ACTAAP

RELEASED ITEM BOOKLET

Geometry
End-of-Course Examinations

2012–2013 Administrations

Arkansas Department of Education

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PART I OVERVIEW

The criterion-referenced tests implemented as part of the **Arkansas Comprehensive Testing, Assessment, and Accountability Program** (ACTAAP) are being developed in response to Arkansas Legislative Act 35, which requires the State Board of Education to develop a comprehensive testing program that includes assessment of the challenging academic content standards defined by the Arkansas Curriculum Frameworks.

As part of this program, students in Arkansas public schools in 2013 who had completed or were completing Geometry by the end of first semester participated in the *Mid-Year Geometry End-of-Course Examination*. Students in Arkansas public schools who had completed or were completing Geometry by the end of the spring semester participated in the *Spring Geometry End-of-Course Examination*.

This Released Item Booklet for the Geometry End-of-Course Examinations contains test questions or items that were asked of students during the 2012–2013 operational administrations. The test items included in Part II of this booklet are some of the items that contributed to the student performance results for these administrations.

Students were given approximately an hour and a half each day to complete assigned test sessions during the two days of Mid-Year testing. Students were given approximately two hours each day to complete assigned test sessions during the two days of Spring testing. Students were permitted to use a calculator for both multiple-choice and open-response items. Students were also supplied with a reference sheet to be used so that all students would have equal access to this information during testing. (See the reference sheet on page 52 of this booklet.) All of the multiple-choice items within this booklet have the correct response marked with an asterisk (*).

The development of the Geometry End-of-Course Examinations was based on the *Arkansas Geometry Mathematics Curriculum Framework*. This framework has distinct levels: Strands to be taught in concert, Content Standards within each Strand, and Student Learning Expectations within each Content Standard. An abridged version of the *Arkansas Geometry Mathematics Curriculum Framework* can be found in Part III of this booklet. It is important to note that this abridged version lists only the predominant Strand, Content Standard, and Student Learning Expectation associated with each item. However, since many key concepts within the *Arkansas Geometry Mathematics Curriculum Framework* are interrelated, in many cases there are other item correlations or associations across Strands, Content Standards, and Student Learning Expectations.

Part IV of the Released Item Booklet contains a tabular listing of the Strand, Content Standard, and Student Learning Expectation that each question was designed to assess. The multiple-choice and open-response items found on the Geometry End-of-Course Examinations were developed in close association with the Arkansas education community. Arkansas teachers participated as members of the Geometry Content Advisory Committee, providing routine feedback and recommendations for all items. The number of items associated with specific Strands, Content Standards, and Student Learning Expectations was based on approximate proportions suggested by the Content Advisory Committee, and their recommendations were accommodated to the greatest extent possible given the overall test design. Part IV of the Released Item Booklet provides Arkansas educators with specific information on how Geometry End-of-Course Examination items align or correlate with the *Arkansas Geometry Mathematics Curriculum Framework* to provide models for classroom instruction.

PART I Scoring Student Responses to Geometry Open-Response Items

While multiple-choice items are scored by machine to determine if the student chose the correct answer from four options, responses to open-response items must be scored by trained "readers" using a pre-established set of scoring criteria. Readers are trained to score in only one content area. Qualified readers for Arkansas scoring will be those with a four-year college degree in mathematics, education, or related fields.

The Arkansas Geometry Rangefinding Committee assisted in the development of the scoring criteria. The committee comprises active Arkansas educators with expertise in mathematics education.

Reader Training

Before readers are allowed to begin assigning scores to any student responses, they go through intensive training. The first step in that training is for the readers to read the Geometry open-response items as they appear in the test booklet and to respond—just as the student test takers are required to do. This step gives the readers some insight into how the students might have responded. The next step is the readers' introduction to the scoring rubric. All of the specific requirements of the rubric are explained by the Scoring Director who has been specifically trained to lead the scoring group. Then responses (anchor papers) that illustrate the score points of the rubric are presented to the readers and discussed. The goal of this discussion is for the readers to understand why a particular response (or type of response) receives a particular score. After discussion of the rubric and anchor papers, readers practice scoring sets of responses that have been prescored and selected for use as training papers. Detailed discussion of the responses and the scores they receive follows.

After three or four of these practice sets, readers are given "qualifying rounds." These are additional sets of prescored papers, and, in order to qualify, each reader scoring Geometry responses must score in exact agreement on at least 80% of the responses. Readers who do not score within the required rate of agreement are not allowed to score the Geometry End-of-Course Examination responses.

Once scoring of the actual student responses begins, readers are monitored constantly throughout the project to ensure that they are scoring according to the criteria. Daily and cumulative statistics are posted and analyzed, and Scoring Directors or Team Leaders reread selected responses scored by the readers. These procedures promote reliable and consistent scoring. Any reader who does not maintain an acceptable level of agreement is dismissed from the project.

Scoring Procedures

All student responses to the Geometry End-of-Course Examination open-response test items are scored independently by two readers. Those two scores are compared, and responses that receive scores that are non-adjacent (a "1" and a "3," for example) are scored a third time by a Team Leader or the Scoring Director for resolution.

PART II MID-YEAR RELEASED GEOMETRY ITEMS

1. Xenia needs to get from her house to the store. Since she is in a hurry, she wants to cut diagonally across the grass field.

Xenia's
house

Oak Street | 400 m   Grass field

800 m

Main Street   Store
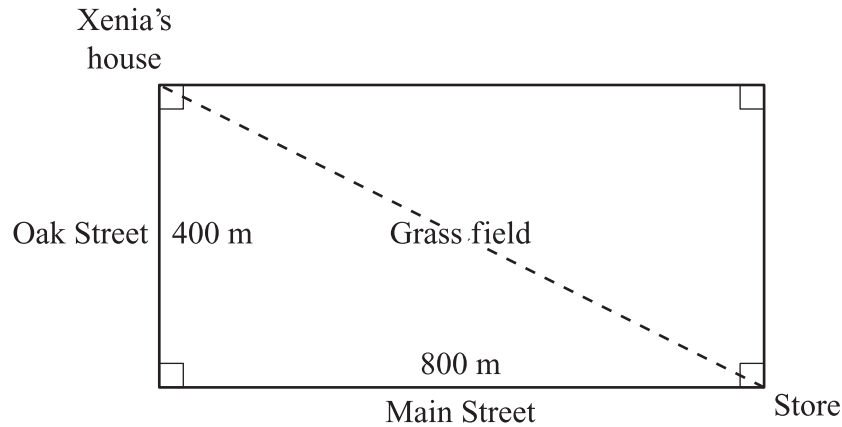
Approximately how many meters will Xenia walk if she goes this way?

    A.   35 m

* B.   894 m

    C.   1,200 m

    D. 400,000 m

2. Peter is enlarging a photo that is 9 inches long and 6 inches wide to poster size. He enlarges the photo so that the sides are proportional.

If the width of the poster is 36 inches, what is the length of the poster?

    A.   24 inches
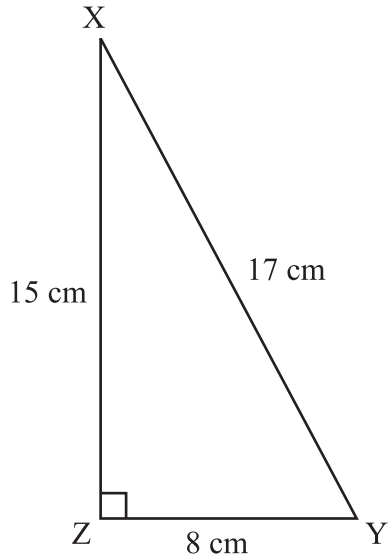
    B.   36 inches

    C.   45 inches

* D.   54 inches

3. $\triangle ABC$ is inscribed in circle X and $m\angle BAC = 70°$.
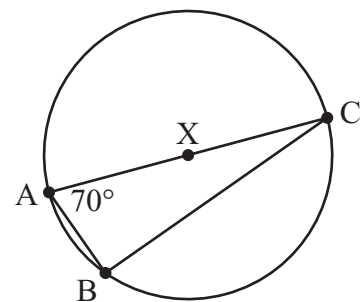
What is $m\angle ACB$?
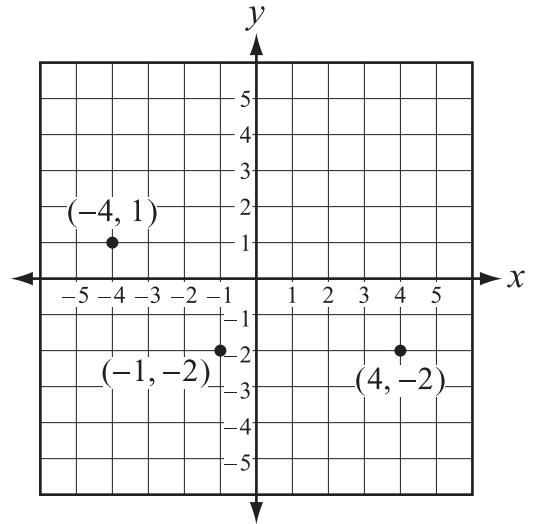
* A.   20°

    B.   90°

    C. 110°

    D. 180°

4. In ΔXYZ, which has the value $\frac{15}{17}$?

A.   sin X

* B.   sin Y

C.   tan X

D.   tan Y

5. The graph below shows three vertices of a quadrilateral at the points $(-4, 1)$, $(4, -2)$, and $(-1, -2)$.


If the fourth vertex is at $(1, 1)$, what is the most precise name for the quadrilateral?

A.   square

B.   rectangle

C.   trapezoid

* D.   parallelogram

6. Over the weekend, Andy built a skateboard ramp that has a length of 24 inches and a height of 18 inches. Adam wants to build a geometrically similar ramp for his skateboard. Adam's ramp will have a length of 36 inches. What will be the height of Adam's ramp?

Andy's Ramp   **Adam's Ramp**

18 in.

24 in.

?

36 in.
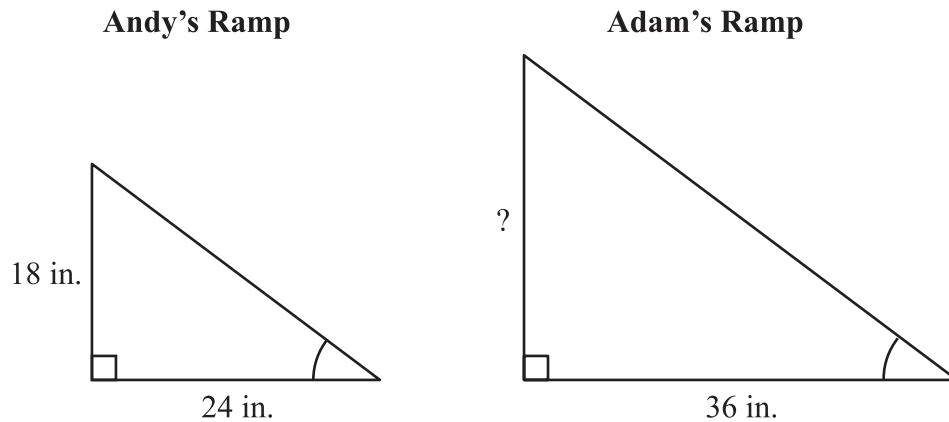
* A.   27 inches

  B.   37 inches

  C.   48 inches

  D.   53 inches

7. Jana wants to build a pyramid by stacking cups upside down on each other. If the top of the pyramid has 1 cup and the bottom of the pyramid has 6 cups, how many rows of cups are in Jana's pyramid?

  A.   3

  B.   5

* C.   6

  D.   7

8. Which best describes a polygon that tessellates?

  A.   When it covers an area, it leaves gaps and has overlaps.

  B.   When it covers an area, it leaves gaps but has no overlaps.

  C.   When it covers an area, it does not leave gaps but has overlaps.

* D.   When it covers an area, it does not leave gaps and has no overlaps.

