



Arkansas Comprehensive Testing, Assessment, and Accountability Program

Released Item Booklet

Geometry

Mid-Year End-of-Course Examination

January 2007 Administration

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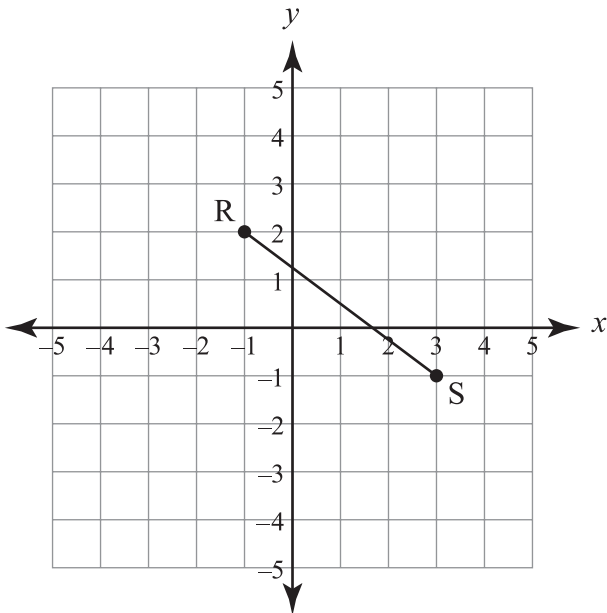
Arkansas Department of Education

PART II Released Geometry Items

1. Cynthia wants to enlarge a photo that is 4 inches tall and 6 inches wide into a poster with a similarity ratio of $\frac{9}{2}$. What will be the dimensions of the poster?

- A. 4 in. \times 6 in.
- B. 8 in. \times 12 in.
- * C. 18 in. \times 27 in.
- D. 36 in. \times 54 in.

2. What is the length of \overline{RS} on the graph below?

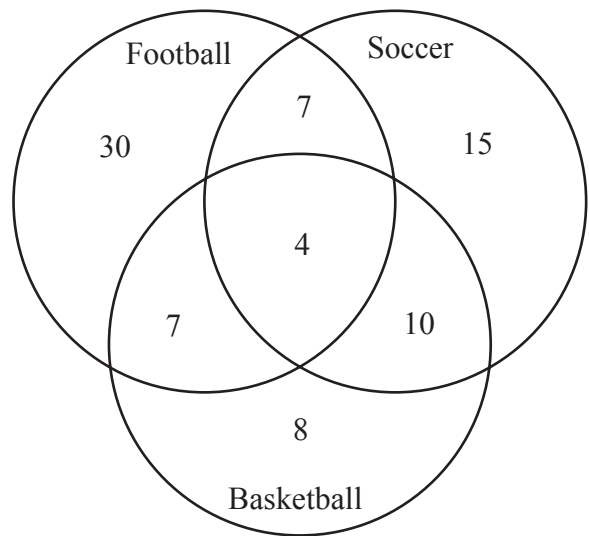


- A. $\sqrt{5}$
- * B. 5
- C. 7
- D. 25

3. What is the sum of the interior angles of a pentagon?

- A. 108°
- B. 360°
- * C. 540°
- D. 720°

4. The Venn diagram below shows the number of boys who play three sports.

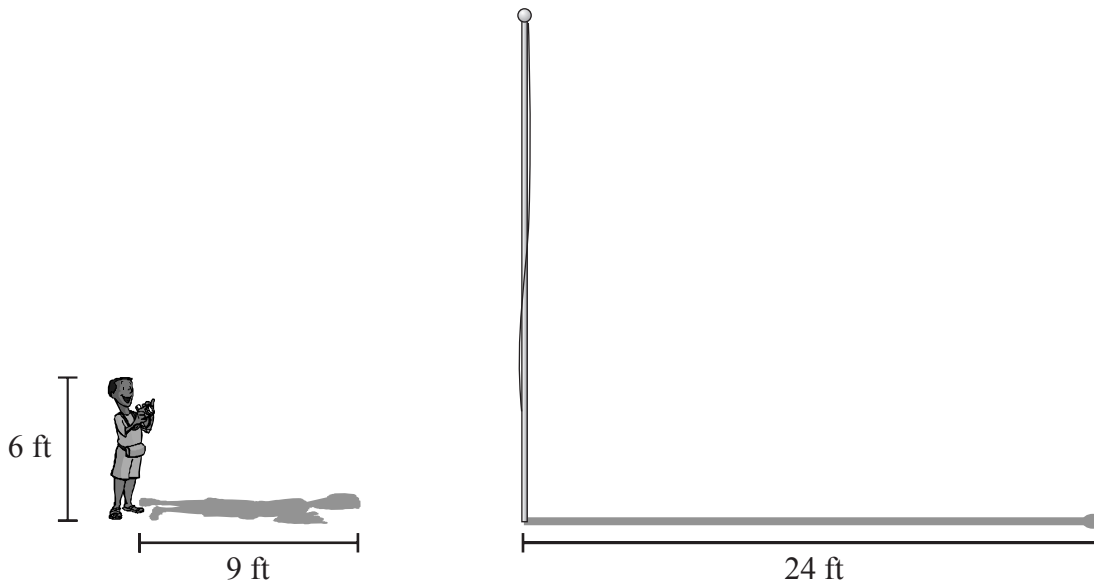


According to the diagram, how many boys play soccer but do **not** play football?

- A. 15
- * B. 25
- C. 28
- D. 36

PART II Released Geometry Items

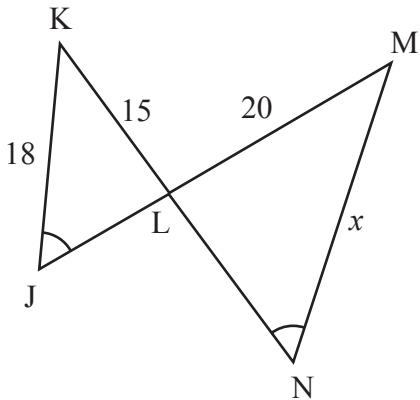
5. Russell, who is 6 feet tall, casts a 9-foot shadow at the same time that a flagpole casts a 24-foot shadow.



How tall is the flagpole?

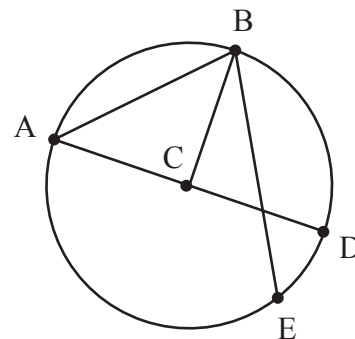
- * A. 16 feet
- B. 21 feet
- C. 27 feet
- D. 36 feet

6. In the similar triangles shown below, what is the value of x ?



- A. 13.5
- B. 16.7
- C. 18
- * D. 24

7. If point C is the center of the circle, which segment is **not** a chord of the circle?



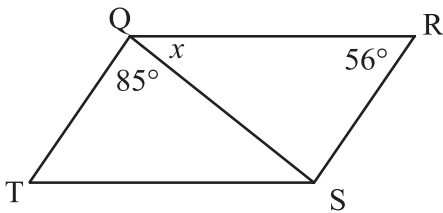
- A. \overline{AB}
- B. \overline{BE}
- * C. \overline{CB}
- D. \overline{AD}

PART II Released Geometry Items

8. For a potluck dinner, the Robertsons, the Smiths, the Tylers, and the Underwoods all brought desserts. The desserts are apple pie, angel food cake, fudge bars, and chocolate brownies.
- The Smiths did not bring the fudge bars or the chocolate brownies.
 - The Robertsons brought either the apple pie or the chocolate brownies.
 - The Tylers brought the angel food cake.
 - The Underwoods brought either the fudge bars or the chocolate brownies.

Who brought the apple pie, based on the statements above?

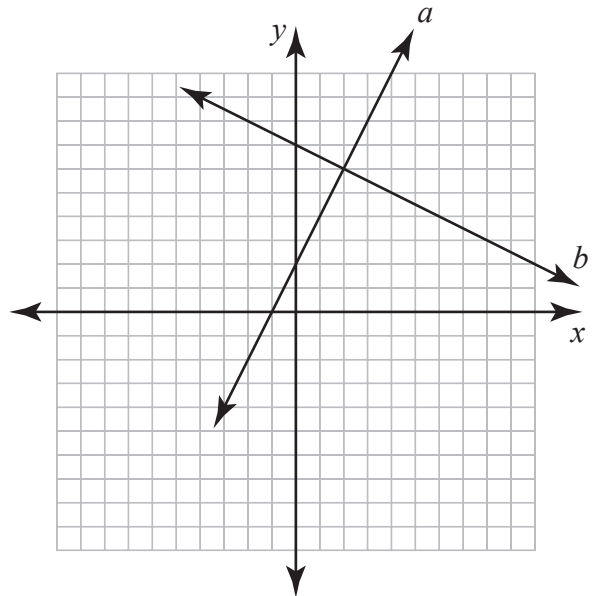
- A. the Robertsons
 - * B. the Smiths
 - C. the Tylers
 - D. the Underwoods
9. Quadrilateral QRST is a parallelogram.



According to the properties of a parallelogram, what is the value of x ?

