)$, and $(4, -5)$?
1) scalene
2) isosceles
3) equilateral
4) no triangle can be drawn

27 In the diagram below, $\overline{DE}$ joins the midpoints of two sides of ΔABC.

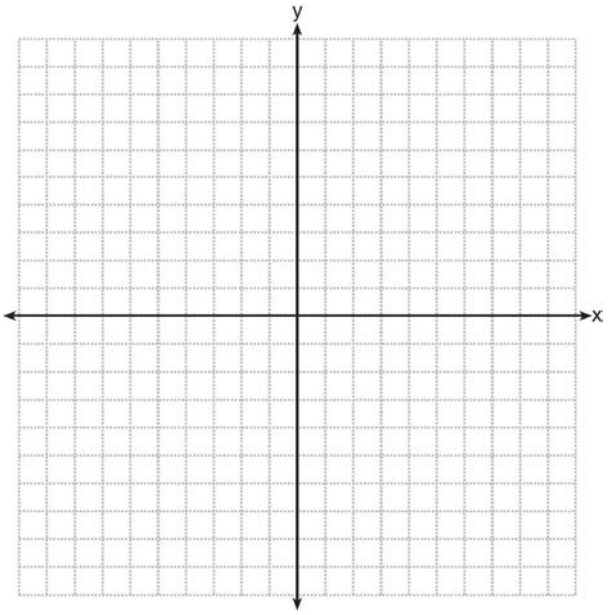


Which statement is *not* true?
1) $CE = \frac{1}{2}CB$
2) $DE = \frac{1}{2}AB$
3) area of $\Delta CDE = \frac{1}{2}$ area of ΔCAB
4) perimeter of $\Delta CDE = \frac{1}{2}$ perimeter of ΔCAB

28 Which equation represents the line that is perpendicular to $2y = x + 2$ and passes through the point $(4, 3)$?
1) $y = \frac{1}{2}x - 5$
2) $y = \frac{1}{2}x + 1$
3) $y = -2x + 11$
4) $y = -2x - 5$

29 Write the negation of the statement "2 is a prime number," and determine the truth value of the negation.

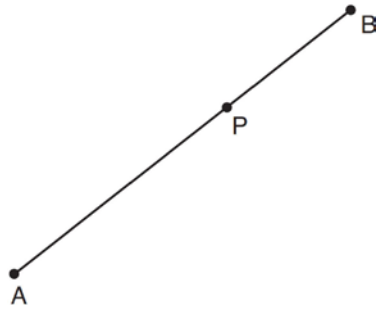
30 The coordinates of the vertices of ΔABC are $A(1,2)$, $B(-4,3)$, and $C(-3,-5)$. State the coordinates of $\Delta A'B'C'$, the image of ΔABC after a rotation of 90º about the origin. [The use of the set of axes below is optional.]



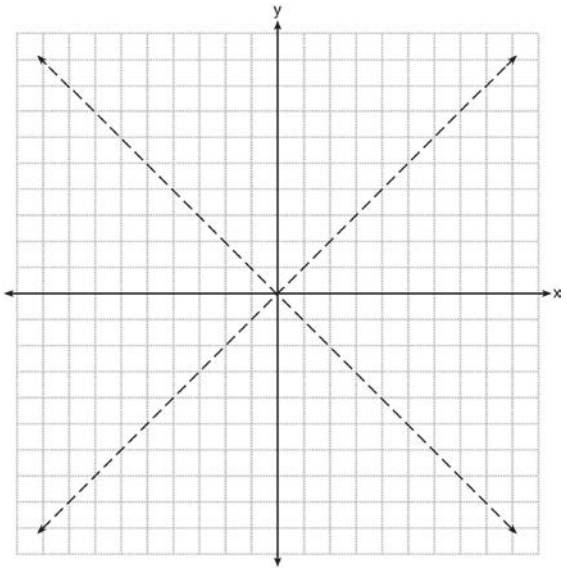
31 A cylinder has a height of 7 cm and a base with a diameter of 10 cm. Determine the volume, in cubic centimeters, of the cylinder in terms of π.

32 The coordinates of the endpoints of $\overline{FG}$ are $(-4,3)$ and $(2,5)$. Find the length of $\overline{FG}$ in simplest radical form.

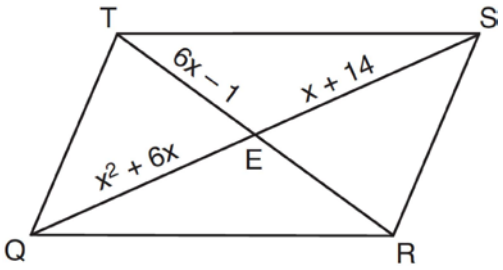
33 Using a compass and straightedge, construct a line perpendicular to $\overline{AB}$ through point P. [Leave all construction marks.]