9. Construction workers are laying new railroad tracks. They must lay parallel tracks for trains coming into town and trains going out. Both of the new railroad tracks will cross an existing track that runs through the town, as shown below.
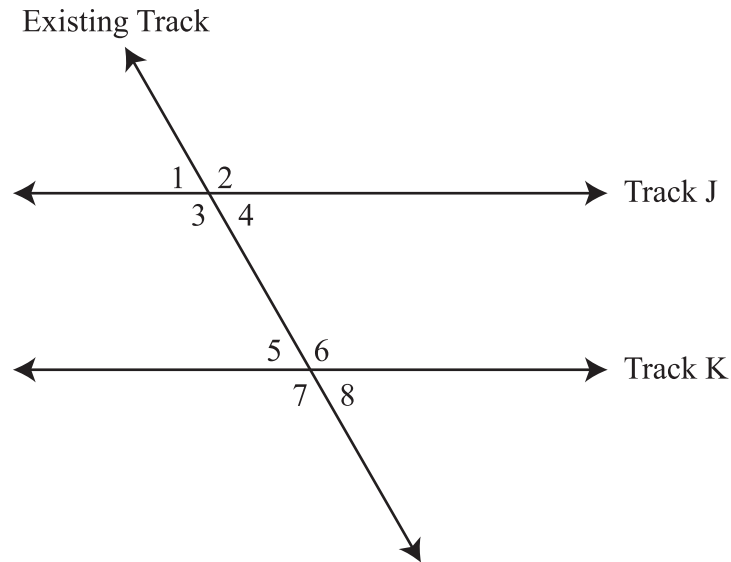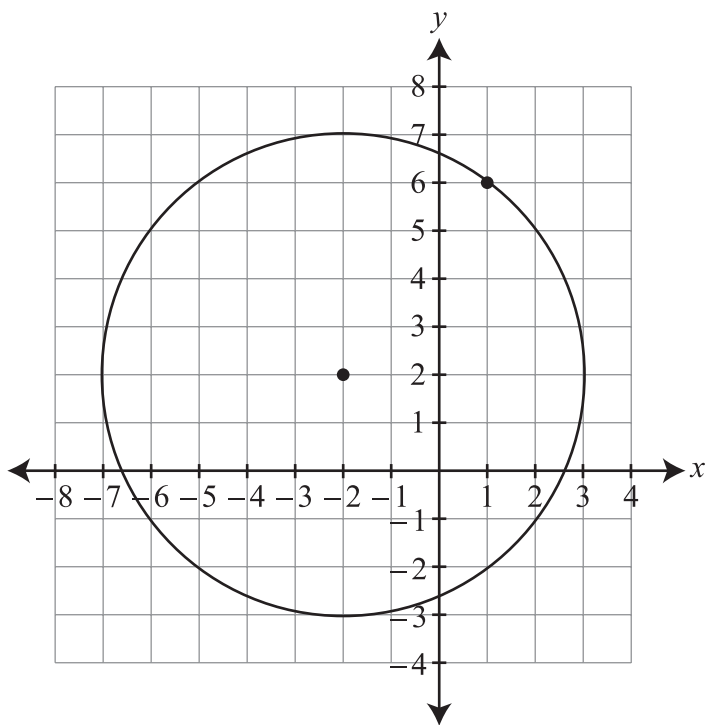

Which of the following pairs of angles must be equal so that Track J ∥ Track K?

A.   ∠1 and ∠6

B.   ∠2 and ∠8

* C.   ∠3 and ∠6

D.   ∠5 and ∠7

10. What are the center and radius of a circle
    having the equation $(x - 3)^2 + (y + 1)^2 = 16$?

A.   center at $(-3, 1)$, radius $= 4$ units

* B.   center at $(3, -1)$, radius $= 4$ units

C.   center at $(-3, 1)$, radius $= 16$ units

D.   center at $(3, -1)$, radius $= 16$ units

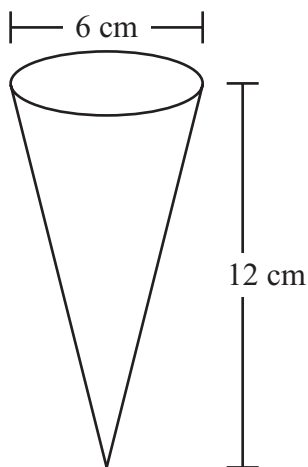**11.** What is the radius of the circle shown below?

A. $\sqrt{15}$

B. $\sqrt{17}$

* C.   5

D.   7

**12.** The drain shown below has a diameter of 6 cm and a height of 12 cm.

6 cm

12 cm

If the diameter of the drain is shortened to 4 cm but the volume does not change, what must the height of the drain become?

A.   14 cm

B.   16 cm

C.   18 cm

* D.   27 cm

13. What is the equation of the line through $(8, 1)$ that is parallel to $y = -2x + 5$?

* A. $y = -2x + 17$

B. $y = \dfrac{1}{2}x - 3$

C. $y = 2x - 15$

D. $y = 8x + 1$

14. Kevin took a survey of students at lunch to determine the kinds of pets that they owned. The information that he collected is shown in the Venn diagram below.
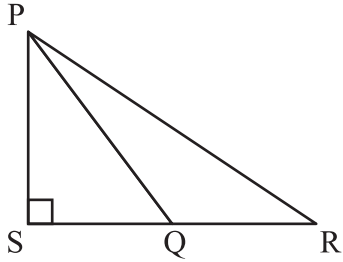
Number of Students with Pets
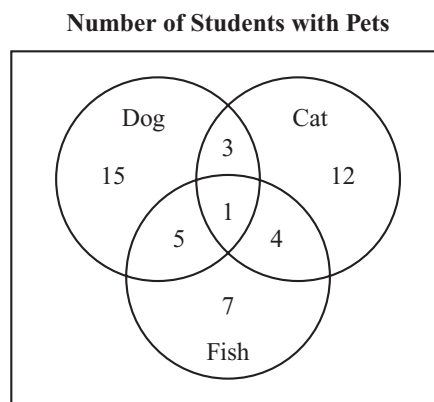
How many students in the survey owned a cat, a dog, or both, but no fish?

A.   27

* B.   30

C.   33

D.   40

15. In the figure shown below, $\overline{PQ}$ is a median of $\triangle PRS$, PS = 4 cm, and SQ = 3 cm.
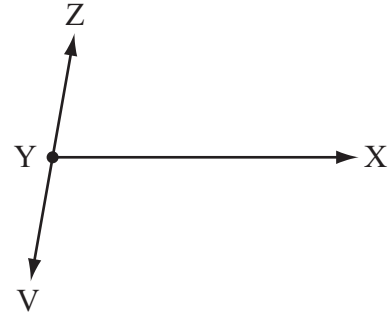

What is PR? Round your answer to the nearest tenth.

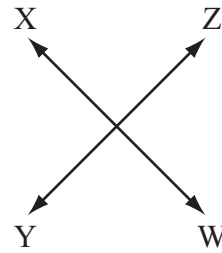A.   5.0 cm

B.   5.8 cm

* C.   7.2 cm

D.   10.0 cm

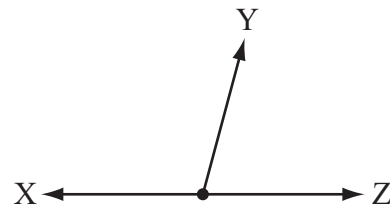**16.** Which of the following figures contains $\angle XYZ$?
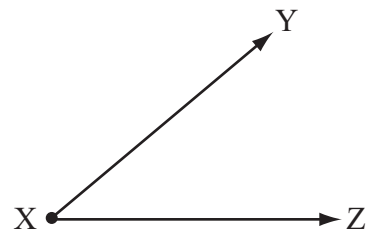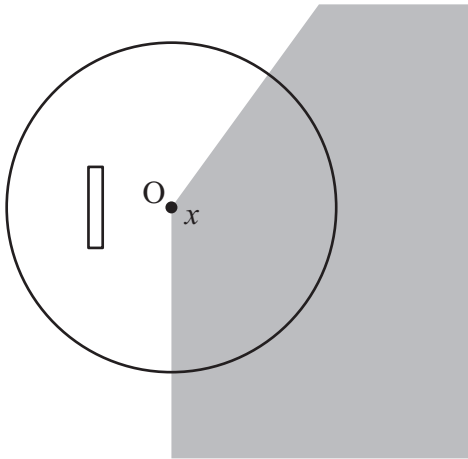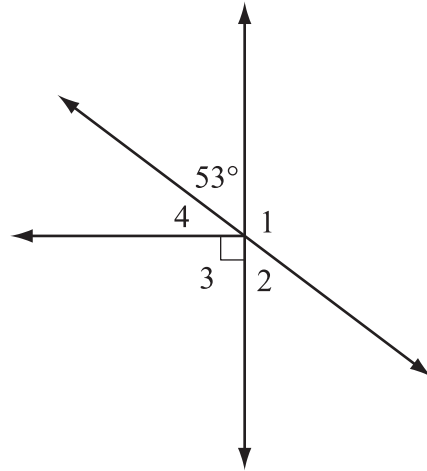
* A.

B.

C.

D.

17. The stands at a baseball stadium cast a shadow that covers $\frac{2}{5}$ of the pitcher's mound, with two sides of the shadow meeting at the center of the mound, shown below.

What is the measure of the smaller angle x made by the two sides of the shadow?

  A. 72°
 * B. 144°
  C. 216°
  D. 288°

18. Use the drawing below for this problem.

Which of the following angles has a measurement equal to 127°?

 * A. ∠1
  B. ∠2
  C. ∠3
  D. ∠4

19. Sarah is building an exercise ramp for her hamsters. She plans to use a triangular frame for the ramp and has several pieces of wood to choose from. Which lengths of wood can Sarah use to form a triangle?

  A. 5 in., 8 in., 13 in.
  B. 5 in., 9 in., 15 in.
  C. 6 in., 8 in., 15 in.
 * D. 6 in., 9 in., 12 in.

20. In a game of chance, a computer randomly places a dot in one of the 64 squares shown below. If the dot falls inside a white square, the player loses the game.
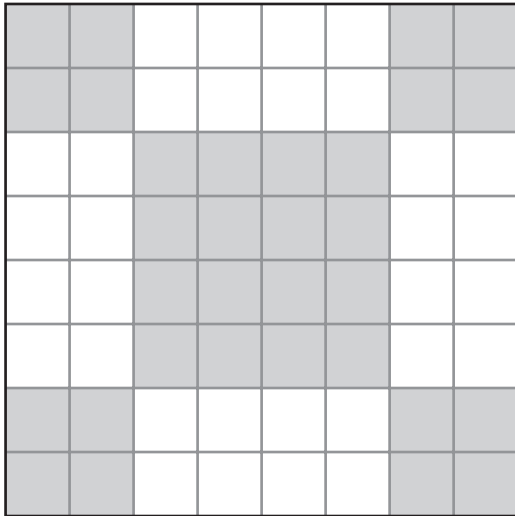

Rounded to the nearest percent, what is the probability that the person playing the game will lose?

   A.   32%
* B.   50%
   C.   64%
   D.   80%

21. Which statement is false in Euclidean geometry but is true in spherical geometry?

   A.   Every pair of vertical angles is congruent.

   B.   The sum of the angles of any triangle is 180°.

   C.   A triangle cannot have more than one right angle.

* D.   Two intersecting lines intersect in exactly two points.

22. Which of the following is the equation of a line perpendicular to the line whose equation is $y = \frac{1}{3}x + 2$ and passing through the point $(6, \ -10)$?

* A. $y = -3x + 8$

   B. $y = -\frac{1}{3}x - 8$

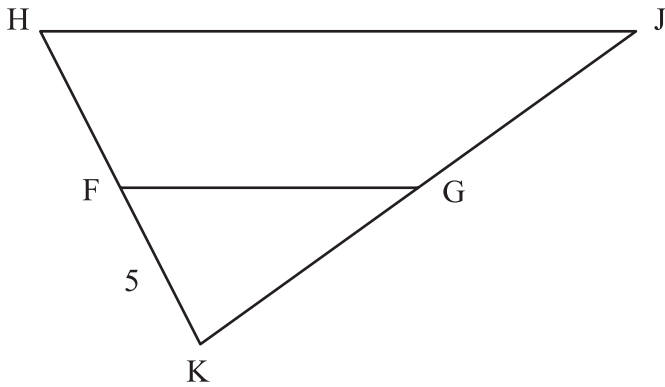   C. $y = \frac{1}{3}x - 12$

   D. $y = 3x - 28$

23. Use the figure below to answer the following question.
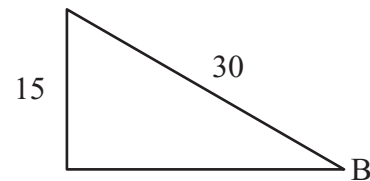
If the above triangle is a right triangle and the hypotenuse is 30 units long, what is the measure of $\angle B$?

   A.   60°
   B.   45°
* C.   30°
   D.   15°

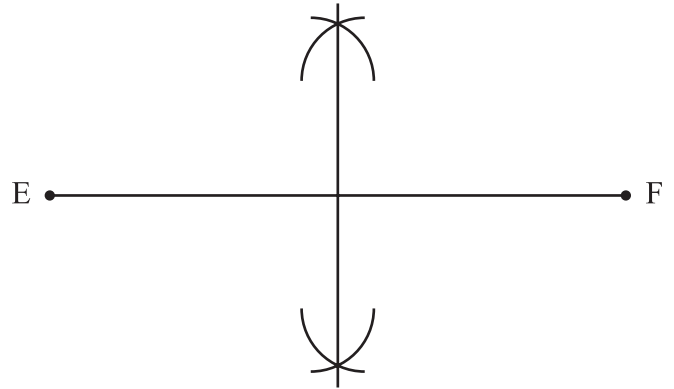**24.** In the figure below, $\overline{FG} \parallel \overline{HJ}$ and HK = 2FK.

Which of the following is true?