- * A. 39°
- B. 56°
- C. 85°
- D. 141°

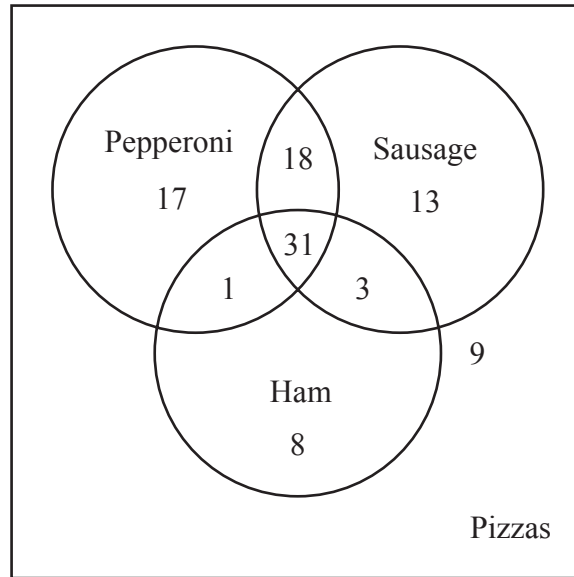
10. The lengths of two sides of a triangle are 15 and 20. The length of the third side of the triangle would be between which two numbers?
- A. 5 and 15
 - B. 5 and 20
 - * C. 5 and 35
 - D. 15 and 35
11. The equation for line a is $y = 2x + 2$. Lines a and b are perpendicular. Which equation represents line b ?



- A. $y = 2x + 7$
- B. $y = \frac{1}{2}x + 7$
- C. $y = -2x + 7$
- * D. $y = -\frac{1}{2}x + 7$

PART II Released Geometry Items

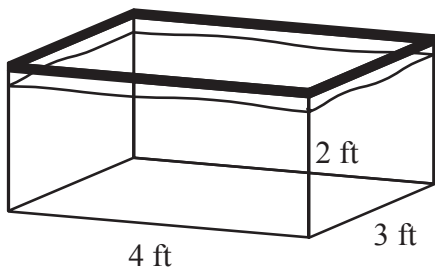
12. The figure below is a Venn diagram representing 100 pizzas and the percentage sold with 3 different types of meat toppings.



What percentage of pizzas do **not** have pepperoni, ham, or sausage as a topping?

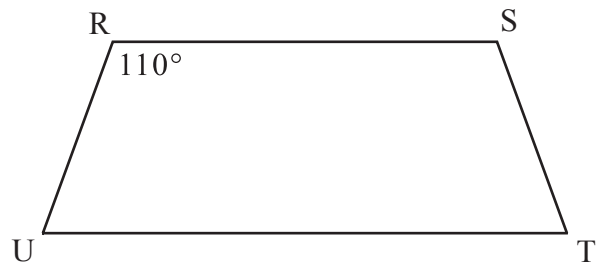
- * A. 9
- B. 13
- C. 18
- D. 31

13. Marcus has a rectangular fish tank with the dimensions shown below. How many cubic feet of water does it hold?



- A. 12 ft^3
- B. 14 ft^3
- * C. 24 ft^3
- D. 40 ft^3

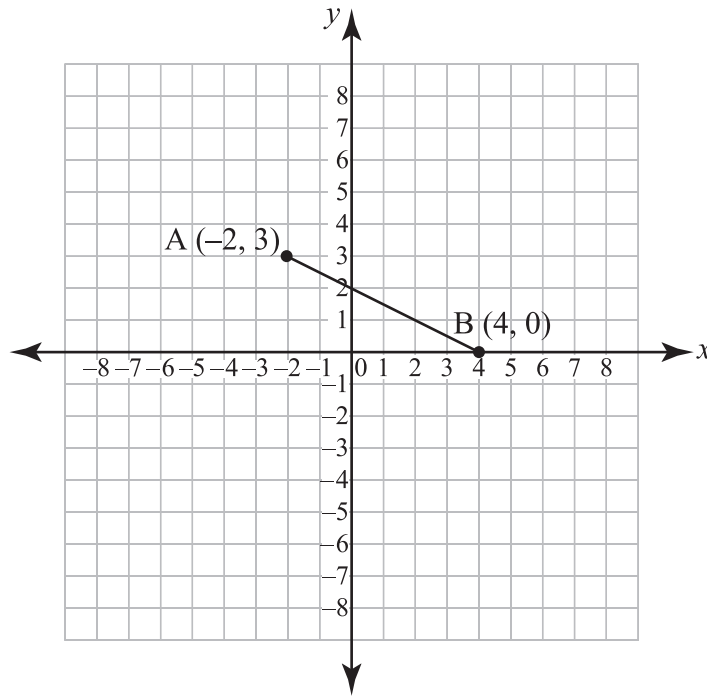
14. RSTU, shown below, is an isosceles trapezoid. What is the measure of $\angle T$?



- * A. 70°
- B. 110°
- C. 140°
- D. 250°

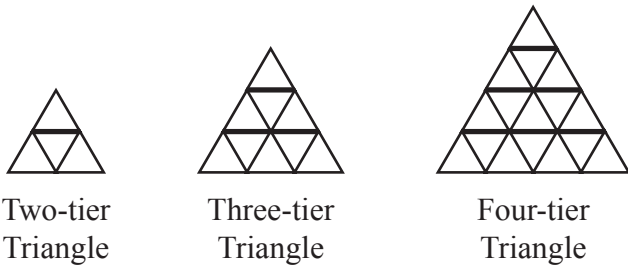
PART II Released Geometry Items

15. What is the midpoint of \overline{AB} below?



- * A. $(1, 1.5)$
- B. $(3, 1.5)$
- C. $(2, 2)$
- D. $(2, 3)$

16. Based on the pattern below, how many small, identical triangles does it take to build a larger triangle that is 6 tiers high?



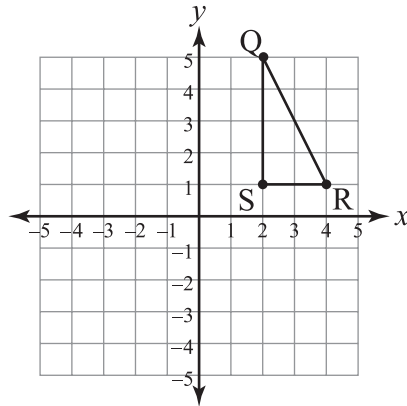
- A. 6
- B. 11
- * C. 36
- D. 39

17. In what type of triangle are the angle bisectors also the altitudes and medians of the triangle?

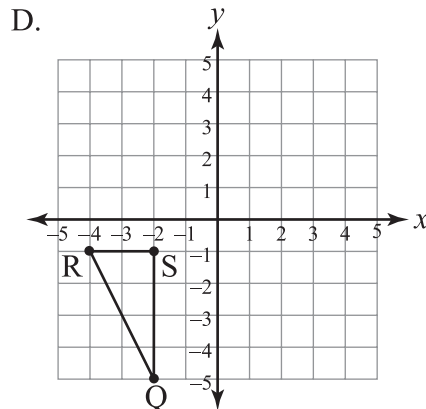
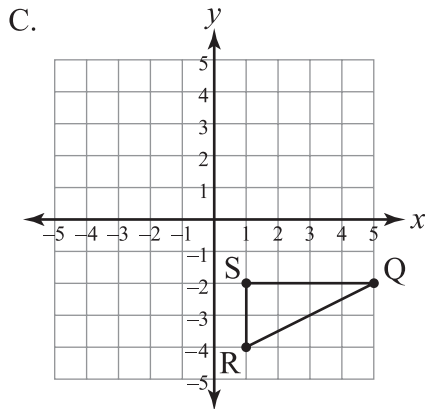
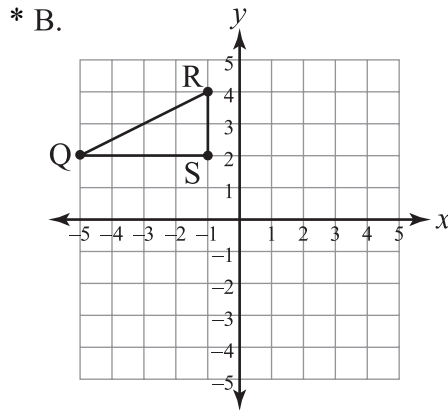
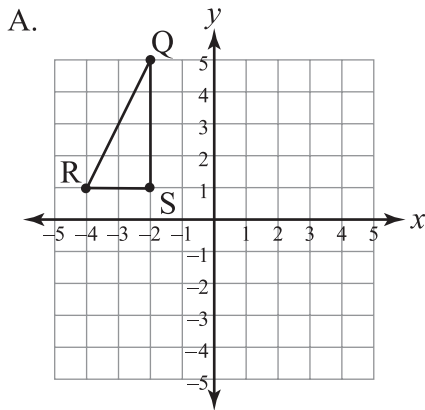
- A. right
- B. obtuse
- C. scalene
- * D. equilateral

PART II Released Geometry Items

18. Triangle QRS is shown in the graph below.

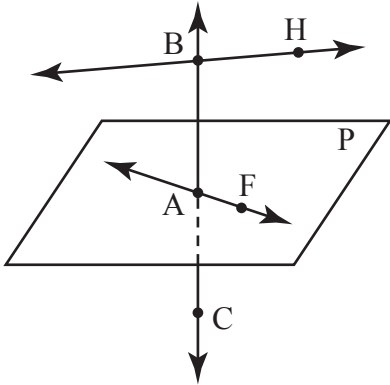


Which of the following graphs shows $\triangle QRS$ rotated 90 degrees counterclockwise about the origin?



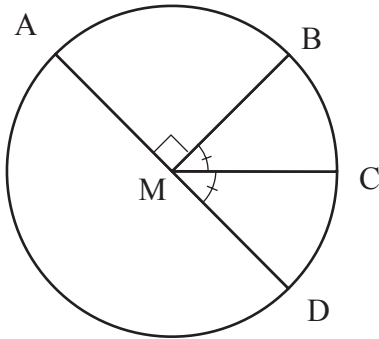
PART II Released Geometry Items

19. Line BH is parallel to plane P in the figure below. What is their intersection?



- A. point A
- B. point B
- C. line BH
- * D. There is no intersection.