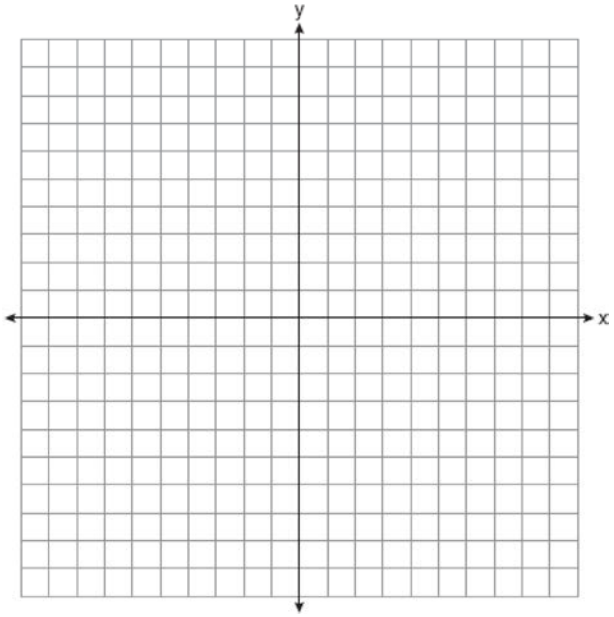
34 The graph below shows the locus of points equidistant from the x-axis and y-axis. On the same set of axes, graph the locus of points 3 units from the line $x = 0$. Label with an **X** *all* points that satisfy both conditions.



35 As shown in the diagram below, the diagonals of parallelogram $QRST$ intersect at E. If $QE = x^2 + 6x$, $SE = x + 14$, and $TE = 6x - 1$, determine TE algebraically.



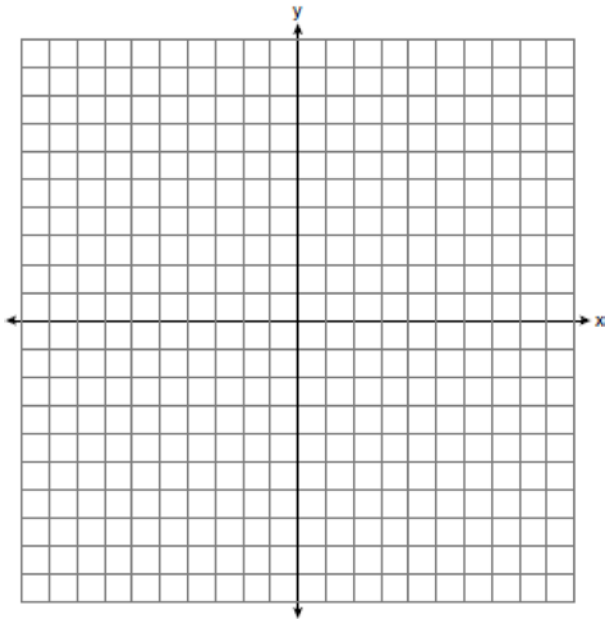
36 The vertices of ΔRST are $R(-6, 5)$, $S(-7, -2)$, and $T(1, 4)$. The image of ΔRST after the composition $T_{-2,3} \circ r_{y=x}$ is $\Delta R''S''T''$. State the coordinates of $\Delta R''S''T''$. [The use of the set of axes below is optional.]



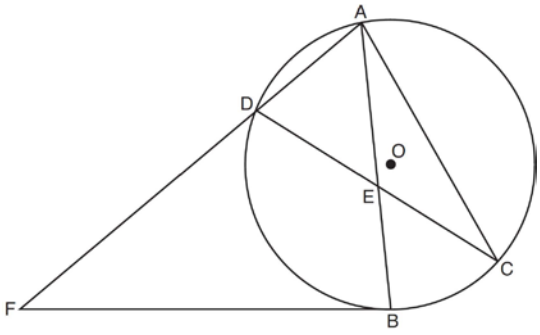
37 On the set of axes below, solve the following system of equations graphically and state the coordinates of *all* points in the solution.

$$(x + 3)^2 + (y - 2)^2 = 25$$

$$2y + 4 = -x$$



38 Chords $\overline{AB}$ and $\overline{CD}$ intersect at E in circle O, as shown in the diagram below. Secant $\overline{FDA}$ and tangent $\overline{FB}$ are drawn to circle O from external point F and chord $\overline{AC}$ is drawn. The $m\overset{\frown}{DA} = 56$, $m\overset{\frown}{DB} = 112$, and the ratio of $m\overset{\frown}{AC} : m\overset{\frown}{CB} = 3:1$.



Determine $m\angle CEB$. Determine $m\angle F$. Determine $m\angle DAC$.