A.   GK = 5

B.   GK > GJ

C.   GF = HJ

* D.   GK = GJ

25. Michelle puts the sharp point of her compass on point E of the 12-cm line segment $\overline{EF}$. She draws one arc above $\overline{EF}$ and another arc below $\overline{EF}$, repeating this process with the sharp point of her compass on point F and then drawing a line perpendicular to $\overline{EF}$ as shown.
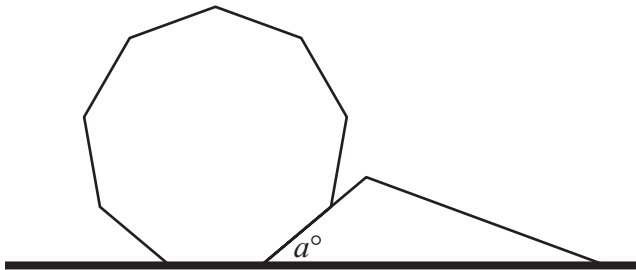

What is the distance between point E and the perpendicular line?

A.   3 cm

B.   4 cm

* C.   6 cm

D.   9 cm

26. A stained-glass artist cuts pieces of glass in the shapes of a regular nonagon and a triangle to use along the straight edge of a window he is building.

What is the value of a?

A.   12°

* B.   40°

C.   60°

D.   140°

27. Oliver uses a tabletop chess set as a model to build an oversized chess set in a park. Each king in the tabletop set is 8 cm tall. Each king in the park set is 1.2 m tall. Each pawn in the tabletop set is 4.5 cm tall. What is the height of each pawn in the park set?

A.   0.150 m

* B.   0.675 m

C.   1.778 m

D.   5.400 m

28. Barney drew a quadrilateral with the following characteristics.

- Only two of the four sides are congruent.
- The diagonals do not bisect each other.
- Only two of the four sides are parallel.

What type of quadrilateral did Barney draw?

A.   kite

B.   square

C.   rhombus

* D.   trapezoid

29. A cone has a height of 14 centimeters and a base radius of 3 centimeters. What is its volume? Round your answer to the nearest cubic cm.

A.   28 cm³

B.   57 cm³

* C.   132 cm³

D.   396 cm³

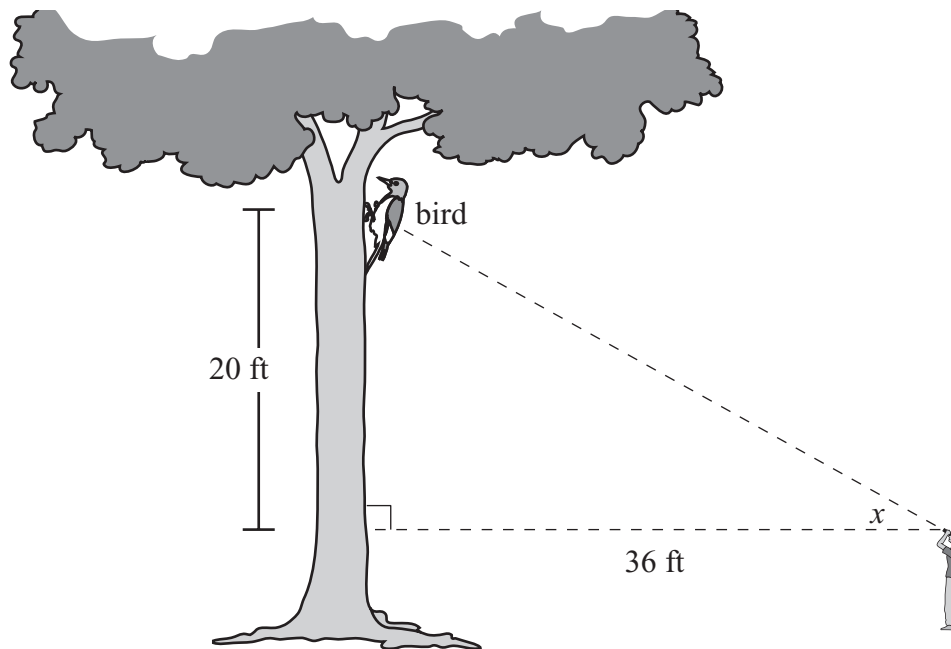**30.** The transformation of pentagon M to pentagon M′ is shown below.
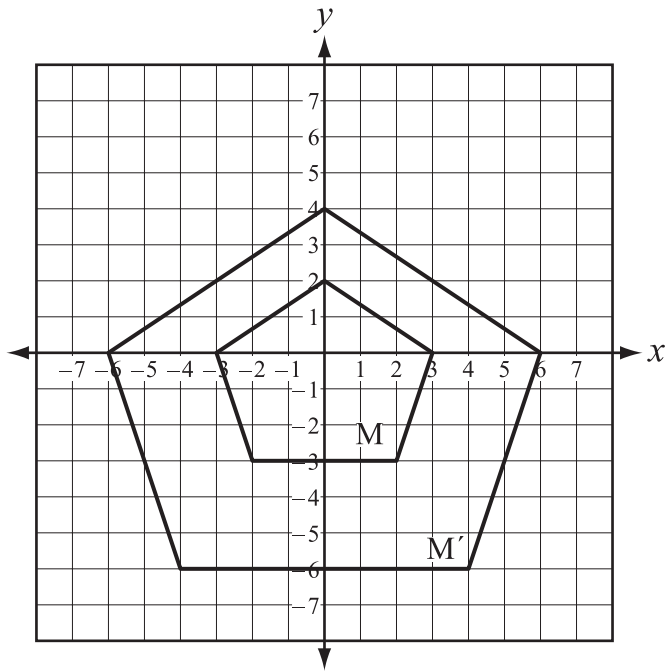
Which of the following is the correct name for the transformation?

* A.   dilation
   B.   rotation
   C.   reflection
   D.   translation

A. Maria is observing a woodpecker near the top of a tree, as shown in the diagram below.

1. What is the distance between Maria and the woodpecker? Show all of your work, and round to the nearest foot.

2. What is the measure of angle x, the angle of elevation, rounded to the nearest degree? Show all of your work to justify your answer.

BE SURE TO LABEL YOUR RESPONSES 1 AND 2.

	Item A Scoring Rubric—2013 Geometry

Score	Description
4	The student earns 4 points. The response contains no incorrect work.
3	The student earns 3 – 3½ points.
2	The student earns 2 – 2½ points.
1	The student earns 1 – 1½ 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" is assigned for the item.)

SOLUTION AND SCORING

Do not deduct for early rounding or truncating in internal work that results in the correct answer.
**Students may write these values for brevity, using the exact calculator value to find their answer.**

4 points possible:

Part	Points
1	**2 points possible:** 2 points: Correct distance: **41** (*rounded to the nearest foot* [***foot*** *not needed for a* **4**]) Correct procedure shown and/or explained Give credit for the following or equivalent: Ex: $d = \sqrt{20^2 + 36^2} = \sqrt{400 + 1296} = \sqrt{1696} = 41.18252\ldots \approx 41$ Ex: $\tan x = \dfrac{20}{36} \Rightarrow x = \tan^{-1}\left(\dfrac{20}{36}\right) \approx 29° \Rightarrow \cos 29 = \dfrac{36}{h} \Rightarrow h = \dfrac{36}{\cos 29} \approx 41 \text{ feet}$ Ex: $\tan x = \dfrac{20}{36} \Rightarrow x = \tan^{-1}\left(\dfrac{20}{36}\right) \approx 29° \Rightarrow \sin 29 = \dfrac{20}{h} \Rightarrow h = \dfrac{20}{\sin 29} \approx 41 \text{ feet}$ **OR** 1½ points: ● Distance is correct but is rounded or truncated to a place other than the nearest foot Correct procedure shown and/or explained ● Work contains evidence of early rounding(s) that results in an incorrect distance (*may or may not be rounded to the nearest foot*) Correct procedure shown and/or explained ● Distance is correct but procedure has an incorrect use of " $\sqrt{}$ " (*may or may not be rounded to the nearest foot*) Correct procedure is shown and/or explained **OR** 1 point: ● Correct distance: **41** (*rounded to the nearest foot*) Work is incomplete or missing or contains incorrect trig notation ● Distance is incorrect due to a calculation, copy or rounding error (*may or may not be rounded to the nearest foot*) Correct procedure is shown and/or explained

Part	Points
2	**2 points possible:**

2 points: Correct measure: **29**   (*rounded to the nearest degree* [***degree*** *not needed for a* **4**])
(*or correct measure based on an incorrect distance in Part 1*)
Correct procedure shown and/or explained
Give credit for the following or equivalent:

Ex: $\tan x = \dfrac{20}{36} = 0.\overline{5} \Rightarrow x = \tan^{-1}\left(\dfrac{20}{36}\right) = 29.05460\ldots \approx 29°$

Ex: $\sin x = \dfrac{20}{41} = 0.\overline{48780} \Rightarrow x = \sin^{-1}\left(\dfrac{20}{41}\right) = 29.19640\ldots \approx 29°$

Ex: $\sin x = \dfrac{20}{41} = 0.48564\ldots \Rightarrow x = \sin^{-1}\left(\dfrac{20}{41}\right) = 29.05460\ldots \approx 29°$
(*uses* **41.18252…** *value in calculator from Part 1*)

Ex: $\cos x = \dfrac{36}{41} = 0.\overline{87804} \Rightarrow x = \cos^{-1}\left(\dfrac{36}{41}\right) = 28.59212\ldots \approx 29°$

Ex: $\cos x = \dfrac{36}{41} = 0.87415\ldots \Rightarrow x = \cos^{-1}\left(\dfrac{36}{41}\right) = 29.05460\ldots \approx 29°$
(*uses* **41.18252…** *value in calculator from Part 1*)

Ex: $\tan x = \dfrac{20}{36}$ **or** $\sin x = \dfrac{20}{41}$ **or** $\cos x = \dfrac{36}{41}$ **with** correct answer of ***x* = 29°**

Ex: Performs at least **two guess-and-check** trials.

OR

1½ points: ● Measure is correct but is rounded or truncated to a place other than the nearest degree
Correct procedure is shown and/or explained

● Work contains evidence of early rounding(s) that results in an incorrect measure
(*may or may not be rounded to the nearest degree*)
Correct procedure is shown and/or explained

OR

1 point: ● Correct measure: **29**   (*rounded to the nearest degree*)
Work is incomplete or missing or contains incorrect trig notation

● Measure is incorrect due to a calculation, copy or rounding error
(*may or may not be rounded to the nearest degree*)
Correct procedure is shown and/or explained

● $\tan x = \dfrac{20}{36}$ **or** $\sin x = \dfrac{20}{41}$ **or** $\cos x = \dfrac{36}{41}$
Measure may be incorrect or missing

B.   The marching band director is using a coordinate grid to help him design a formation for the marching band. He begins by placing the four section leaders, Jodi, Mark, Sandra, and Terrence, at the locations J, M, S, and T, as shown below.
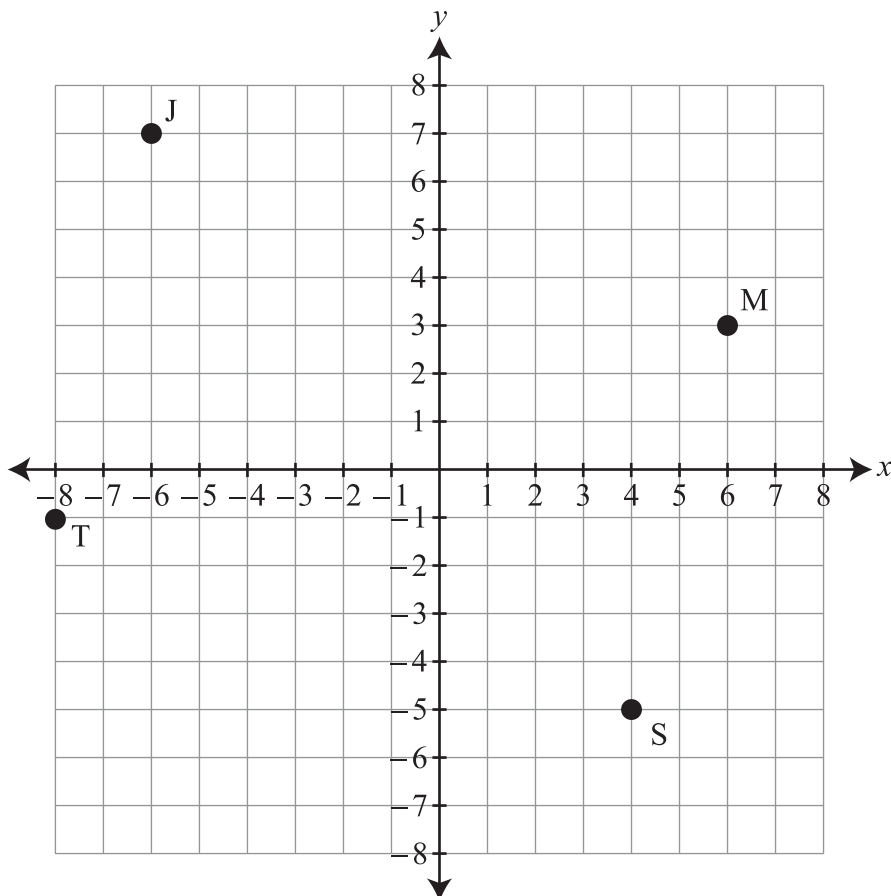
1.   The band director wants to place another key band member, Zach, halfway between Sandra (S) and Terrence (T). What will be the coordinates of Zach's location? Show your work or explain how you found your answer.