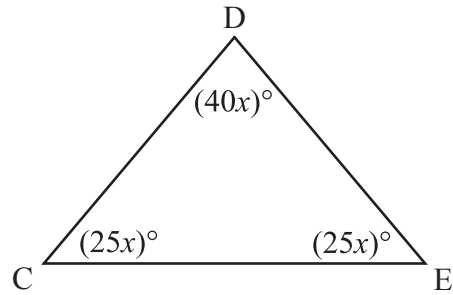
20. In the figure below, \overline{AD} is a diameter of circle M. Angle AMB is a right angle and ray MC bisects $\angle BMD$.



A point is picked randomly from inside the circle. What is the percent probability that the point is inside sector AMC?

- A. 12.5%
- * B. 37.5%
- C. 50.0%
- D. 75.0%

21. What is the measure of $\angle CDE$ below?



- A. 2°
- B. 40°
- C. 50°
- * D. 80°

22. Which set of segment lengths would form a triangle?

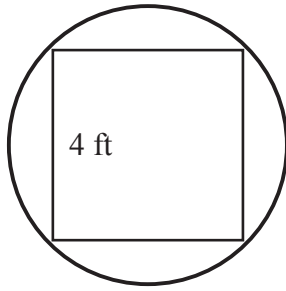
- * A. 4 in. 7 in. 8 in.
- B. 7 in. 3 in. 11 in.
- C. 38 in. 22 in. 16 in.
- D. 80 in. 40 in. 30 in.

23. Sara is making a shape with a piece of fabric. One corner is cut at an angle of 29 degrees. The angle at the opposite corner forms the complementary angle. What is the measure of the angle in the opposite corner?

- A. 29°
- B. 58°
- * C. 61°
- D. 151°

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24. The circular tabletop below has four flaps that fold down to make it a square.



The length of each side of the square is 4 feet. If a penny is tossed onto the table with the flaps up, what is the percent probability that the penny lands inside the square?
Use $\pi = 3.14$.

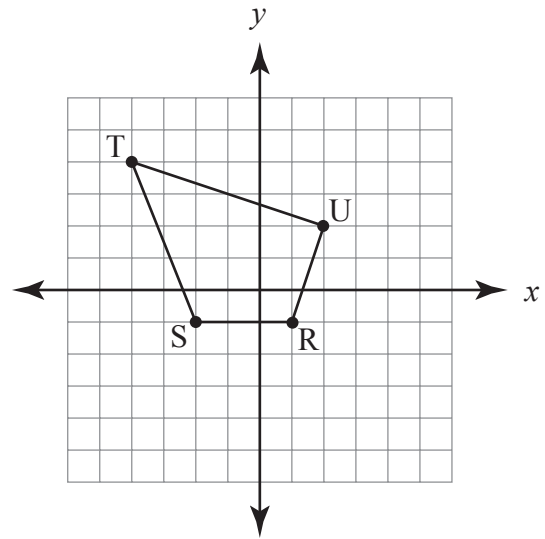
25. Which regular polygon can be used alone to create a tessellation?

- A. pentagon
- * B. hexagon
- C. decagon
- D. octagon

26. John measured the sides of four triangles. He measured the side lengths of one triangle incorrectly. Which triangle was measured **incorrectly**?

- * A. $\triangle A$, with sides measuring 6, 6, and 15
- B. $\triangle B$, with sides measuring 8, 9, and 10
- C. $\triangle C$, with sides measuring 1, 18, and 18
- D. $\triangle D$, with sides measuring 11, 15, and 24

27. What are the coordinates for the midpoint of \overline{TU} below?



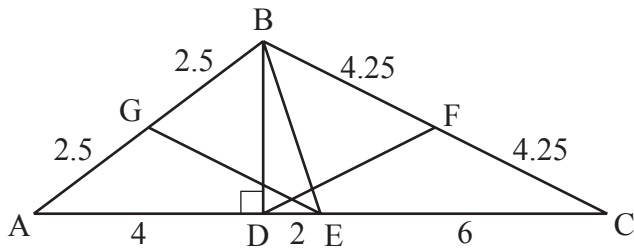
- A. $(-3, 1)$
- B. $(-2, 6)$
- * C. $(-1, 3)$
- D. $(3, -1)$

28. Which example demonstrates deductive reasoning?

- * A. All dogs have 4 legs. Benji is a dog. Benji has 4 legs.
- B. All dogs have 4 legs. Astro has 4 legs. Astro is a dog.
- C. Every frog I have ever seen has been green. All frogs are green.
- D. Ashley has gone to the pool every day so far this summer. Tomorrow she will go to the pool.

PART II Released Geometry Items

29. Which segment is the altitude of $\triangle ABC$?

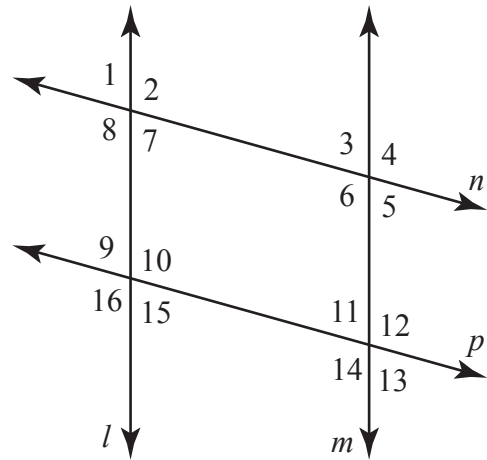


- * A. \overline{BD}
- B. \overline{BE}
- C. \overline{DF}
- D. \overline{EG}

30. If the radius of a circle were to be halved, how would the circumference and the area of the circle be affected?

- A. Both the circumference and the area would be $\frac{1}{4}$ of the original circle.
- B. Both the circumference and the area would be $\frac{1}{2}$ of the original circle.
- C. The circumference would be $\frac{1}{4}$ and the area would be $\frac{1}{2}$ of the original circle.
- * D. The circumference would be $\frac{1}{2}$ and the area would be $\frac{1}{4}$ of the original circle.

31. A fence on a hill uses vertical posts l and m to hold parallel rails n and p , as shown in the figure below.



Which statement is **correct**?

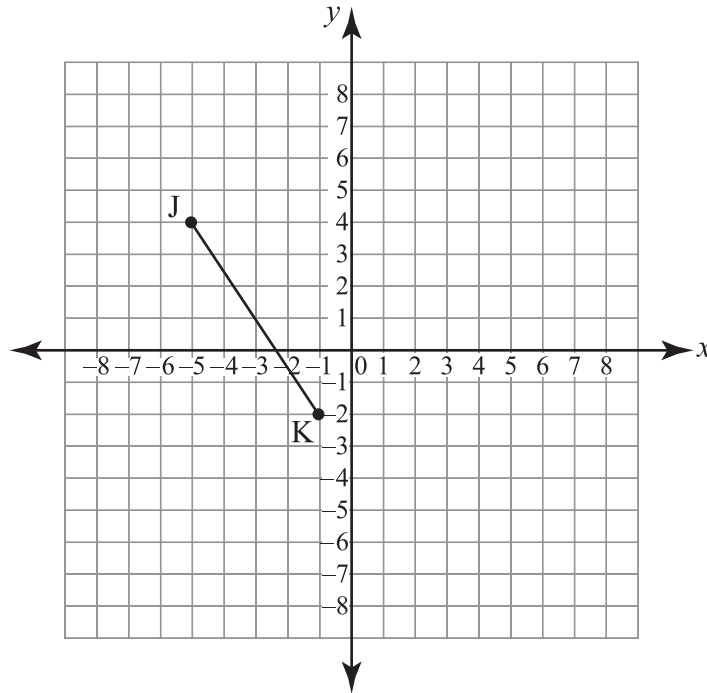
- A. $\angle 2 \cong \angle 11$
- * B. $m\angle 4 + m\angle 11 = 180^\circ$
- C. $\angle 12 \cong \angle 9$
- D. $m\angle 15 + m\angle 11 = 180^\circ$

32. If a line has an equation of $y = \frac{1}{4}x - 3$, which line would be perpendicular to it?

- A. $y = \frac{1}{4}x - 3$
- B. $y = 4x + 11$
- * C. $y = -4x + 7$
- D. $y = -\frac{1}{4}x - 15$

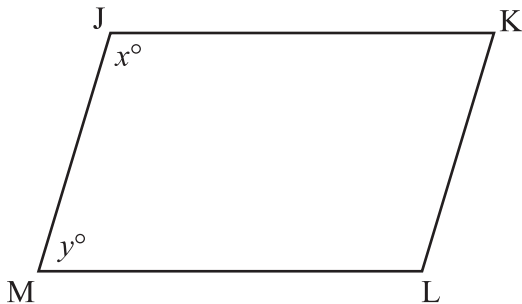
PART II Released Geometry Items

33. Segment JK is reflected across the y-axis to form $\overline{J'K'}$. What are the coordinates of J' and K'?



- A. $J'(-4, -5), K'(-2, 1)$
- B. $J'(5, -4), K'(-1, 2)$
- C. $J'(4, 5), K'(-2, 1)$
- * D. $J'(5, 4), K'(1, -2)$

34. JKLM is a parallelogram. What is the measure of $\angle K$?



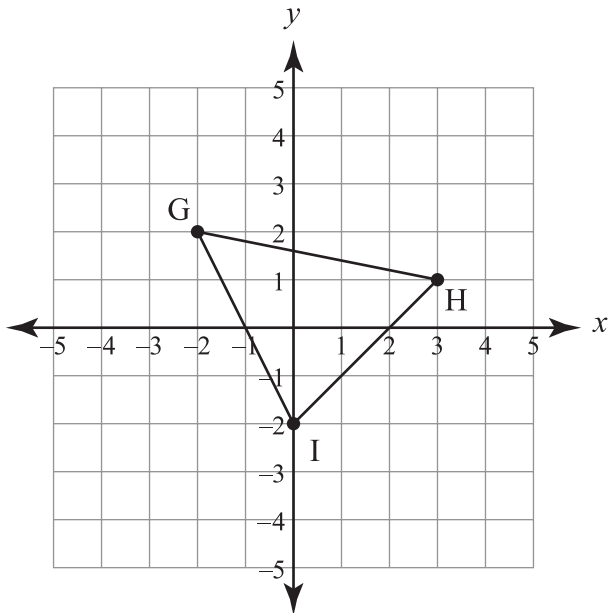
- A. x°
- * B. y°
- C. $(x + y)^\circ$
- D. $(x - y)^\circ$

35. The side opposite the 60-degree angle of a 30° - 60° - 90° triangle has a length of $5\sqrt{3}$. What are the lengths of the other two sides?