0812ge
Answer Section

1 ANS: 4
Parallel lines intercept congruent arcs.

PTS: 2 REF: 081201ge STA: G.G.52 TOP: Chords

2 ANS: 2 PTS: 2 REF: 081202ge STA: G.G.55
TOP: Properties of Transformations

3 ANS: 4

$-5 = \frac{-3+x}{2}$. $2 = \frac{6+y}{2}$

$-10 = -3 + x$ $4 = 6 + y$

$-7 = x$ $-2 = y$

PTS: 2 REF: 081203ge STA: G.G.66 TOP: Midpoint

4 ANS: 3 PTS: 2 REF: 081204ge STA: G.G.59
TOP: Properties of Transformations

5 ANS: 2 PTS: 2 REF: 081205ge STA: G.G.17
TOP: Constructions

6 ANS: 4 PTS: 2 REF: 081206ge STA: G.G.30
TOP: Interior and Exterior Angles of Triangles

7 ANS: 1

$AB = CD$

$AB + BC = CD + BC$

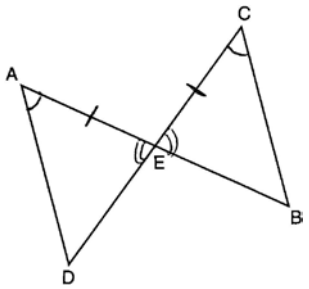
$AC = BD$

PTS: 2 REF: 081207ge STA: G.G.27 TOP: Triangle Proofs

8 ANS: 3 PTS: 2 REF: 081208ge STA: G.G.27
TOP: Quadrilateral Proofs

9 ANS: 3 PTS: 2 REF: 081209ge STA: G.G.71
TOP: Equations of Circles

10 ANS: 1



PTS: 2 REF: 081210ge STA: G.G.28 TOP: Triangle Congruency

11 ANS: 3

As originally administered, this question read, "Which fact is *not* sufficient to show that planes $\mathcal{R}$ and $\mathcal{S}$ are perpendicular?" The State Education Department stated that since a correct solution was not provided for Question 11, all students shall be awarded credit for this question.

PTS: 2 REF: 081211ge STA: G.G.5 TOP: Planes

12 ANS: 2 PTS: 2 REF: 081212ge STA: G.G.72
TOP: Equations of Circles

13 ANS: 3

$$4x + 14 + 8x + 10 = 180$$
$$12x = 156$$
$$x = 13$$

PTS: 2 REF: 081213ge STA: G.G.35 TOP: Parallel Lines and Transversals

14 ANS: 2 PTS: 2 REF: 081214ge STA: G.G.50
TOP: Tangents KEY: point of tangency

15 ANS: 2

$$V = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi \cdot \left(\frac{6}{2}\right)^3 \approx 36\pi$$

PTS: 2 REF: 081215ge STA: G.G.16 TOP: Volume and Surface Area

16 ANS: 4 PTS: 2 REF: 081216ge STA: G.G.45
TOP: Similarity KEY: basic

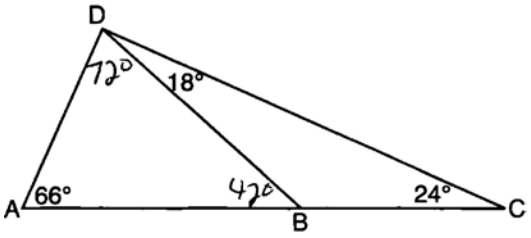
17 ANS: 1

$$m = \frac{3}{2} \qquad y = mx + b$$
$$2 = \frac{3}{2}(1) + b$$
$$\frac{1}{2} = b$$

PTS: 2 REF: 081217ge STA: G.G.65 TOP: Parallel and Perpendicular Lines

18 ANS: 3 PTS: 2 REF: 081218ge STA: G.G.1
TOP: Planes

19 ANS: 1



PTS: 2 REF: 081219ge STA: G.G.34 TOP: Angle Side Relationship

20 ANS: 4
The centroid divides each median into segments whose lengths are in the ratio 2 : 1.

PTS: 2 REF: 081220ge STA: G.G.43 TOP: Centroid

21 ANS: 1

The length of the midsegment of a trapezoid is the average of the lengths of its bases. $\frac{x+3+5x-9}{2} = 2x+2.$

$$6x-6 = 4x+4$$
$$2x = 10$$
$$x = 5$$

PTS: 2 REF: 081221ge STA: G.G.40 TOP: Trapezoids

22 ANS: 2

$$3x + x + 20 + x + 20 = 180$$
$$5x = 40$$
$$x = 28$$

PTS: 2 REF: 081222ge STA: G.G.31 TOP: Isosceles Triangle Theorem

23 ANS: 3

$$180(n-2) = n\left(180 - \frac{180(n-2)}{n}\right)$$

$$180n - 360 = 180n - 180n + 360$$
$$180n = 720$$
$$n = 4$$

PTS: 2 REF: 081223ge STA: G.G.36 TOP: Interior and Exterior Angles of Polygons

24 ANS: 4 PTS: 2 REF: 081224ge STA: G.G.21
TOP: Centroid, Orthocenter, Incenter and Circumcenter

25 ANS: 3

The slope of $9x - 3y = 27$ is $m = \frac{-A}{B} = \frac{-9}{-3} = 3$, which is the opposite reciprocal of $-\frac{1}{3}$.