2.   The band director plans to scale the graphic as 1 grid unit = 3 yards. How far, in yards, will Sandra be from Jodi? Round your answer to the nearest tenth of a yard. Show your work and/or explain how you found your answer.

3.   Except for Zach, the other band members will be placed along the segments from Jodi to Sandra and from Mark to Terrence. Determine whether these two segments, $\overline{JS}$ and $\overline{TM}$, are perpendicular. Show your work or explain how you found your answer.

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

Item B Scoring Rubric—2013 Geometry

Score	Description
4	The student earns 4 points. The response contains no incorrect work.
3	The student earns 3 – 3½ points.
2	The student earns 2 – 2½ points.
1	The student earns ½ – 1½ points, or some minimal understanding is shown. Ex. Correctly uses the midpoint formula with incorrect points.
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" is assigned for the item.)

SOLUTION AND SCORING

Do not deduct for early rounding or truncating in internal work that results in the correct answer. Students may write these values for brevity, using the exact calculator value to find their answer.

J: $(^-6, 7)$ **M:** $(6, 3)$ **S:** $(4, ^-5)$ **T:** $(^-8, ^-1)$

4 points possible:

| Part	Points
1	**1 point possible:** 1 point: 2 Correct coordinates: $(^-2, ^-3)$ Correct procedure shown and/or explained Give credit for the following or equivalent: Ex: $\left(\dfrac{4+^-8}{2}, \dfrac{^-5+^-1}{2}\right) = \left(\dfrac{^-4}{2}, \dfrac{^-6}{2}\right) = (^-2, ^-3)$ Ex: "From **T**, I counted two down and six right to **Z**. From **Z**, I counted two down and six right to **S**." **OR** ½ point: • 2 Correct coordinates: $(^-2, ^-3)$ Work is incomplete or missing • 1 coordinate is correct 1 coordinate is incorrect due to a calculation or copy error Correct procedure is shown and/or explained
2	**1½ points possible:** 1½ points: Correct length: **46.8** or **46.9** (*yards not required for a 4*) Correct procedure shown and/or explained Give credit for the following or equivalent: Ex: Length = $\sqrt{(4-^-6)^2 + (^-5-7)^2} = \sqrt{100+144} = \sqrt{244} = 15.62049\ldots$ $3 \cdot 15.62049\ldots = 46.86149\ldots \approx 46.9$ **OR** 1 point: • Length is correctly rounded to a place other than nearest tenth of a yard Correct procedure is shown and/or explained • Length is correct but procedure has an incorrect use of "$\sqrt{}$" Otherwise correct procedure is shown and/or explained **OR** ½ point: • Student finds length from Sandra to Jodi but doesn't multiply by **3** ($3 \cdot \sqrt{244}$ or equivalent) (*may or may not be rounded to the nearest tenth of a yard*) Correct procedure is shown and/or explained • Answer is incorrect due to a calculation or copy error, or early rounding Correct procedure is shown and/or explained • Correct length: **46.8** or **46.9**; Incomplete procedure

Part	Points
3	**1½ points possible:**

1½ points: Correct answer: "**No, they are not perpendicular.**"
Correct procedure shown and/or explained
Give credit for the following or equivalent:

Ex: $$m\overline{JS} = \frac{(^-5-7)}{(4-^-6)} = \frac{^-12}{10} = \frac{^-6}{5} \qquad m\overline{TM} = \frac{(3-^-1)}{(6-^-8)} = \frac{4}{14} = \frac{2}{7}$$

"The slopes are not negative reciprocals so the segments are not perpendicular."

Ex: Student shows rise over run on diagram to determine slope

OR

1 point:
- Both slopes are correctly found
Correct procedure is shown and/or explained
Answer ("**No**") is missing

- Correct answer ("**No**")
Both slopes are correct
Work and/or explanation is incomplete,
but some correct procedure is shown and/or explained

- 1 slope is correct
1 slope is incorrect due to a calculation or copy error
Correct procedure is shown and/or explained
Answer ("**No**") is correct

OR

½ point:
- 1 slope is correct
1 slope is incorrect due to a calculation or copy error
Correct procedure is shown and/or explained
Answer ("**No**") is incorrect or missing

- Both slopes are correct
Work and/or explanation is missing
Answer ("**No**") may be correct, incorrect or missing

- "No, they are not opposite reciprocals."
With or without additional work shown
"**No**" and "**opposite** (or **negative**) **reciprocals**" are **both** required.

C.   Ike's Ice Cream Company sells its ice cream in cylindrical containers, with the dimensions shown below.
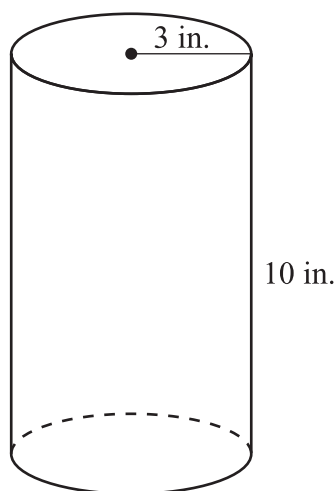
Ike's Ice Cream Company plans to create a new container by decreasing the volume of its current ice cream containers by 20%.

1.   Find the volume of the new container. Leave your answer in terms of pi or round to the nearest hundredth of a cubic inch. Show your work.

2.   If Ike's Ice Cream Company decides to change the height of the current container but keep the radius the same, what will be the height of the new container whose volume was found in Part 1? Show your work or explain how you found your answer.

3.   If Ike's Ice Cream Company decides to change the radius of the current container but keep the height the same, what will be the radius of the new container whose volume was found in Part 1? Show your work or explain how you found your answer.

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

Item C Scoring Rubric—2013 Geometry

Score	Description
4	The student earns 4 points. The response contains no incorrect work. Correct label of "inches" in Parts 2 and 3.
3	The student earns 3 – 3½ points.
2	The student earns 2 – 2½ points.
1	The student earns ½ – 1½ 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" is assigned for the item.)

PART II   Mɪᴅ-Yᴇᴀʀ Rᴇʟᴇᴀsᴇᴅ Gᴇᴏᴍᴇᴛʀʏ Iᴛᴇᴍs

Sᴏʟᴜᴛɪᴏɴ ᴀɴᴅ Sᴄᴏʀɪɴɢ

**Do not deduct for early rounding or truncating in internal work that results in the correct answer.
Students may write these values for brevity, using the exact calculator value to find their answer.**

4 points possible:

| Part	Points
1	**2 points possible:** 2 points: Correct volume: **72π** or **226.08** or **226.19** (*cubic inches* not required) Correct procedure shown and/or explained Give credit for the following or equivalent: Ex: $V = \pi r^2 h = \pi(3^2)10 = \pi(9)10 = 90\pi = 282.74333\ldots$ $.8V = .8\cdot 90\pi = 72\pi = 226.19467\ldots \approx 226.19$ Ex: $V = \pi r^2 h = \pi(3^2)10 = \pi(9)10 = 90\pi = 282.74333\ldots$ $.2\cdot 282.74333\ldots = 56.54866\ldots$ $282.74333\ldots - 56.54866\ldots = 226.19467\ldots \approx 226.19$ Ex: $V = \pi r^2 h = \pi(3^2)10 = \pi(9)10 = 3.14\cdot 90 = 282.6$ $.8V = .8\cdot 282.6 = 226.08$ Ex: $V = \pi r^2 h = \pi(3^2)10 = \pi(9)10 = 3.14\cdot 90 = 282.6$ $.2\cdot 282.6 = 56.52$ $282.6 - 56.52 = 226.08$ **OR** 1½ points: • Volume is correctly rounded or truncated to a place other than the nearest 100ᵗʰ or work contains evidence of early rounding(s) that results in an incorrect answer Correct procedure shown and/or explained **OR** 1 point: • Correct volume Procedures are missing or incomplete • Incorrect or missing volume Correct procedure is shown and/or explained Work may have a calculation, copy, or rounding error, or the label exponent is attached to the numerical value.

Part	Points
2	**1 point possible:**

1 point:
    Correct height: **8**   (***inches*** *required for a 4*)
    (*or correct height based on an incorrect volume in Part 1*)
    Because the prompt does not specify rounding,
    correct answers correctly rounded to any position are acceptable.
    Correct procedure shown and/or explained
    Give credit for the following or equivalent:

Ex: $.8h = .8 \cdot 10 = 8$

Ex: $V = \pi r^2 h \Rightarrow h = \dfrac{V}{\pi r^2} = \dfrac{72\pi}{\pi(3)^2} = \dfrac{72\pi}{9\pi} = 8$

Ex: $V = \pi r^2 h \Rightarrow h = \dfrac{V}{\pi r^2} = \dfrac{226.19}{9\pi} = 7.99983\ldots$

Ex: $V = \pi r^2 h \Rightarrow h = \dfrac{V}{\pi r^2} = \dfrac{226.19}{9 \cdot 3.14} = 8.00389\ldots$

Ex: $V = \pi r^2 h \Rightarrow h = \dfrac{V}{\pi r^2} = \dfrac{226.08}{9 \cdot 3.14} = 8$

Ex: Guess-and-Check **with** correct answer

OR

½ point:
- Correct height
  Procedure is missing or incomplete
- Correct height
  Procedure contains an incorrect use of " $\sqrt{}$ "
- Incorrect or missing height
  Correct procedure shown and/or explained
  Work may have a calculation, copy, or rounding error, or is truncated
  or work contains evidence of early rounding(s) that results in an incorrect answer

Part	Points
3	**1 point possible:**

1 point: Correct radius: **2.68**   (***inches*** *required for a **4***)
(*or correct radius based on an incorrect volume in Part 1*)
Because the prompt does not specify rounding,
correct answers correctly rounded to any position are acceptable.
Correct procedure shown and/or explained
Give credit for the following or equivalent:

Ex: $V = \pi r^2 h \Rightarrow 72\pi = \pi r^2 10 \Rightarrow r^2 = \dfrac{72\pi}{10\pi} = 7.2 \Rightarrow r = \sqrt{7.2} = 2.68328\ldots$

Ex: $V = \pi r^2 h \Rightarrow r^2 = \dfrac{226.19}{10\pi} = 7.19985\ldots \Rightarrow r = \sqrt{7.19985\ldots} = 2.68325\ldots$

Ex: $V = \pi r^2 h \Rightarrow r^2 = \dfrac{226.19}{10 \cdot 3.14} = 7.20350\ldots \Rightarrow r = \sqrt{7.20350\ldots} = 2.68393\ldots$

Ex: $V = \pi r^2 h \Rightarrow r^2 = \dfrac{226.08}{10 \cdot 3.14} = 7.2 \Rightarrow r = \sqrt{7.2} = 2.68328\ldots$

Ex: Guess-and-Check **with** correct answer

OR

½ point:
- Correct radius
  (*or correct radius based on an incorrect volume in Part 1*)
  Procedure is missing or incomplete
- Correct radius
  Procedure contains an incorrect use of " $\sqrt{}$ "
- Incorrect or missing radius
  Correct procedure shown and/or explained
  Work may have a calculation, copy, or rounding error, or is truncated
  or work contains evidence of early rounding(s) that results in an incorrect answer

1. Look at the coordinate plane below.
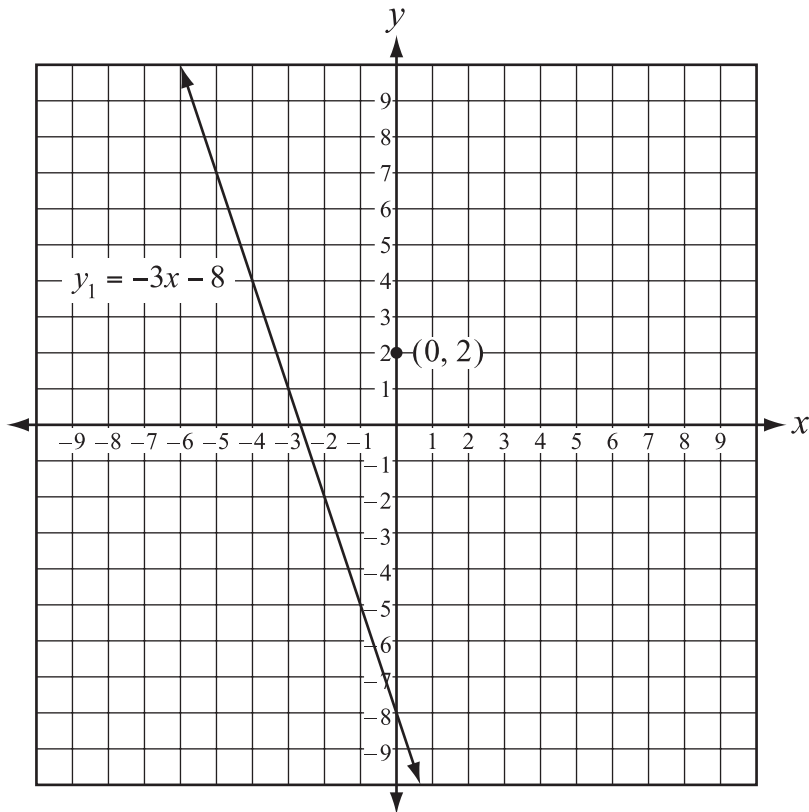
What is the equation of a line perpendicular to line y_1 and passing through $(0, 2)$?