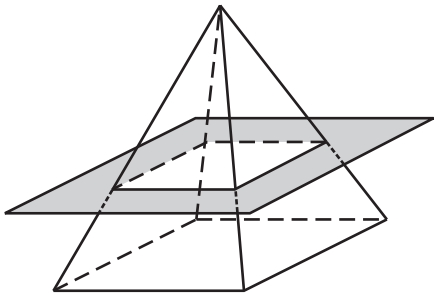
- A. $5\sqrt{3}$ and $5\sqrt{3}$
- B. $\sqrt{3}$ and $5\sqrt{3}$
- C. $5\sqrt{3}$ and 10
- * D. 5 and 10

PART II Released Geometry Items

36. What type of triangle is $\triangle GHI$, as shown below?



- A. right
 - * B. scalene
 - C. isosceles
 - D. equilateral
37. The plane shown below is parallel to the base of the square pyramid.

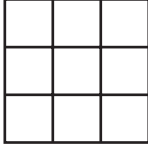


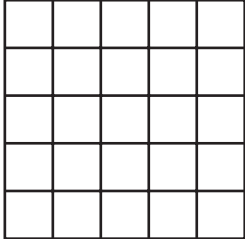
Which **best** describes the shape of the cross section cut by the plane?

- A. kite
- * B. square
- C. triangle
- D. trapezoid

38. Jack is tiling the kitchen floor for his mother. The steps below show the progress Jack has made so far as he places tiles around the single tile he started with in Step 1.

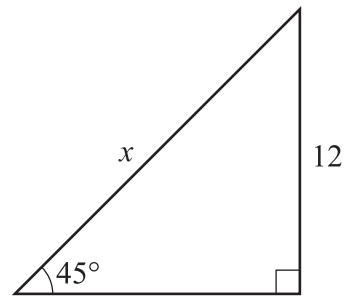
Step 1 

Step 2 

Step 3 

If Jack continues this procedure, how many total tiles will he have set after completing Step 4?

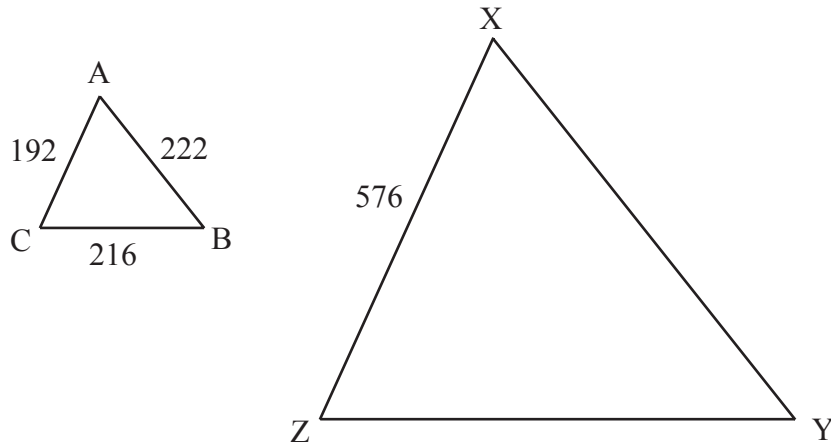
- A. 30
 - B. 36
 - C. 41
 - * D. 49
39. What is the value of x for the triangle below?



- A. $\sqrt{2}$
- * B. $12\sqrt{2}$
- C. $12\sqrt{3}$
- D. 24

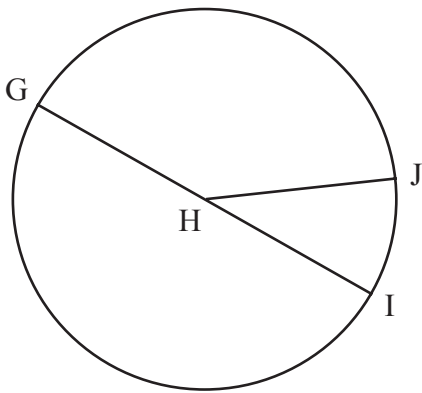
PART II Released Geometry Items

40. Triangles ABC and XYZ are similar. Which is the length of the longest side of $\triangle XYZ$?



- A. 222
- B. 576
- C. 648
- * D. 666

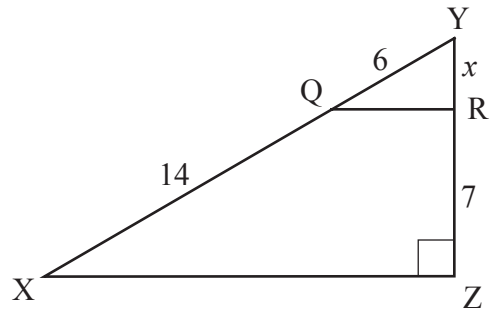
41. In circle H, the measure of \widehat{GJ} is 4 times the measure of \widehat{IJ} .



What is the measure of $\angle GHJ$?

- A. 36°
- B. 72°
- C. 135°
- * D. 144°

42. For $\triangle XYZ$, $\overline{QR} \parallel \overline{XZ}$.



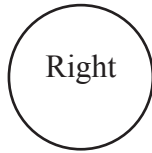
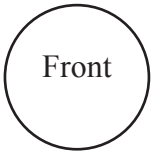
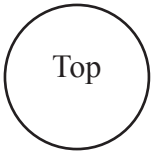
What is the length of \overline{RY} ?

- * A. 3
- B. 12
- C. 13
- D. 16

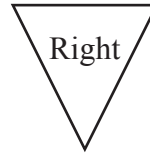
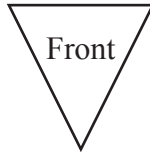
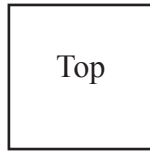
PART II Released Geometry Items

43. Which of the following is a **correct** drawing of the top, front, and right views of a cylinder?

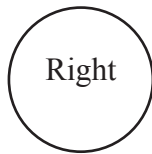
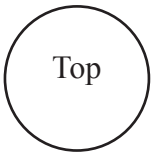
A.



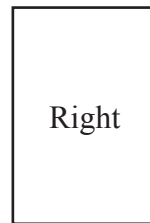
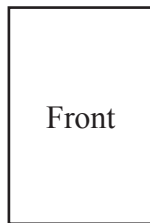
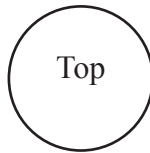
B.



C.



* D.



44. Which set of angle measures total 360 degrees?

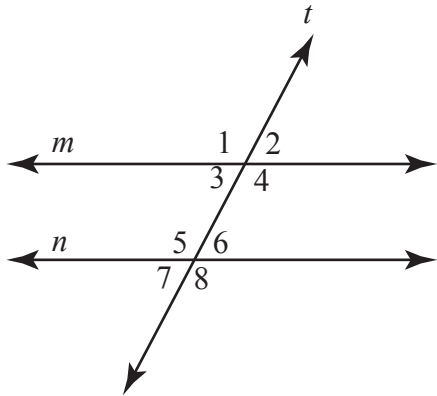
- * A. two pairs of supplementary angles
- B. two pairs of complementary angles
- C. one pair of complementary angles and one pair of supplementary angles
- D. one pair of complementary angles, one pair of linear angles, and one pair of supplementary angles

45. Given a circle with the equation $(x - 2)^2 + (y + 3)^2 = 25$, what are the coordinates of the center point of the circle?

- A. $(-3, 2)$
- B. $(-2, 3)$
- * C. $(2, -3)$
- D. $(3, 2)$

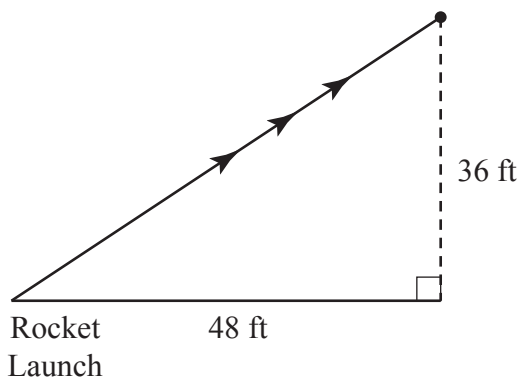
PART II Released Geometry Items

46. Two parallel lines, m and n , are cut by a transversal, t , as shown in the diagram below.



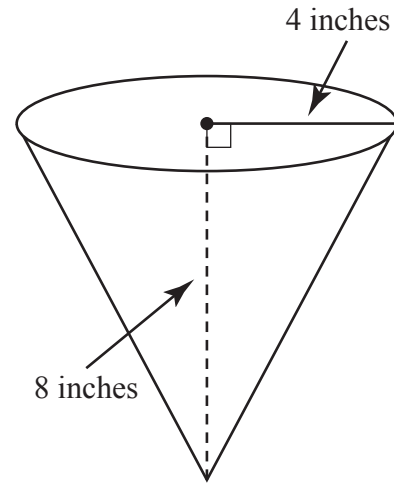
Which angles are congruent to $\angle 1$?