PTS: 2 REF: 081225ge STA: G.G.62 TOP: Parallel and Perpendicular Lines

26 ANS: 2 PTS: 2 REF: 081226ge STA: G.G.69
TOP: Triangles in the Coordinate Plane

27 ANS: 3 PTS: 2 REF: 081227ge STA: G.G.42
TOP: Midsegments

28 ANS: 3

The slope of $2y = x + 2$ is $\frac{1}{2}$, which is the opposite reciprocal of -2. $3 = -2(4) + b$

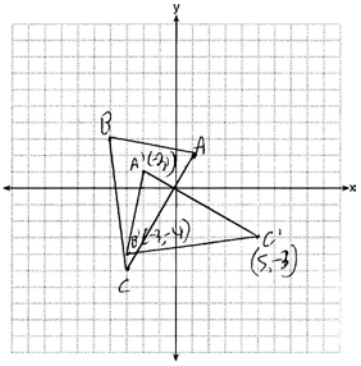
$$11 = b$$

PTS: 2 REF: 081228ge STA: G.G.64 TOP: Parallel and Perpendicular Lines

29 ANS:
2 is not a prime number, false.

PTS: 2 REF: 081229ge STA: G.G.24 TOP: Negations

30 ANS:



$A'(-2, 1)$, $B'(-3, -4)$, and $C'(5, -3)$

PTS: 2 REF: 081230ge STA: G.G.54 TOP: Rotations

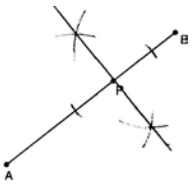
31 ANS:
$V = \pi r^2 h = \pi(5)^2 \cdot 7 = 175\pi$

PTS: 2 REF: 081231ge STA: G.G.14 TOP: Volume and Lateral Area

32 ANS:
$\sqrt{(-4-2)^2 + (3-5)^2} = \sqrt{36+4} = \sqrt{40} = \sqrt{4}\sqrt{10} = 2\sqrt{10}$.

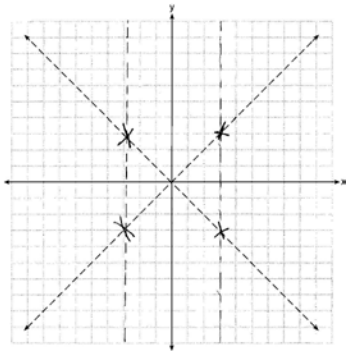
PTS: 2 REF: 081232ge STA: G.G.67 TOP: Distance

33 ANS:



PTS: 2 REF: 081233ge STA: G.G.19 TOP: Constructions

34 ANS:



PTS: 2 REF: 081234ge STA: G.G.23 TOP: Locus

35 ANS:

11. $x^2 + 6x = x + 14$. $6(2) - 1 = 11$

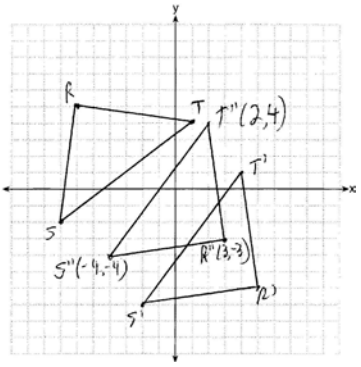
$x^2 + 5x - 14 = 0$

$(x + 7)(x - 2) = 0$

$x = 2$

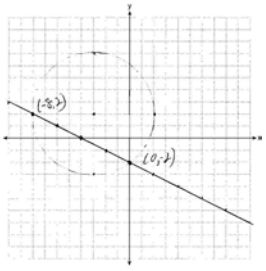
PTS: 2 REF: 081235ge STA: G.G.38 TOP: Parallelograms

36 ANS:



PTS: 4 REF: 081236ge STA: G.G.58 TOP: Compositions of Transformations
KEY: grids

37 ANS:



PTS: 4 REF: 081237ge STA: G.G.70 TOP: Quadratic-Linear Systems

38 ANS:

52, 40, 80. $360 - (56 + 112) = 192$. $\frac{192 - 112}{2} = 40$. $\frac{112 + 48}{2} = 80$

$\frac{1}{4} \times 192 = 48$

$\frac{56 + 48}{2} = 52$

PTS: 6 REF: 081238ge STA: G.G.51 TOP: Arcs Determined by Angles
KEY: mixed