* A. $y = \dfrac{1}{3}x + 2$

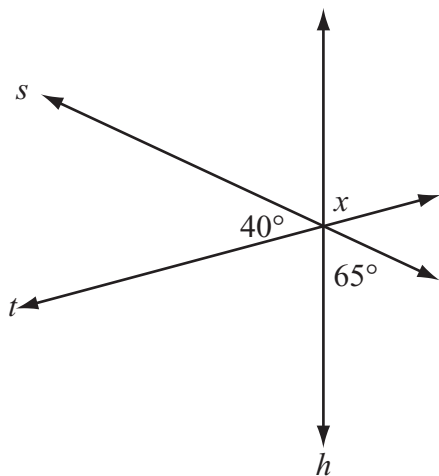B. $y = -3x + 2$

C. $y = 3x - 2$

D. $y = -\dfrac{1}{3}x - 2$

2. The equation below describes a circle.

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

What circle could this equation represent?

   A.   a circle with center $(-2, 5)$ and radius 4

* B.   a circle with center $(5, -2)$ and radius 4

   C.   a circle with center $(5, -2)$ and radius 16

   D.   a circle with center $(-2, 5)$ and radius 16

3. What is the value of x?

   A.   40°

   B.   65°

* C.   75°

   D.   105°

4. At Fulton Middle School, students' schedules follow these rules:

- If a student has Math during first period, the student must have PE before lunch.
- If a student has PE before lunch, the student must have English after lunch.
- Students eat lunch between third period and fourth period.
- A school day has six periods.

Michelle's first-period class is Math. Which conclusion must be true?

   A.   Michelle has PE during third period.

   B.   Michelle has PE during fourth, fifth, or sixth period.

   C.   Michelle has English during sixth period.

* D.   Michelle has English during fourth, fifth, or sixth period.

5. In circle X below, $\angle AXB \cong \angle CXD$.
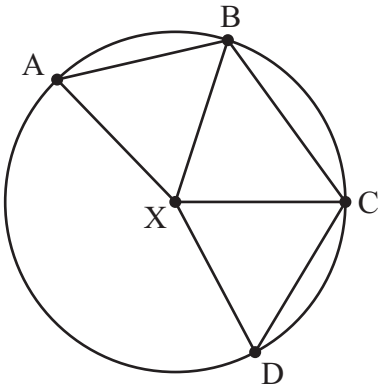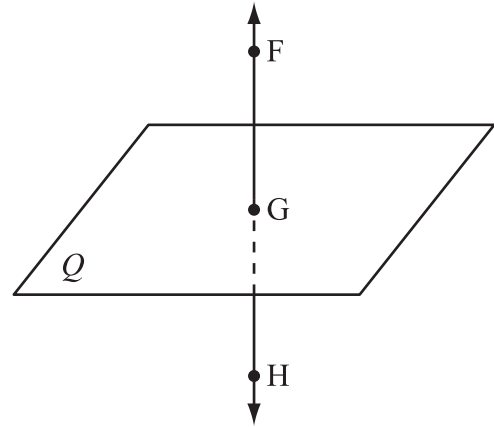

Which **must** be true?

A. $\overline{AB} \cong \overline{BX}$

B. $\overline{AB} \cong \overline{CX}$

* C. $\overline{CD} \cong \overline{AB}$

D. $\overline{CD} \cong \overline{CX}$

6. Look at the triangle below.
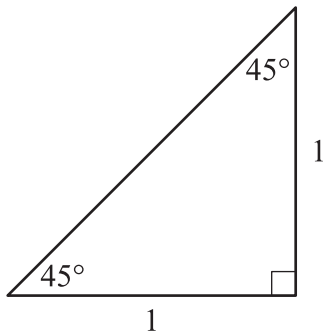
What is the length of the hypotenuse in the triangle?

A. 1

* B. $\sqrt{2}$
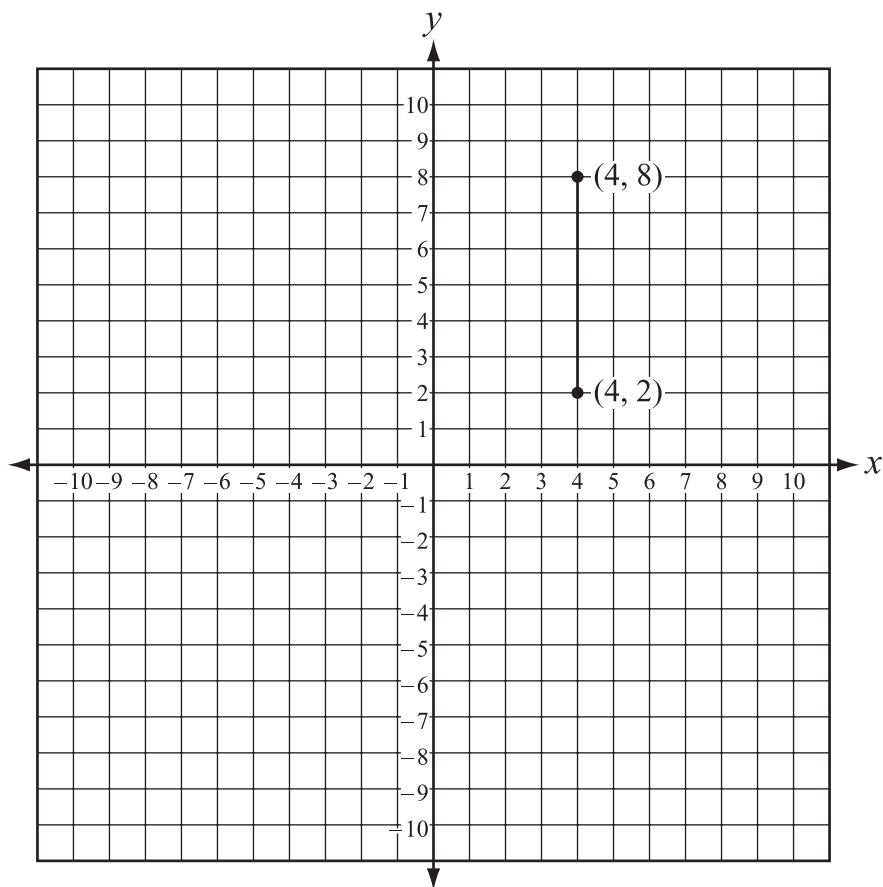
C. 2

D. $2\sqrt{2}$

7. Look at the figure below.

What represents the intersection of plane Q and $\overleftrightarrow{FH}$?

A. $\overline{FG}$

B. $\overline{QG}$

C. $\angle QGF$

* D. point G

8. Look at the coordinate plane below.

What is the equation for the perpendicular bisector of the segment shown above?

* A. $y = 5$

  B. $x = 5$

  C. $y = 4$

  D. $x = 4$

9. A cylindrical oatmeal container has a height of 13 inches and a radius of 3.5 inches. What is the approximate volume of oatmeal that the container will hold?

    A.   286 in.^{3}
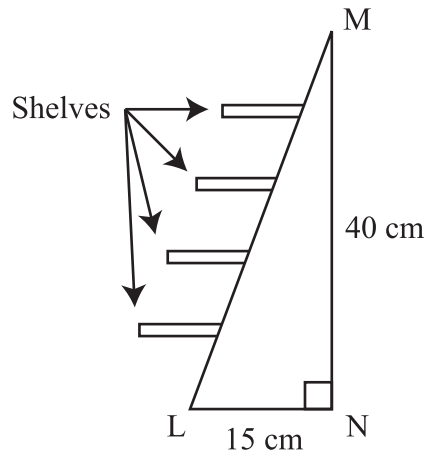   B.   363 in.^{3}
  * C.   500 in.^{3}
    D.   1,592 in.^{3}

10. Which is another name for a quadrilateral with four congruent sides and four right angles?

  * A.   square
    B.   rectangle
    C.   rhombus
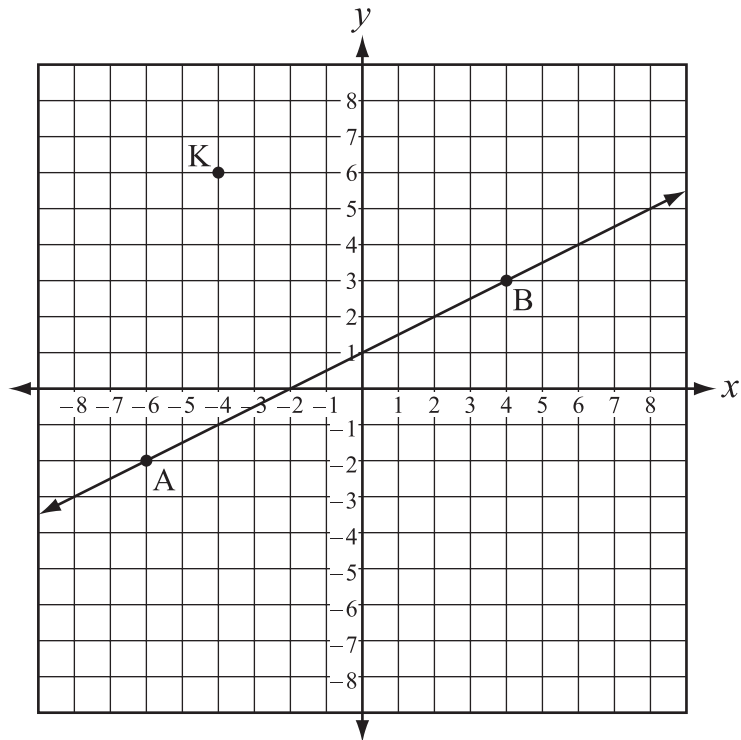   D.   parallelogram

PART II   Spring Released Geometry Items

11.   A designer is building a plastic display case. Its side view is shown below.

Shelves

M

40 cm

L   15 cm   N

What is LM? Round your answer to the nearest centimeter.

A.   10 cm

B.   25 cm

* C.   43 cm

D.   55 cm

12. Look at the graph below.

What is the equation of the line that passes through point K and is parallel to $\overleftrightarrow{AB}$?

A. $y = \dfrac{1}{2}x + 1$

B. $y = -\dfrac{5}{4}x + 1$

* C. $y = \dfrac{1}{2}x + 8$

D. $y = -2x - 2$

13. A glassblower starts with a solid cylindrical glass rod 150 millimeters long with a diameter of 24 millimeters. After heating the rod, the glassblower works it until it is 225 millimeters long. The rod's diameter is unchanged. Which is the best estimate of the increase in the surface area of the rod?

   A. 75 mm^2

   * B. $5,655 \text{ mm}^2$

   C. $11,310 \text{ mm}^2$

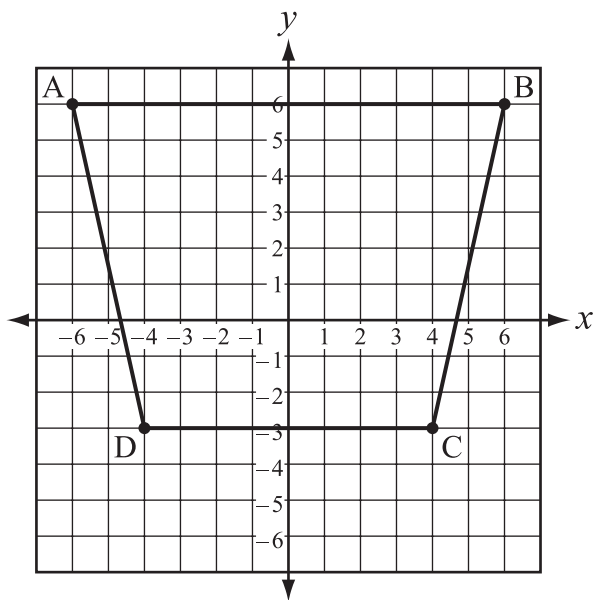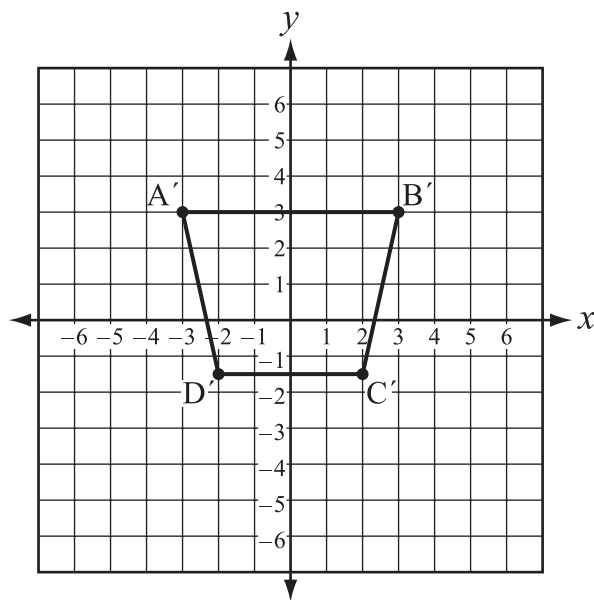   D. $33,929 \text{ mm}^2$

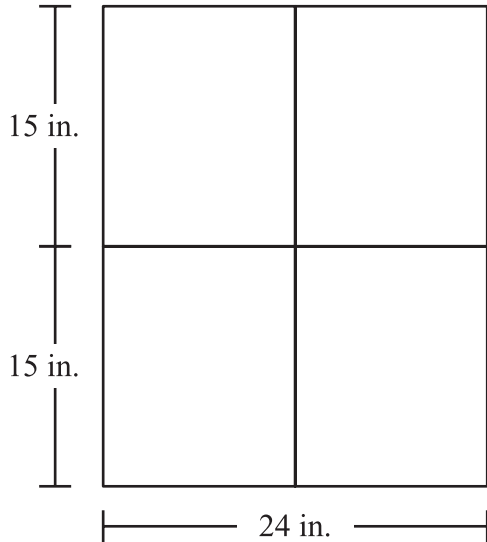14. Use the graphs below to answer this question.