- A. $\angle 5$ only
 - B. $\angle 4$ only
 - C. $\angle 4$ and $\angle 5$ only
 - * D. $\angle 4$, $\angle 5$, and $\angle 8$
47. A model rocket is launched. It rises to a point 36 feet above the ground, and is 48 feet along the ground from the lift-off site, as shown below. What is the length of the rocket's path in the air, to the nearest foot?



- A. 12 ft
- B. 32 ft
- * C. 60 ft
- D. 84 ft

48. A restaurant sells ice cream in cones shaped like the figure shown below.

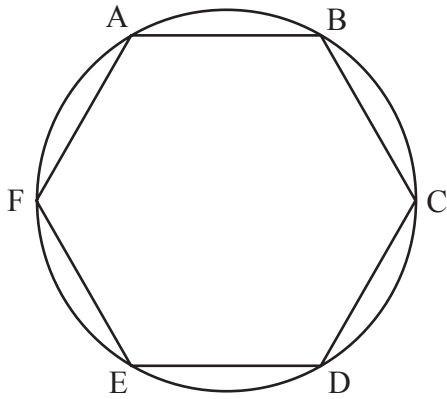


The ice cream fills the entire cone and is leveled off at the top. **Approximately** what volume of ice cream is needed to fill the cone? Use $\pi = 3.14$.

- * A. 134 in.³
 - B. 201 in.³
 - C. 268 in.³
 - D. 402 in.³
49. The equation of a circle in standard form is $(x - 3)^2 + (y - 4)^2 = 25$. What are the center point and radius length of the circle?
- * A. (3, 4) and 5
 - B. (-3, 4) and 5
 - C. (-3, 4) and 25
 - D. (3, -4) and 25

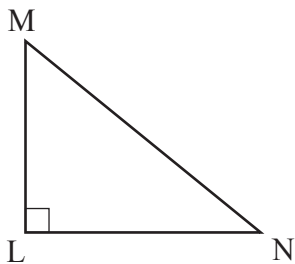
PART II Released Geometry Items

50. Polygon ABCDEF is a regular hexagon inscribed in a circle. What is the measure of \widehat{BD} ?



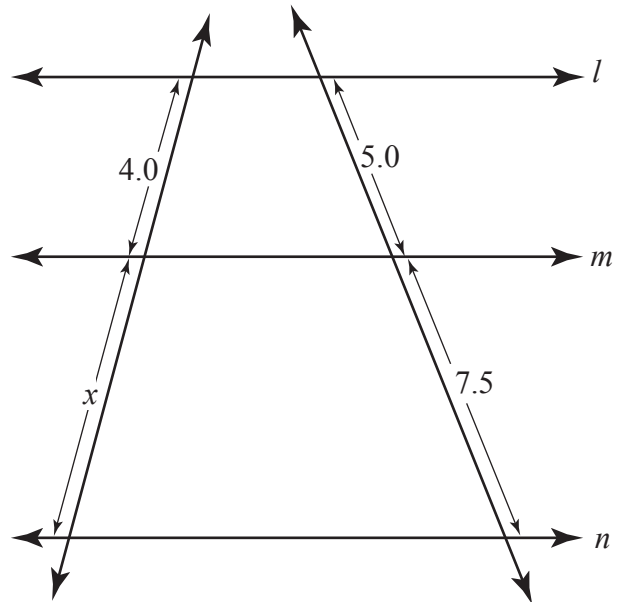
- A. 60°
- B. 90°
- * C. 120°
- D. 180°

51. Given $\triangle LMN$ below, $\angle L$ is a right angle. Segment LN is 21 cm and \overline{MN} is 28 cm. What is the length of \overline{LM} , to the nearest centimeter?



- A. 7 cm
- * B. 19 cm
- C. 35 cm
- D. 49 cm

52. Lines l , m , and n are parallel.

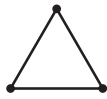


What is the value of x , to the nearest tenth?

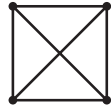
- A. 2.7
 - * B. 6.0
 - C. 8.5
 - D. 9.4
53. Triangle PQR has vertices of $P(-2, -1)$, $Q(1, 6)$, and $R(3, -2)$. What are the coordinates of the vertices of the image of $\triangle PQR$ if the figure is translated 4 units right and 3 units up?
- * A. $P'(2, 2)$, $Q'(5, 9)$, $R'(7, 1)$
 - B. $P'(1, 3)$, $Q'(4, 10)$, $R'(0, 2)$
 - C. $P'(-6, 2)$, $Q'(-3, 9)$, $R'(-1, 1)$
 - D. $P'(-8, -3)$, $Q'(4, 18)$, $R'(12, -6)$

PART II Released Geometry Items

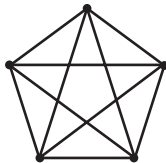
54. If 3 points are drawn on a piece of paper, each point can be connected to every other point with 3 lines, as shown below.



If 4 points are drawn, each point can be connected to every other point with 6 lines.



If 5 points are drawn, each point can be connected to every other point with 10 lines.

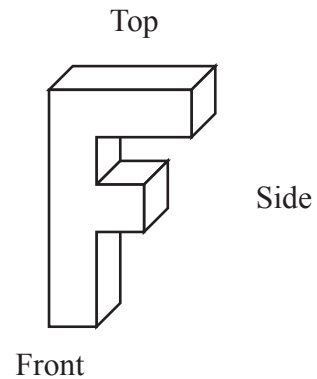


Suppose 8 points were drawn. How many lines would be needed to connect each point to every other point?

- A. 16
 - B. 22
 - * C. 28
 - D. 36
55. What is the equation of a circle with a radius of 7 and a center point of $(-3, -8)$?

- A. $(x + 8)^2 + (y + 3)^2 = 7$
- B. $(x + 3)^2 + (y + 8)^2 = 7$
- C. $(x - 3)^2 + (y - 8)^2 = 49$
- * D. $(x + 3)^2 + (y + 8)^2 = 49$

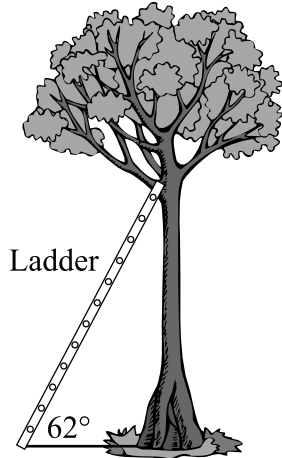
56. Which figure is an orthographic drawing of a side view of the three-dimensional block letter below?



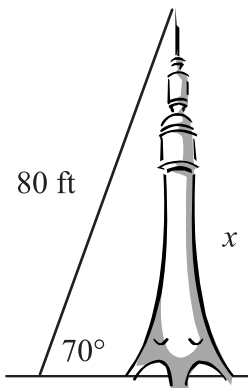
- * A.
- B.
- C.
- D.

PART II Released Geometry Items

57. A cat is stuck in a tree. A firefighter's 15-foot ladder is leaning against the tree. The ladder and the ground form a 62-degree angle. How high above the ground does the ladder touch the tree?

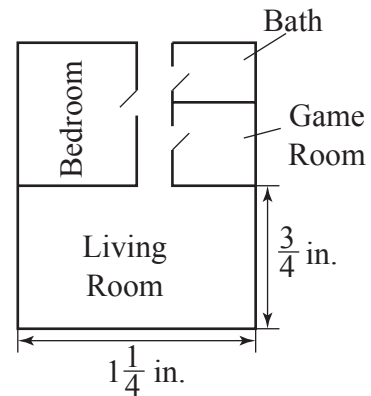


- A. 7.04 ft
 * B. 13.24 ft
 C. 16.99 ft
 D. 28.21 ft
58. An 80-foot support wire is attached to the top of a tower and meets the ground at a 70-degree angle. How tall is the tower, to the nearest foot?



- A. 27 ft
 B. 70 ft
 * C. 75 ft
 D. 220 ft

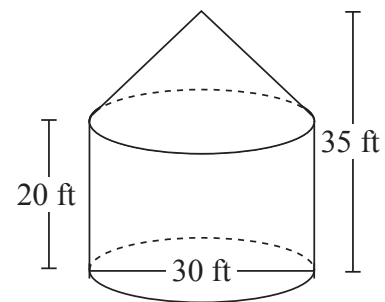
59. An architect's drawing for part of the Johnsons' house is shown below.



Scale 1 in. = 15 ft

What are the actual dimensions of the living room?

- A. $11\frac{1}{4}$ ft \times $\frac{3}{4}$ ft
 B. 15 ft \times 15 ft
 * C. $18\frac{3}{4}$ ft \times $11\frac{1}{4}$ ft
 D. 19 ft \times 11 ft
60. The grain bin below is made up of a cylinder with a cone on top.



To the nearest cubic foot, how much grain will this bin hold? Use $\pi = 3.14$.

- A. 5,625 cubic feet
 * B. 17,663 cubic feet
 C. 32,987 cubic feet
 D. 70,650 cubic feet

PART II Released Geometry Items

MATHEMATICS OPEN-RESPONSE ITEM A

- A. Trapezoid GHIJ has parallel sides \overline{GH} and \overline{IJ} . The coordinates for the vertices are given in the table below.

Vertex	Coordinates
G	(-2, 5)
H	(6, 11)
I	(8, 7)
J	(-8, -5)

A median of a trapezoid is a segment that connects the midpoints of the sides that are **not** parallel. Let point W be the midpoint of \overline{HI} and point Z be the midpoint of \overline{GJ} .

1. Find the coordinates of points W and Z. Show all of your work and/or explain your answer.
2. Find the slopes of \overline{GH} , \overline{IJ} , and \overline{WZ} . Show all of your work and/or explain your answer.
3. Find the lengths of \overline{GH} , \overline{IJ} , and \overline{WZ} . Show all of your work and/or explain your answer.
4. Use your answers from Parts 2 and 3 to describe two relationships that exist between trapezoid GHIJ's median and its parallel sides. Explain your answer.

BE SURE TO LABEL YOUR RESPONSES 1, 2, 3, AND 4.

RUBRIC FOR MATHEMATICS OPEN-RESPONSE ITEM A

SCORE	DESCRIPTION
4	The student earns 6 points. The response contains no incorrect work and credit is awarded for Part 4.
3	The student earns 6 points and credit is not awarded for Part 4 as noted in the Scoring Guide, or the student earns $4\frac{1}{2}$ – $5\frac{1}{2}$ points, or the student earns 4 points as noted in the Scoring Guide.
2	The student earns 4 points as noted in the Scoring Guide, or the student earns $2\frac{1}{2}$ – $3\frac{1}{2}$ points.
1	The student earns $\frac{1}{2}$ –2 points, or some minimum understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank—No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” assigned for the item.)

PART II Released Geometry Items

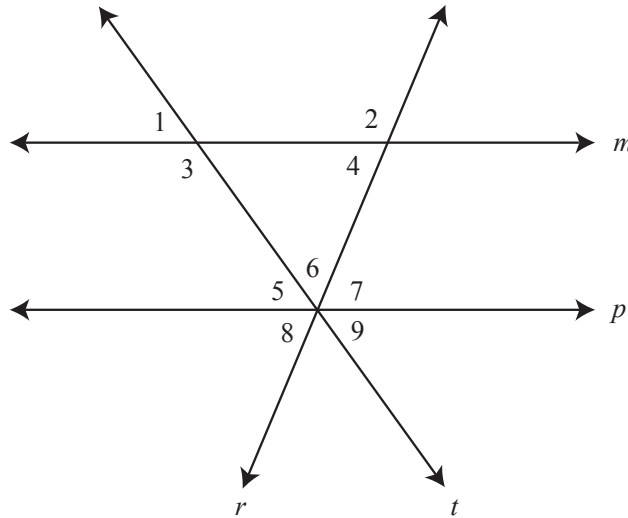
Solution and Scoring

Part	Points
1	<p>2 points possible</p> <p>2 points: 2 correct midpoints: $W(7, 9)$, $Z(-5, 0)$ and Correct and complete procedure shown or explained for at least 1 point. Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> • Ex: midpoint of $\overline{HI} = W = \left(\frac{6+8}{2}, \frac{11+7}{2}\right) = \left(\frac{14}{2}, \frac{18}{2}\right) = (\#, \#)$ • Ex: midpoint of $\overline{GJ} = Z = \left(\frac{-2+-8}{2}, \frac{5+-5}{2}\right) = \left(\frac{-10}{2}, \frac{0}{2}\right) = (\#, \#)$ <p>OR</p> <p>1 ½ points: 1 correct midpoint with correct and complete procedure shown or explained. Work for 2nd midpoint may contain a calculation or copy error, or may be missing.</p> <p>OR</p> <p>1 point: 2 correct midpoints with procedure missing. or Correct and complete procedure for finding at least 1 midpoint. Work for each point contains calculation or copy error.</p> <p>OR</p> <p>½ point: 1 correct midpoint with procedure missing.</p>
2	<p>2 points possible</p> <p>2 points: 3 correct slopes: $m \overline{GH} = \frac{3}{4}$, $m \overline{IJ} = \frac{3}{4}$, $m \overline{WZ} = \frac{3}{4}$ or $m \overline{WZ}$ may be based on incorrect coordinate(s) for W and/or Z in Part 1. and Correct and complete procedure for finding at least one of 1 slope. Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> • $m \overline{GH} = \frac{11-5}{6-2} = \frac{6}{8} = \#$ • $m \overline{IJ} = \frac{7+5}{8+8} = \frac{12}{16} = \#$ • $m \overline{WZ} = \frac{0-9}{-5-7} = \frac{-9}{-12} = \#$ • Student graphs the points and uses $\frac{\text{rise}}{\text{run}}$ to determine the slope. <p>OR</p> <p>1 ½ points: 1 or 2 correct slopes with correct and complete procedure. Work for 2nd and/or 3rd slope may contain a calculation or copy error, or may be missing.</p> <p>OR</p> <p>1 point: 3 correct slopes with procedure missing. or Correct and complete procedure for finding at least 1 slope but no correct slopes.</p> <p>OR</p> <p>½ point: 1 or 2 correct slopes with procedure missing.</p>

PART II Released Geometry Items

MATHEMATICS OPEN-RESPONSE ITEM B

B. Line m is parallel to line p . Both lines are cut by the transversals, line r and line t .



1. What are two labeled angles that are congruent to $\angle 1$? Explain your answers by providing the name of the angle relationships.
2. What are two **different** labeled angles that are supplementary to $\angle 2$? Explain your answers by stating the name of the angle relationships.

The table below gives measures, in terms of x , for several angles shown in the figure above.

Angle	Measure
1	$(x - 20)^\circ$
2	$(x + 20)^\circ$
3	$(x + 40)^\circ$

3. What is the value of x ? What is the measure of $\angle 6$? Show all of your work and/or explain your answer.

BE SURE TO LABEL YOUR RESPONSES 1, 2, AND 3.

RUBRIC FOR MATHEMATICS OPEN-RESPONSE ITEM B

SCORE	DESCRIPTION
4	The student earns 6 points. The response contains no incorrect work. The correct label of “degrees” or “°” is included in Part 3.
3	The student earns 4–5 ½ points.
2	The student earns 2–3 ½ points.
1	The student earns ½–1 ½ points, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank—No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” assigned for the item.)

PART II Released Geometry Items

Solution and Scoring

Part	Points								
1	<p>1 ½ points possible</p> <p>Note: Assume the name of the angle relationship is to $\angle 1$ unless otherwise stated.</p> <p>1 ½ points: Correct Answer: 2 correct \angle's with correct names. No incorrect \angle's are included.</p> <table style="margin-left: 40px;"> <thead> <tr> <th style="text-align: center;">Angle</th> <th style="text-align: center;">Name of Angle Relationship</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">5</td> <td>1 & 5 are Corresponding \angle's</td> </tr> <tr> <td style="text-align: center;">9</td> <td>1 & 9 are Alternate (or opposite) Exterior \angle's, or 9 & 5 are Vertical \angle's</td> </tr> </tbody> </table> <p>OR</p> <p>1 point: 2 correct \angle's with 1 correct name. No incorrect \angle's are included. Other name incorrect or missing.</p> <p>OR</p> <p>½ point: Give credit for any of the following:</p> <ul style="list-style-type: none"> • 5 with correct name (1 other \angle incorrect or missing) • 9 with correct name (1 other \angle incorrect or missing) • 2 correct \angle's (5 & 9)—Names are incorrect or missing 	Angle	Name of Angle Relationship	5	1 & 5 are Corresponding \angle 's	9	1 & 9 are Alternate (or opposite) Exterior \angle 's, or 9 & 5 are Vertical \angle 's		
Angle	Name of Angle Relationship								
5	1 & 5 are Corresponding \angle 's								
9	1 & 9 are Alternate (or opposite) Exterior \angle 's, or 9 & 5 are Vertical \angle 's								
2	<p>1 ½ points possible</p> <p>Note: Assume the name of the angle relationship is to $\angle 2$ unless otherwise stated.</p> <p>1 ½ points: Correct Answer: 2 (out of 3) correct \angle's with correct names. No incorrect \angle's are included.</p> <table style="margin-left: 40px;"> <thead> <tr> <th style="text-align: center;">Angle</th> <th style="text-align: center;">Name of Angle Relationship</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">4</td> <td>2 & 4 are a Linear pair</td> </tr> <tr> <td style="text-align: center;">8</td> <td>2 & 8 are Same-side Exterior \angle's, or 4 & 8 are Corresponding \angle's</td> </tr> <tr> <td style="text-align: center;">7</td> <td>7 & 4 are Alternate (or opposite) Interior \angle's, or 7 & 8 are Vertical \angle's</td> </tr> </tbody> </table> <p>OR</p> <p>1 point: 2 correct \angle's with 1 correct name. No incorrect \angle's are included. Other name incorrect or missing.</p> <p>OR</p> <p>½ point: Give credit for any of the following:</p> <ul style="list-style-type: none"> • 4 with correct name (other \angle incorrect or missing) • 8 with correct name (other \angle incorrect or missing) • 7 with correct name (other \angle incorrect or missing) • 2 of the 3 correct \angle's—Names are incorrect or missing 	Angle	Name of Angle Relationship	4	2 & 4 are a Linear pair	8	2 & 8 are Same-side Exterior \angle 's, or 4 & 8 are Corresponding \angle 's	7	7 & 4 are Alternate (or opposite) Interior \angle 's, or 7 & 8 are Vertical \angle 's
Angle	Name of Angle Relationship								
4	2 & 4 are a Linear pair								
8	2 & 8 are Same-side Exterior \angle 's, or 4 & 8 are Corresponding \angle 's								
7	7 & 4 are Alternate (or opposite) Interior \angle 's, or 7 & 8 are Vertical \angle 's								