Figure 1

Figure 2

Which type of transformation is shown from Figure 1 to Figure 2?

   * A.   dilation
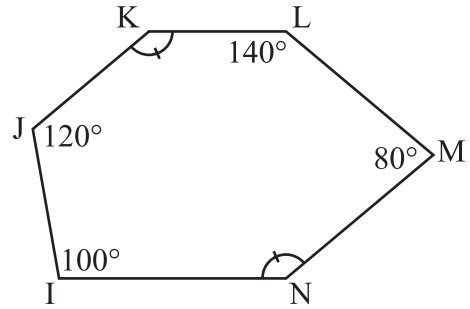
   B.   rotation

   C.   reflection

   D.   translation

15. Mary Ann's rectangular window is 24 in. wide and 30 in. long. The window has 4 panes that are similar to the window.

15 in.

15 in.

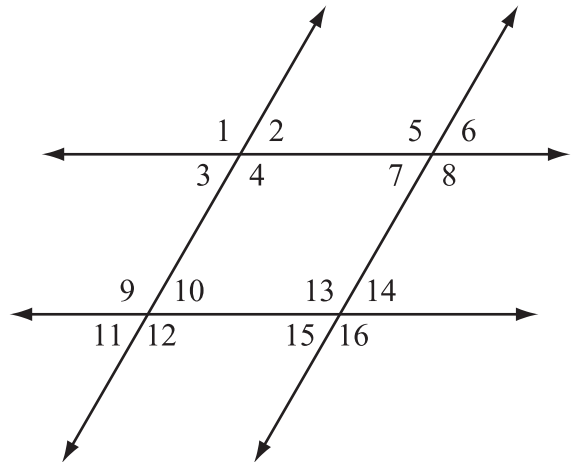24 in.

If the length of each pane is 15 in., what is the width of each pane?

* A.   12 in.
  B.   15 in.
  C.   24 in.
  D.   30 in.

16. In the figure below, what is m∠N?

K
L
140°
J 120°
80° M
100°
I   N

A.   90°
B.   110°
C.   120°
* D.   140°

17. Two sets of parallel lines are shown below.

1 2   5 6
3 4   7 8

9 10   13 14
11 12   15 16

Which statement must be true?

* A.   ∠1 ≅ ∠12
  B.   ∠1 ≅ ∠14
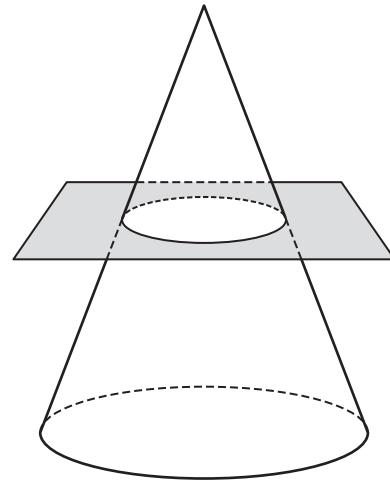 C.   m∠5 + m∠9 = 180°
  D.   m∠10 + m∠11 = 90°

37

18. The storage cabinet shown below is in the shape of a rectangular solid.
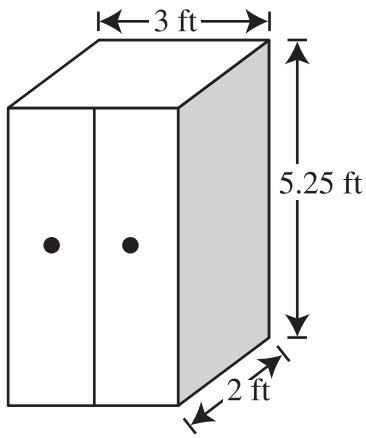
All six faces of the storage cabinet are to be painted. What is the surface area of the storage cabinet to the nearest hundredth of a square foot?
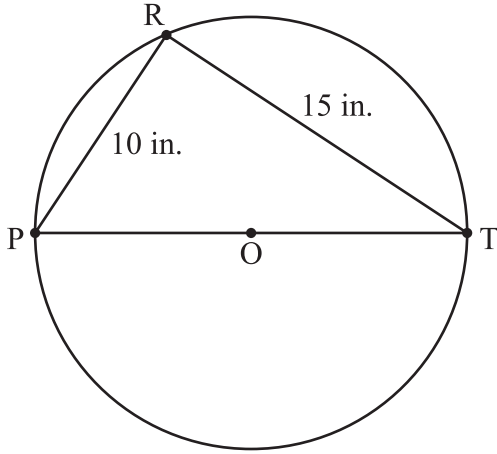
- A.   31.50
- B.   32.25
- C.   63.00
- * D.   64.50

19. Look at the figure below.

What shape is the cross-section of the cone?

- A.   point
- * B.   circle
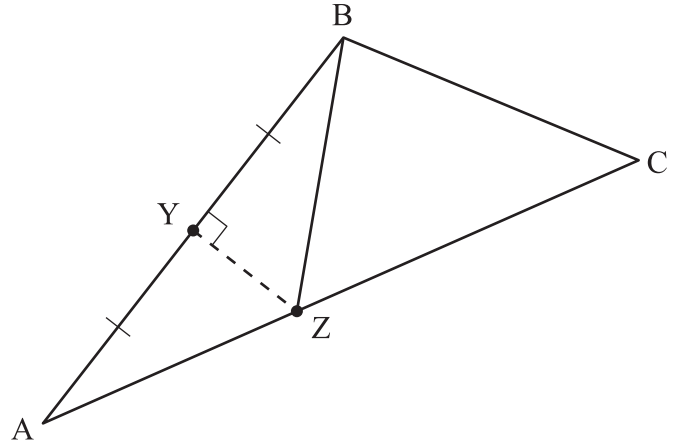- C.   triangle
- D.   rectangle

20. In the figure below, ΔPRT is inscribed in circle O.

What is the length of diameter $\overline{PT}$? Round your answer to the nearest tenth.

A.   11.2 in.

B.   12.5 in.

C.   17.3 in.

* D.   18.0 in.

21. The drawing below shows ΔABC. $\overline{YZ}$ is perpendicular to $\overline{AB}$, and $\overline{AY} \cong \overline{BY}$.
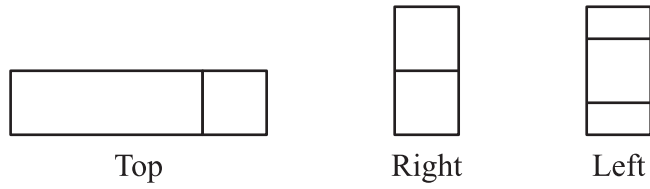

Which conclusion does this evidence support?

A.   ΔABZ ~ ΔABC

* B.   ΔAYZ ≅ ΔBYZ

C. $\overline{BZ} \cong \overline{BC}$

D.   ∠BZC ≅ ∠BCZ
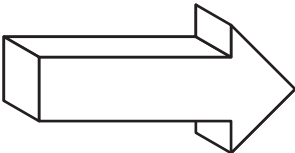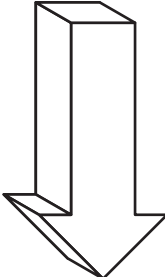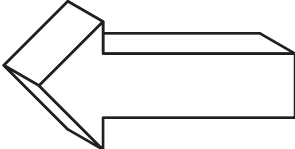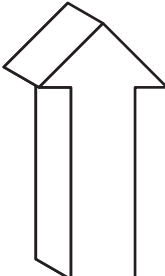
22. Three views of a figure are shown below.

Top   Right   Left

Which could be the figure shown in the three views?

* A.

B.

C.

D.

23. Using only one shape, which regular polygon will tessellate?

    A.   pentagon

* B.   hexagon

    C.   octagon

    D.   decagon

24. Which of the following theorems is the name of a triangle similarity theorem?

    A.   Side-Side (SS)

    B.   Angle-Side (AS)

    C.   Side-Vertex-Side (SVS)

* D.   Side-Angle-Side (SAS)

25. If the pattern below continues, how many squares will there be in Figure 7?

Figure 1	Figure 2	Figure 3	Figure 4
2 squares	5 squares	9 squares	14 squares
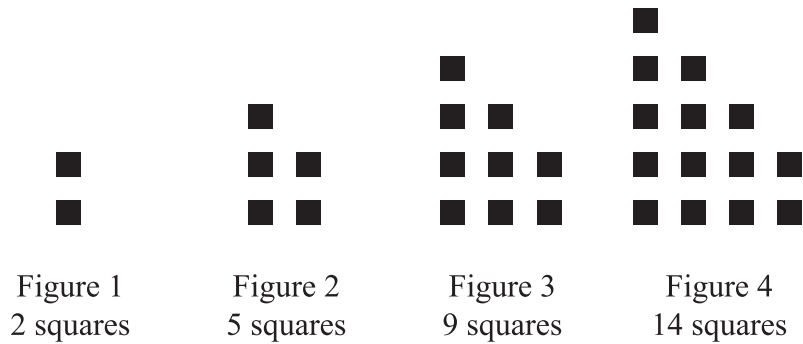
   A.   27

* B.   35

   C.   44

   D.   54

---

26. Look at the triangle below.
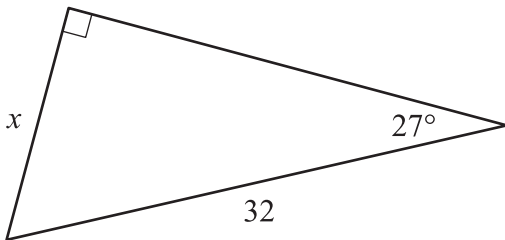
Which of the following is the value of x? Round your answer to the nearest whole number.

* A.   15

   B.   29

   C.   62

   D.   70

27. Look at the figure below.
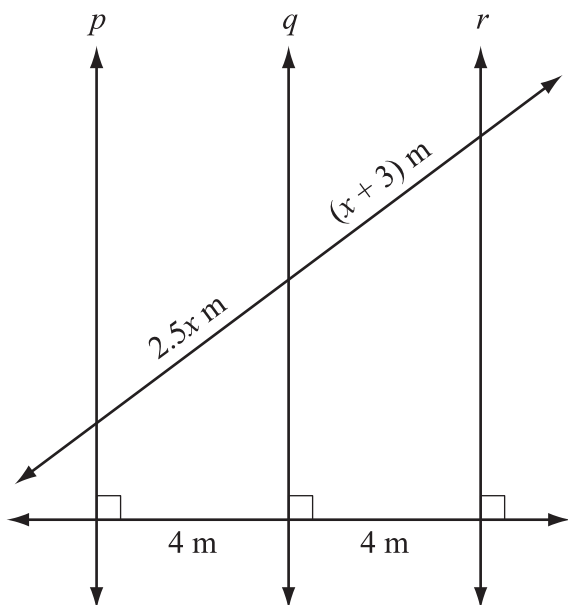
What is the value of x?

A. 1.0

B. 1.6

* C. 2.0

D. 5.0

28. Alex and three of his friends are all different ages.

- Lauren is older than Alex.
- Breanna is the oldest of the friends.
- Meghan is younger than Breanna but older than Lauren.

Which shows the correct order of the friends from oldest to youngest?

* A. Breanna, Meghan, Lauren, and Alex

B. Breanna, Lauren, Meghan, and Alex

C. Breanna, Meghan, Alex, and Lauren

D. Breanna, Lauren, Alex, and Meghan

29. A potato chip manufacturer sells its potato chips in cylindrical cans. The current can has a volume of 300 cm^3. They want to increase the size of the can to a volume of 400 cm^3 while keeping the radius the same.