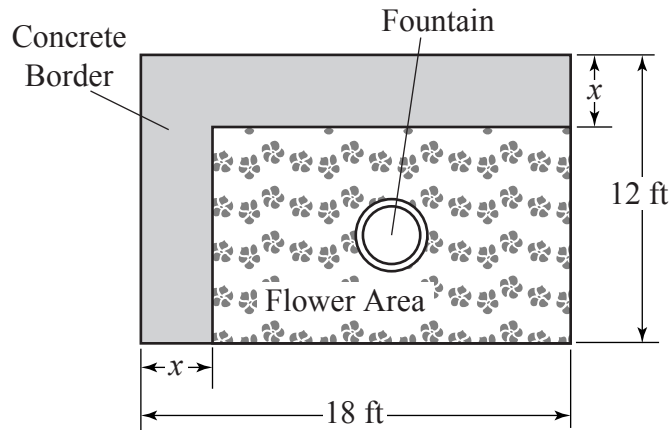
PART II Released Geometry Items

Part	Points
3	<p>3 points possible</p> <p>Note: Do not give credit for $x = 80$ or $m\angle 6 = 40$ if there is evidence of incorrect procedure. Correct symbolism is not required (Ex: $\angle 6 = 40$).</p> <p>3 points: The response includes the following:</p> <ul style="list-style-type: none"> • Correct answer & procedure: $x = 80$ with adequate work shown At least $(x - 20) + (x + 40) = 180$ is shown • Correct answer & procedure: $m\angle 6 = 40$ with adequate work shown (you can follow what is being done) <p>Example: Uses value of x to find measures of Angles 1, 2, and 3 (work not required):</p> $m\angle 1 = x - 20 = 60^\circ$ $m\angle 2 = x + 20 = 100^\circ$ $m\angle 3 = x + 40 = 120^\circ$ <p>Uses measures of angles 1, 2, and 3 and relationships found in Parts 1 and/or 2 to find measure of angle 6:</p> $m\angle 1 = m\angle 5 = m\angle 9 = 60^\circ$ $m\angle 2 + m\angle 4 = 180^\circ$ $m\angle 4 = 80^\circ$ $m\angle 4 = m\angle 7 = m\angle 8 = 80^\circ$ <p>Angles 5, 6, and 8 (or 5, 6, and 7) or (6, 7, and 9) add to 180°</p> $m\angle 6 = 180 - m\angle 8 - m\angle 5 = 180 - 80 - 60 = 40^\circ$ <p style="text-align: center;">or</p> <p>Uses the fact that the measures of the 3 angles in a triangle add to 180°: Third angle of triangle $\cong \angle 1 = 60^\circ$ (vertical angles)</p> $m\angle 4 = 180 - m\angle 2 = 80^\circ$ $60^\circ + 80^\circ + m\angle 6 = 180 \quad m\angle 6 = 40^\circ$ <p>OR</p> <p>2 points: Value(s) are incorrect due to 1 calculation or copy error. Correct procedures are used—adequate work is shown in each part. or 2 correct values ($x=80$ and $m\angle 6 = 40$) are given. Correct procedures are used but work is incomplete. At least some work is shown in each part.</p> <p>OR</p> <p>1 ½ points: 2 correct values are given. Work in one part is missing with at least some work in the other part.</p> <p>OR</p> <p>1 point: 2 correct values are given (work is missing). or 1 correct value is given with adequate work (may be based on previous work). Other part uses incorrect procedure or procedure is missing.</p> <p>OR</p> <p>½ point: 1 correct value is given (work is missing). or 1 correct procedure.</p>

PART II Released Geometry Items

MATHEMATICS OPEN-RESPONSE ITEM C

- C. A city built the rectangular flower garden shown below. The garden is 18 ft long and 12 ft wide. The city put a concrete border along two sides, as shown by the shaded area. The perimeter of the flower area is 48 ft.



1. What is the width, x , of the concrete border? Show or explain all of your work even if you use mental math or a calculator.

A local company donated a circular fountain to be placed in the center of the flower area. The diameter of the fountain is 3 ft.

2. To the nearest square foot, what is the area of the section that remained for flowers after the fountain was installed? Use $\pi = 3.14$. Show all of your work and/or explain your answer.

BE SURE TO LABEL YOUR RESPONSES 1 AND 2.

RUBRIC FOR MATHEMATICS OPEN-RESPONSE ITEM C

SCORE	DESCRIPTION
4	The student earns 4 points. The response contains no incorrect work. The correct label of "Feet" is included in Part 1. The answer is rounded to the nearest square foot and contains the correct label of "Square Feet" in Part 2.
3	The student earns 3–3 ½ points.
2	The student earns 2–2 ½ points.
1	The student earns ½–1 ½ points, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank—No Response. A score of "B" will be reported as "NA." (No attempt to answer the item. Score of "0" assigned for the item.)

PART II Released Geometry Items

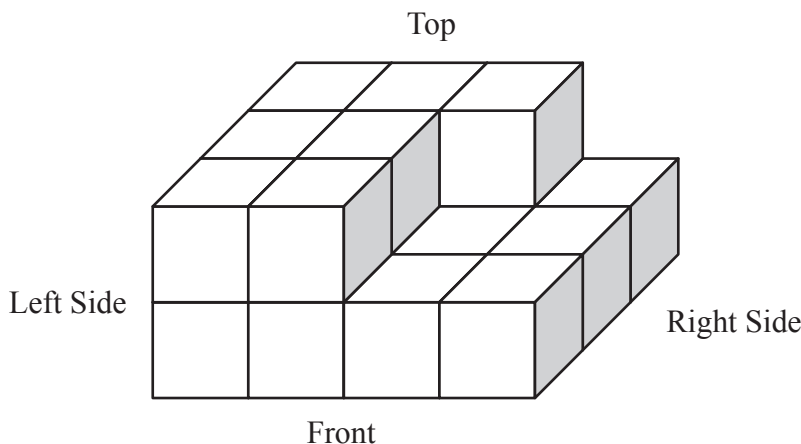
Solution and Scoring

Part	Points
1	<p>2 points possible</p> <p>1 point: Correct value for x: 3 (Correct label “feet” is required for a score of 4.) Note: Do not give credit if incorrect procedure is used.</p> <p>AND</p> <p>1 point: Correct and complete procedure shown and/or explained. Work may contain a calculation or copy error. Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> • Sets up and solves an equation (all steps not required): $48 = 2(18 - x) + 2(12 - x)$ $48 = 36 - 2x + 24 - 2x$ $48 = 60 - 4x$ $-12 = -4x$ $x = \#, \text{ or}$ • Finds difference in perimeters and amount added to 4 sides: $2(18) + 2(12) = 60$ $60 - 48 = 12 \quad 12/4 = \#, \text{ or}$ • Guess and check (2 steps): $18 - 3 = 15 \quad 12 - 3 = 9$ $15 + 15 + 9 + 9 = 48$ <p>Note: If guess and check is used, x must be correct.</p> <p>OR</p> <p>½ point: Correct but incomplete procedure shown or explained. Examples:</p> <ul style="list-style-type: none"> • $60 - 48 = 12$ • $18 - 3 = 15 \quad 12 - 3 = 9$ (doesn't show $P = 48$) • $2(15) + 2(9) = 48$ (doesn't show each are 3 less than 18 and 12)
2	<p>2 points possible</p> <p>1 point: Note: Rounding to the nearest sq. ft. (with label) is required only for a score of 4. Correct area: 127.935, 128, or any correct answer correctly rounded. or Correct answer based on incorrect value for x or incorrect dimensions for the garden in Part 1.</p> <p>AND</p> <p>1 point: Correct and complete procedure shown and/or explained. Work may contain a calculation copy or rounding error and/or may be based on an incorrect value for x in Part 1. Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> • 3 steps Area of rectangle: $15 \times 9 = 135$ Area of fountain: $(3.14)(1.5)^2 = 7.065 \text{ (may be rounded)}$ Finds difference for Area for flowers: $135 - 7.065 = \#$ <p>OR</p> <p>½ point: Credit given for any of the following: Note: No credit is given for finding the difference only.</p> <ul style="list-style-type: none"> • Correct but incomplete procedure shown or explained. • Correct procedure for area of garden <u>based on Part 1 answer.</u> • Correct procedure for area of circular fountain.

PART II Released Geometry Items

MATHEMATICS OPEN-RESPONSE ITEM D

D. The three-dimensional drawing below is a model of a proposed new office building.



1. On the grid provided in your answer document, draw two-dimensional sketches of the office building from the perspectives below.
 - the front view of the office building
 - the top view of the office building
 - the right side view of the office building

2. Determine the actual volume of the building if each cube in the drawing represents a section of the office that measures 10 feet by 10 feet by 10 feet. Show all of your work and/or explain your answer.


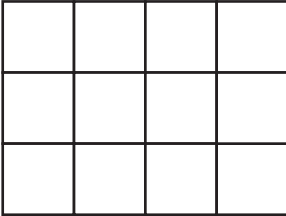
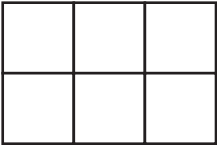
BE SURE TO LABEL YOUR RESPONSES 1 AND 2.

RUBRIC FOR MATHEMATICS OPEN-RESPONSE ITEM D

SCORE	DESCRIPTION
4	The student earns 5 points. The response contains no incorrect work. The correct label of “Cubic Feet” is included in Part 2.
3	The student earns 4 points.
2	The student earns 3 points, or the student earns 2 points (both points from Part 2), or the student earns 2 points (1 point from Part 1 and 1 point from Part 2).
1	The student earns 2 points (both from Part 1), or the student earns 1 point, or some minimal understanding is shown (Ex: Volume is correct in Part 2 based on a counting error for number of cubes, or no credit in is awarded in Part 1).
0	The student earns 0 points. No understanding is shown (Ex: 19 cubes only in Part 2, or $10 \times 10 \times 10 = 1000$ only in Part 2).
B	Blank—No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” assigned for the item.)

PART II Released Geometry Items

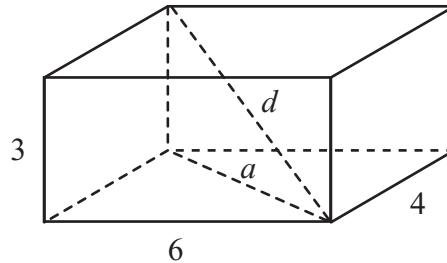
Solution and Scoring

Part	Points
1	<p>3 points possible</p> <p>Note: Labels (front, top, right view) are not required, but diagrams must be in the correct order if labels are missing in order to receive credit. Credit may be given if diagrams are out of order if they are correct and labeled. Squares do not have to be the same size.</p> <p>1 point: Correct Front View:</p>  <p>AND</p> <p>1 point: Correct Top View:</p>  <p>AND</p> <p>1 point: Correct Right side view:</p> 
2	<p>2 points possible</p> <p>1 point: Correct volume: 19,000 (correct label “cubic feet” is required for a score of 4)</p> <p>AND</p> <p>1 point: Correct and complete procedure shown and/or explained. Work may contain a calculation (ex. $7 + 12 = 18$) or copy error. Do not give credit for a counting error of the # of cubes. Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> • Breaks up building into sections to find total V: $(10)(10)(10) + (30)(20)(10) + (20)(20)(30) = V$, or • $10^3 (12) + 10^3 (7) = V$, or • $19 \times 10 \times 10 \times 10 = V$, or • Volume of 1 cube = 1000 (or 10^3 or $10 \times 10 \times 10$) (V of cube identified) $1000 \times 19 = V$. <p>Note: Do not give credit for incomplete procedure (Ex: $19 \times 1000 = V$). No work or explanation shown for 1000.</p>

PART II Released Geometry Items

MATHEMATICS OPEN-RESPONSE ITEM E

E. The figure below is of a rectangular prism.



1. What is the length of diagonal a ? Show all of your work and/or explain your answer.
2. On the grid provided in your answer document, draw the triangle that is formed by diagonals a and d . Label all the known sides and/or measurements of the triangle.
3. What is the length of d , a diagonal of the prism? Show all of your work and/or explain your answer.

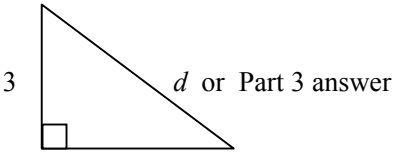
BE SURE TO LABEL YOUR RESPONSES 1, 2, AND 3.

RUBRIC FOR MATHEMATICS OPEN-RESPONSE ITEM E

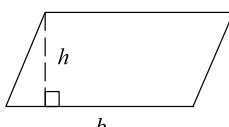
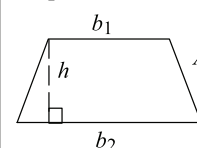
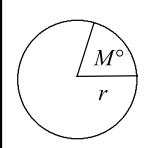
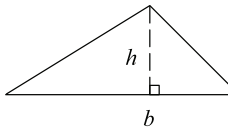
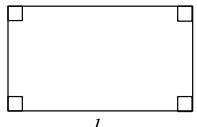
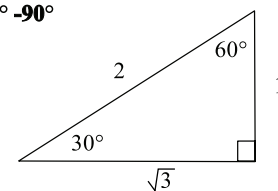
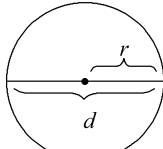
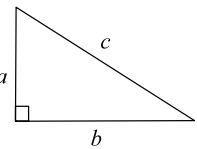
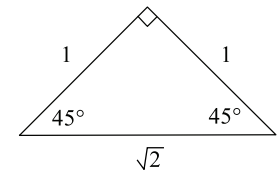
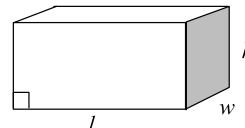
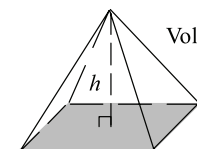
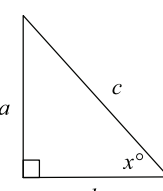
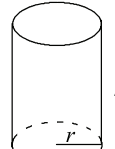
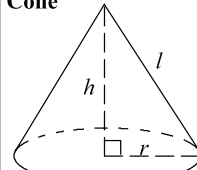
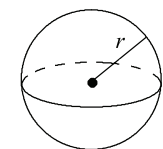
SCORE	DESCRIPTION
4	The student earns 5 points. The response contains no incorrect work.
3	The student earns 4 points.
2	The student earns 2–3 points.
1	The student earns 1 point, or some minimal understanding is shown
0	The student earns 0 points. No understanding is shown.
B	Blank—No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” assigned for the item.)

PART II Released Geometry Items

Solution and Scoring

Part	Points
1	<p>2 points possible</p> <p>1 point: Correct Answer: $\sqrt{52}$, $2\sqrt{13}$, or 7.211 Answer may be rounded to the nearest tenth or to any other decimal position. Rounding to the nearest integer is not acceptable.</p> <p>AND</p> <p>1 point: Correct and complete procedure shown or explained. Work may contain 1 calculation, copy, or rounding error. Give credit for the following or equivalent (only the first step must be shown):</p> $6^2 + 4^2 = a^2$ $36 + 16 = a^2$ $52 = a^2$ $\# = a$
2	<p>1 point possible</p> <p>1 point: Correct and complete drawing as shown below: Note: If grid lines are used to draw the sides of the triangle, a right angle symbol is not required. Note: Drawing does not have to be drawn to scale.</p> <div style="text-align: center;">  <p style="margin-left: 100px;">3</p> <p style="margin-left: 150px;"><i>d</i> or Part 3 answer</p> </div> <p style="text-align: center;">$2\sqrt{13}$ or Part 1 answer or “<i>a</i>”</p> <p>Note: Values for “<i>a</i>” and/or “<i>d</i>” may be based on incorrect lengths found in Part 1 and/or Part 3.</p>
3	<p>2 points possible</p> <p>1 point: Correct Answer: $\sqrt{61}$, or 7.8102 or Correct length based on incorrect length for “<i>a</i>” found in Part 1. The answer may be rounded to nearest tenth or any other decimal position. Rounding to nearest integer is not acceptable.</p> <p>AND</p> <p>1 point: Correct and complete procedure shown or explained. Work may contain 1 calculation, copy, or rounding error or may be based on incorrect length for “<i>a</i>” found in Part 1. Give credit for the following or equivalent:</p> <ul style="list-style-type: none"> • $3^2 + a^2 = d^2$ $3^2 + (2\sqrt{13})^2 = d^2$ (only this step must be shown) $9 + 52 = d^2$ $61 = d^2$ $\# = d$ • Example with incorrect length of <i>a</i> in Part 1: Part 1 answer is: $a = 6$ $3^2 + 6^2 = d^2$ (only this step must be shown) $9 + 36 = d^2$ $45 = d^2$ $\# = d$

PART II End-of-Course Mathematics Reference Sheet

<p>Parallelogram</p>  <p>$P =$ sum of all sides $A = bh$</p>	<p>Trapezoid</p>  <p>$A = \frac{h(b_1 + b_2)}{2}$</p>	<p>Arc and Sector</p>  <p>Arc Length = $\left(\frac{M}{360}\right) \times 2\pi r$ Sector area = $\left(\frac{M}{360}\right) \times \pi r^2$</p>
<p>Triangle</p>  <p>$P =$ sum of all sides $A = \frac{bh}{2}$</p>	<p>Rectangle</p>  <p>$P = 2l + 2w$ $A = lw$</p>	<p>30° -60° -90°</p> 
<p>Circle</p>  <p>$C = 2\pi r$ $C = \pi d$ $A = \pi r^2$ $\pi \approx 3.14$</p>	<p>Pythagorean Theorem</p>  <p>$a^2 + b^2 = c^2$</p>	<p>45° -45° -90°</p> 
<p>Rectangular Solid</p>  <p>Volume = lwh Surface area = $2lw + 2lh + 2wh$</p>	<p>Pyramid</p>  <p>$B =$ area of base (shaded) Volume = $\frac{Bh}{3}$</p>	<p>Trigonometric Ratios</p>  <p>$\sin x^\circ = \frac{a}{c}$ $\cos x^\circ = \frac{b}{c}$ $\tan x^\circ = \frac{a}{b}$</p>
<p>Cylinder</p>  <p>Volume = $\pi r^2 h$ Surface area = $2\pi rh + 2\pi r^2$</p>	<p>Cone</p>  <p>$l =$ slant height Volume = $\frac{\pi r^2 h}{3}$ Surface area = $\pi rl + \pi r^2$</p>	<p>Sphere</p>  <p>Volume = $\frac{4\pi r^3}{3}$ Surface area = $4\pi r^2$</p>

Miscellaneous Formulas	Area of an equilateral triangle	$A = \frac{s^2\sqrt{3}}{4}$ $s =$ length of a side
	Distance	rate \times time
	Interest	principal \times rate \times time in years
	Sum of the angles of a polygon having n sides	$(n - 2)180^\circ$
	Distance between points on a coordinate plane	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
	Midpoint	$\left(\frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2}\right)$
	Slope of a nonvertical line (where $x_2 \neq x_1$)	$m = \frac{y_2 - y_1}{x_2 - x_1}$
	Slope intercept (where $m =$ slope, $b =$ intercept)	$y = mx + b$
	Last term of an arithmetic series	$a_n = a + (n - 1)d$
	Last term of a geometric series (where $n \geq 1$)	$a_n = ar^{n-1}$
	Quadratic formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
	Area of a square	$A = s^2$
	Volume of a cube	$V = s^3$
Area of a regular polygon	$A = \frac{1}{2}ap$ $a =$ apothem, $p =$ perimeter	