Current Can   New Can
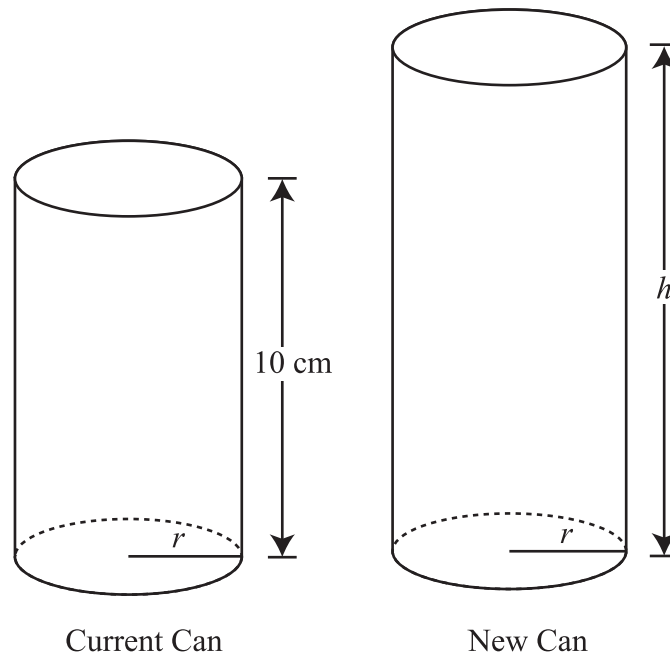
What will be the height, *h,* of the new can? Round your answer to the nearest hundredth of a centimeter.

   A.   7.50 cm

   B.   10.75 cm

   C.   11.33 cm

 * D.   13.33 cm

30. E is the midpoint of $\overline{DF}$.
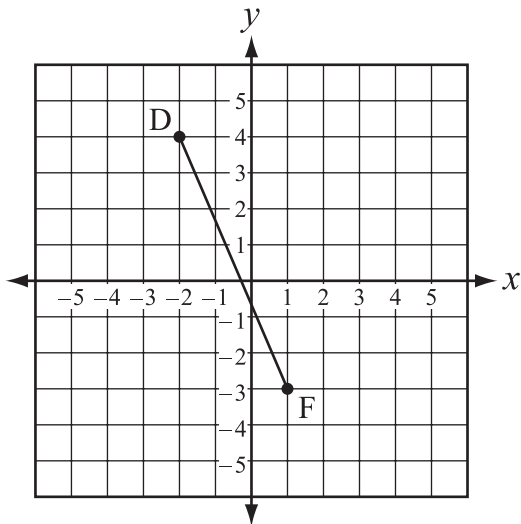
What are the coordinates of E?

A. $\left(\dfrac{1}{2}, -\dfrac{1}{2}\right)$

* B. $\left(-\dfrac{1}{2}, \dfrac{1}{2}\right)$

C. $\left(\dfrac{7}{2}, -\dfrac{3}{2}\right)$

D. $\left(-\dfrac{3}{2}, \dfrac{7}{2}\right)$

A. An arrangement of blocks sitting on a surface is shown below.

Front

1. Draw the view of the blocks from the right side.

2. Draw the view of the blocks from the top.

3. How many blocks in all are in the arrangement?
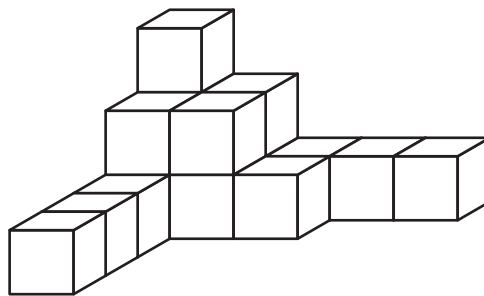
4. The length of each side of the cube-shaped blocks is 3 cm. What is the volume of the arrangement of blocks? Show your work.

BE SURE TO LABEL YOUR RESPONSES 1, 2, 3, AND 4.
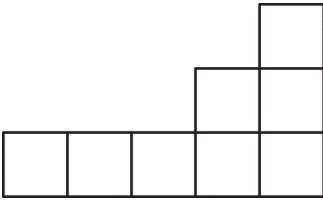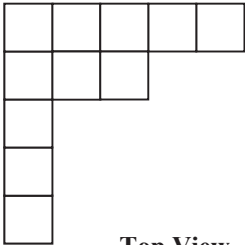
Item A Scoring Rubric—2013 Geometry

Score	Description
4	The student earns 4 points. The response contains no incorrect work. Correct label of "cubic centimeters" in Part 4.
3	The student earns 3 – 3½ points.
2	The student earns 2 – 2½ points.
1	The student earns ½ – 1½ 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" is assigned for the item.)

SOLUTION AND SCORING

4 points possible:

Notes:
- Labels of "**Right-side View**" and "**Top View**" are not required if diagrams are in the correct order. If they are not in order, they must be labeled in order to receive credit.
- Diagrams must delineate the correct number of blocks in the correct configuration. Blocks may be inconsistent in size and shape.
- Diagrams showing change in depth (by shading, etc.; **not** 3-D) are acceptable.

Part	Points
1	**1 point possible:** 1 point: Correct view: **Right Side View**
2	**1 point possible:** 1 point: Correct view: **Top View**
3	**1 point possible:** 1 point: Correct number of blocks: **16**

PART II SPRING RELEASED GEOMETRY ITEMS

Part	Points
4	**1 point possible:** 1 point: Correct volume: **432 cm^3** (*cubic centimeters* required for a **4**) (*or correct volume for an incorrect number of blocks in Part 3*) Give credit for the following or equivalent: Ex: $V = 3 \cdot 3 \cdot 3 \cdot 16 = 27 \cdot 16 = 432$ **OR** ½ point: Correct volume Procedures are missing or incomplete or Incorrect or missing volume Correct procedure is shown and/or explained Work may have a calculation error.

Blocks	Volume
1	27
2	54
3	81
4	108
5	135
6	162
7	189
8	216
9	243
10	270
11	297
12	324
13	351
14	378
15	405
16	**432**
17	459
18	486
19	513
20	540

B. A school requires all students to take an elective in Business, Art, and/or Music. The diagram below shows the distribution of students in the electives.

Student Enrollment in Electives
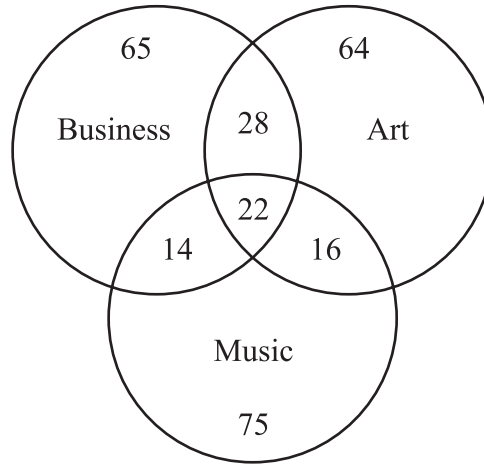
Four claims listed below are made about the distribution of students in the electives. For each claim, determine whether it is true or false. Justify your decision with mathematical reasoning.

1.   More students signed up for Music electives than for Business electives.

2.   More students are enrolled in two or more electives than are enrolled in only one elective.

3.   More students are not enrolled in Music electives than are not enrolled in Art electives.

4.   More students are in Art electives but not Business than are in Music but not Business.

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

	Item B Scoring Rubric—2013 Geometry

Score	Description
4	The student earns 4 points. The response contains no incorrect work.
3	The student earns 3 – 3½ points.
2	The student earns 2 – 2½ points.
1	The student earns ½ – 1½ points, or some minimal understanding is shown. Ex. Finds the correct number of students in one of the categories in one of the four prompts, with work.
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" is assigned for the item.)

Solution and Scoring
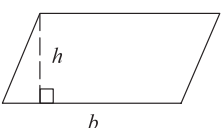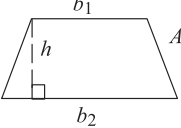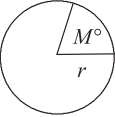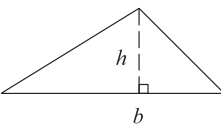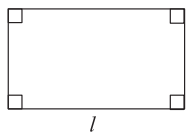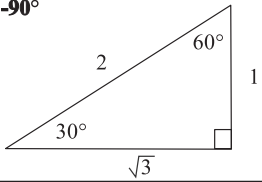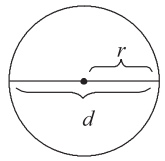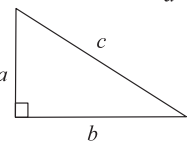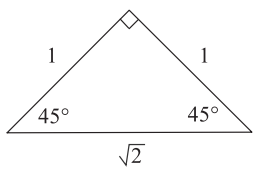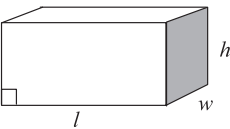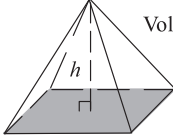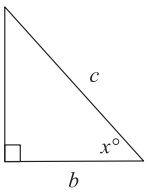
4 points possible:

Part	Points
1	**1 point possible:** 1 point: Correct conclusion: **False** Correct procedure is shown and/or explained Give credit for the following or equivalent: ● Music: $75 + 14 + 22 + 16 = 127$ and Business: $65 + 28 + 22 + 14 = 129$ "Since $129 > 127$, there are more students in Business electives than in Music electives." (*not required*) **or** Music: $75 + 14 + 16 = 105$ and Business: $65 + 28 + 14 = 107$ **or** Music: $75 + 22 + 16 = 113$ and Business: $65 + 28 + 22 = 115$ **or** Music: $75 + 16 = 91$ and Business: $65 + 28 = 93$ [Ignores **14** and/or **22**, which are common to Music and Business] ● Finds any of the above correct number of students in Business **and** in Music Correct conclusion: **False** Work is incomplete or missing **OR** ½ point: ● Correct, incorrect, or missing conclusion Correct procedure is shown and/or explained May have **one** calculation or copy error Conclusion based on the error if there is an error ● Finds any of the above correct number of students in Business **and** in Music Incorrect or missing conclusion Work is incomplete or missing
2	**1 point possible:** 1 point: Correct conclusion: **False** Correct procedure is shown and/or explained Give credit for the following or equivalent: ● Students enrolled in two or more electives: $28 + 22 + 14 + 16 = 80$ Students enrolled in only one elective: $65 + 64 + 75 = 204$ "Since $80 < 204$, there are more enrolled in a single elective than in two or more electives." (*not required*) ● Finds correct number of students enrolled in only one **and** in two or more electives Correct conclusion: **False** Work is incomplete or missing **OR** ½ point: ● Correct, incorrect, or missing conclusion Correct procedure is shown and/or explained May have **one** calculation or copy error Conclusion based on the error if there is an error ● Finds correct number of students enrolled in only one **and** in two or more electives Incorrect or missing conclusion Work is incomplete or missing

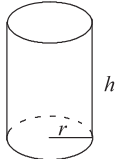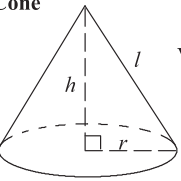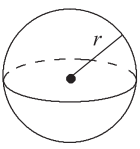| Part	Points

3	**1 point possible:**
	
	 1 point: Correct conclusion: **True**
	 Correct procedure is shown and/or explained
	 Give credit for the following or equivalent:
	
	 • Not taking Music: $65 + 28 + 64 = 157$ and Not taking Art $75 + 65 + 14 = 154$
	    "Since $157 > 154$, there are more students not taking Music
	    than there are that are not taking Art." (*not required*)
	 or Not taking Music: $28 + 64 = 92$ and Not taking Art $75 + 14 = 89$
	    [Ignores **65**, which is common to not-Music and not-Art]
	
	 • Finds any of the above correct number not taking Music **and** not taking Art
	    Correct conclusion: **True**
	    Work is incomplete or missing
	
	 OR
	
	 ½ point: • Correct, incorrect, or missing conclusion
	    Correct procedure is shown and/or explained
	    May have **one** calculation or copy error
	    Conclusion based on the error if there is an error
	
	 • Finds any of the above correct number not taking Music **and** not taking Art
	    Incorrect or missing conclusion
	    Work is incomplete or missing

4	**1 point possible:**
	
	 1 point: Correct conclusion: **False**
	 Correct procedure is shown and/or explained
	 Give credit for the following or equivalent:
	
	 • Art but not in Business: $64 + 16 = 80$
	    and Music but not in Business: $75 + 16 = 91$
	    "Since $91 > 80$, more students are enrolled in Music but not in Business."
	    (*not required*)
	 or Art but not in Business: 64 and Music but not in Business: 75
	    [Ignores **16**, which is common to Art and Music **and**
	    references that the students are not enrolled in Business for both Art and Music]
	
	 • Finds any of the above correct number enrolled in Art but not in Business,
	    and in Music but not in Business
	    Correct conclusion: **False**
	    Work is incomplete or missing
	
	 OR
	
	 ½ point: • Correct, incorrect, or missing conclusion
	    Correct procedure is shown and/or explained
	    May have **one** calculation or copy error
	    Conclusion based on the error if there is an error
	
	 • Finds any of the above correct number enrolled in Art but not in Business,
	    and in Music but not in Business
	    Incorrect or missing conclusion
	    Work is incomplete or missing

End-of-Course Mathematics Reference Sheet

Parallelogram	Trapezoid	Arc and Sector
$P =$ sum of all sides $A = bh$	$A = \dfrac{h(b_1 + b_2)}{2}$	Arc Length $= \left(\dfrac{M}{360}\right) \times 2\pi r$ Sector area $= \left(\dfrac{M}{360}\right) \times \pi r^2$

Triangle	Rectangle	30° -60° -90°
$P =$ sum of all sides $A = \dfrac{bh}{2}$	$P = 2l + 2w$ $A = lw$	

Circle	Pythagorean Theorem	45° -45° -90°
$C = 2\pi r$ $C = \pi d$ $A = \pi r^2$ $\pi \approx 3.14$	$a^2 + b^2 = c^2$	

Rectangular Solid	Pyramid	Trigonometric Ratios
Volume $= lwh$ Surface area $= 2lw + 2lh + 2wh$	$B =$ area of base (shaded) Volume $= \dfrac{Bh}{3}$	$\sin x° = \dfrac{a}{c}$ $\cos x° = \dfrac{b}{c}$ $\tan x° = \dfrac{a}{b}$

Cylinder	Cone	Sphere
Volume $= \pi r^2 h$ Surface area $= 2\pi r h + 2\pi r^2$	$l =$ slant height Volume $= \dfrac{\pi r^2 h}{3}$ Surface area $= \pi r l + \pi r^2$	Volume $= \dfrac{4\pi r^3}{3}$ Surface area $= 4\pi r^2$

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

The Arkansas Geometry Mathematics Curriculum Framework*

Strands	Content Standards	Student Learning Expectations
1. LANGUAGE OF GEOMETRY (LG)	1. Students will develop the language of geometry including specialized vocabulary, reasoning, and application of theorems, properties, and postulates.	1. Define, compare, and contrast inductive reasoning and deductive reasoning for making predictions based on real-world situations. • Venn diagrams • matrix logic • conditional statements (statement, inverse, converse, and contrapositive) • figural patterns 2. Represent points, lines, and planes pictorially with proper identification, as well as basic concepts derived from these undefined terms, such as segments, rays, and angles. 3. Describe relationships derived from geometric figures or figural patterns. 4. Apply, with and without appropriate technology, definitions, theorems, properties, and postulates related to such topics as complementary, supplementary, vertical angles, linear pairs, and angles formed by perpendicular lines. 5. Explore, with and without proper technology, the relationship between angles formed by two lines cut by a transversal to justify when lines are parallel. 6. Give justification for conclusions reached by deductive reasoning. State and prove key basic theorems in geometry (i.e., the Pythagorean theorem, the sum of the measures of the angles of a triangle is 180°, and the line joining the midpoints of two sides of a triangle is parallel to the third side and half its length).
2. TRIANGLES (T)	2. Students will identify and describe types of triangles and their special segments. They will use logic to apply the properties of congruence, similarity, and inequalities. The students will apply the Pythagorean Theorem and trigonometric ratios to solve problems in real-world situations.	1. Apply congruence (SSS ...) and similarity (AA ...) correspondences and properties of figures to find missing parts of geometric figures, and provide logical justification. 2. Investigate the measures of segments to determine the existence of triangles (triangle inequality theorem). 3. Identify and use the special segments of triangles (altitude, median, angle bisector, perpendicular bisector, and midsegment) to solve problems. 4. Apply the Pythagorean Theorem and its converse in solving practical problems. 5. Use the special right triangle relationships (30°-60°-90° and 45°-45°-90°) to solve problems. 6. Use trigonometric ratios (sine, cosine, tangent) to determine lengths of sides and measures of angles in right triangles, including angles of elevation and angles of depression. 7. Use similarity of right triangles to express the sine, cosine, and tangent of an angle, in a right triangle, as a ratio of given lengths of sides.

*The Content Standards and Student Learning Expectations listed are those that specifically relate to the items in the *2013 Mid-Year* and *Spring End-of-Course Geometry Examinations.*

The Arkansas Geometry Mathematics Curriculum Framework*

Strands	Content Standards	Student Learning Expectations
3. MEASUREMENT (M)	3. Students will measure and compare, while using appropriate formulas, tools, and technology, to solve problems dealing with length, perimeter, area, and volume.	1. Calculate probabilities arising in geometric contexts. (Ex. Find the probability of hitting a particular ring on a dartboard.) 2. Apply, using appropriate units, appropriate formulas (area, perimeter, surface area, volume) to solve application problems involving polygons, prisms, pyramids, cones, cylinders, and spheres, as well as composite figures, expressing solutions in both exact and approximate forms. 3. Relate changes in the measurement of one attribute of an object to changes in other attributes. (Ex. How does changing the radius or height of a cylinder affect its surface area or volume?) 4. Use (given similar geometric objects) proportional reasoning to solve practical problems (including scale drawings). 5. Identify and apply properties of, and theorems about, parallel and perpendicular lines to prove other theorems and perform basic Euclidean constructions.
4. RELATIONSHIPS BETWEEN TWO- AND THREE-DIMENSIONS (R)	4. Students will analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.	1. Explore and verify the properties of quadrilaterals. 2. Solve problems using properties of polygons. • sum of the measures of the interior angles of a polygon • interior and exterior angle measure of a regular polygon or irregular polygon • number of sides or angles of a polygon 3. Identify and explain why figures tessellate. 4. Identify the attributes of the five Platonic Solids. 5. Investigate and use the properties of angles (central and inscribed), arcs, chords, tangents, and secants to solve problems involving circles. 6. Solve problems using inscribed and circumscribed figures. 7. Use orthographic drawings (top, front, side) and isometric drawings (corner) to represent three-dimensional objects. 8. Draw, examine, and classify cross-sections of three-dimensional objects. 9. Explore non-Euclidean geometries, such as spherical geometry, and identify its unique properties which result from a change in the parallel postulate.
5. COORDINATE GEOMETRY AND TRANSFORMATIONS (CGT)	5. Students will specify locations, apply transformations, and describe relationships using coordinate geometry.	1. Use coordinate geometry to find the distance between two points, the midpoint of a segment, and the slopes of parallel, perpendicular, horizontal, and vertical lines. 2. Write the equation of a line parallel to a line through a given point not on the line. 3. Write the equation of a line perpendicular to a line through a given point. 4. Write the equation of the perpendicular bisector of a line segment. 5. Determine, given a set of points, the type of figure based on its properties (parallelogram, isosceles triangle, trapezoid). 6. Write, in standard form, the equation of a circle, given a graph on a coordinate plane or the center and radius of a circle. 7. Draw and interpret the results of transformations and successive transformations on figures in the coordinate plane. • translations • reflections • rotations (90°, 180°, clockwise and counterclockwise about the origin) • dilations (scale factor)

*The Content Standards and Student Learning Expectations listed are those that specifically relate to the items in the *2013 Mid-Year* and *Spring End-of-Course Geometry Examinations.*

Mid-Year Released Geometry Items*

Strands	Content Standards
1— LANGUAGE OF GEOMETRY (LG)	1. Students will develop the language of geometry including specialized vocabulary, reasoning, and application of theorems, properties, and postulates.
2— TRIANGLES (T)	2. Students will identify and describe types of triangles and their special segments. They will use logic to apply the properties of congruence, similarity, and inequalities. The students will apply the Pythagorean Theorem and trigonometric ratios to solve problems in real-world situations.
3— MEASUREMENT (M)	3. Students will measure and compare, while using appropriate formulas, tools, and technology, to solve problems dealing with length, perimeter, area, and volume.
4— RELATIONSHIPS BETWEEN TWO- AND THREE-DIMENSIONS (R)	4. Students will analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.
5— COORDINATE GEOMETRY AND TRANSFORMATIONS (CGT)	5. Students will specify locations, apply transformations, and describe relationships using coordinate geometry.

Item	Strand	Content Standard	Student Learning Expectation
1	T	2	4
2	M	3	4
3	R	4	6
4	T	2	7
5	CGT	5	5
6	T	2	1
7	LG	1	3
8	R	4	3
9	LG	1	5
10	CGT	5	6
11	CGT	5	1
12	M	3	3
13	CGT	5	2
14	LG	1	1
15	T	2	3
16	LG	1	2
17	R	4	5
18	LG	1	4
19	T	2	2
20	M	3	1
21	R	4	9
22	CGT	5	3
23	T	2	5
24	LG	1	6
25	M	3	5
26	R	4	2
27	M	3	4
28	R	4	1
29	M	3	2
30	CGT	5	7
A	T	2	6
B	CGT	5	1
C	M	3	2

*Only the predominant Strand, Content Standard, and Student Learning Expectation are listed for the Geometry items.

PART IV ITEM CORRELATION WITH CURRICULUM FRAMEWORK

Spring Released Geometry Items*

Strands	Content Standards
1— LANGUAGE OF GEOMETRY (LG)	1. Students will develop the language of geometry including specialized vocabulary, reasoning, and application of theorems, properties, and postulates.
2— TRIANGLES (T)	2. Students will identify and describe types of triangles and their special segments. They will use logic to apply the properties of congruence, similarity, and inequalities. The students will apply the Pythagorean Theorem and trigonometric ratios to solve problems in real-world situations.
3— MEASUREMENT (M)	3. Students will measure and compare, while using appropriate formulas, tools, and technology, to solve problems dealing with length, perimeter, area, and volume.
4— RELATIONSHIPS BETWEEN TWO- AND THREE-DIMENSIONS (R)	4. Students will analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.
5— COORDINATE GEOMETRY AND TRANSFORMATIONS (CGT)	5. Students will specify locations, apply transformations, and describe relationships using coordinate geometry.

Item	Strand	Content Standard	Student Learning Expectation
1	CGT	5	3
2	CGT	5	6
3	LG	1	4
4	LG	1	6
5	R	4	5
6	T	2	5
7	LG	1	2
8	CGT	5	4
9	M	3	2
10	R	4	1
11	T	2	4
12	CGT	5	2
13	M	3	3
14	CGT	5	7
15	M	3	4
16	R	4	2
17	LG	1	5
18	M	3	2
19	R	4	8
20	R	4	6
21	T	2	3
22	R	4	7
23	R	4	3
24	T	2	1
25	LG	1	3
26	T	2	6
27	M	3	5
28	LG	1	1
29	M	3	3
30	CGT	5	1
A	R	4	7
B	LG	1	6

*Only the predominant Strand, Content Standard, and Student Learning Expectation are listed for the Geometry items.

Mid-Year Non-Released Geometry Items*

Strands	Content Standards
1— LANGUAGE OF GEOMETRY (LG)	1. Students will develop the language of geometry including specialized vocabulary, reasoning, and application of theorems, properties, and postulates.
2— TRIANGLES (T)	2. Students will identify and describe types of triangles and their special segments. They will use logic to apply the properties of congruence, similarity, and inequalities. The students will apply the Pythagorean Theorem and trigonometric ratios to solve problems in real-world situations.
3— MEASUREMENT (M)	3. Students will measure and compare, while using appropriate formulas, tools, and technology, to solve problems dealing with length, perimeter, area, and volume.
4— RELATIONSHIPS BETWEEN TWO- AND THREE-DIMENSIONS (R)	4. Students will analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.
5— COORDINATE GEOMETRY AND TRANSFORMATIONS (CGT)	5. Students will specify locations, apply transformations, and describe relationships using coordinate geometry.

Strand	Content Standard	Student Learning Expectation
CGT	5	4
M	3	4
CGT	5	7
T	2	2
T	2	5
M	3	5
LG	1	6
R	4	7
R	4	2
M	3	1
R	4	1
LG	1	4
CGT	5	5
LG	1	1
CGT	5	6
R	4	8
LG	1	2
LG	1	5
CGT	5	2
T	2	6
M	3	2
T	2	4
LG	1	3
CGT	5	1
R	4	4
T	2	1
M	3	3
R	4	5
M	3	2
T	2	3
LG	1	1
R	4	2

*Only the predominant Strand, Content Standard, and Student Learning Expectation are listed for the Geometry items.

Spring Non-Released Geometry Items*

Strands	Content Standards
1— LANGUAGE OF GEOMETRY (LG)	1. Students will develop the language of geometry including specialized vocabulary, reasoning, and application of theorems, properties, and postulates.
2— TRIANGLES (T)	2. Students will identify and describe types of triangles and their special segments. They will use logic to apply the properties of congruence, similarity, and inequalities. The students will apply the Pythagorean Theorem and trigonometric ratios to solve problems in real-world situations.
3— MEASUREMENT (M)	3. Students will measure and compare, while using appropriate formulas, tools, and technology, to solve problems dealing with length, perimeter, area, and volume.
4— RELATIONSHIPS BETWEEN TWO- AND THREE-DIMENSIONS (R)	4. Students will analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.
5— COORDINATE GEOMETRY AND TRANSFORMATIONS (CGT)	5. Students will specify locations, apply transformations, and describe relationships using coordinate geometry.

Strand	Content Standard	Student Learning Expectation
M	3	4
T	2	3
M	3	1
LG	1	1
M	3	5
R	4	2
CGT	5	7
R	4	4
T	2	1
CGT	5	1
T	2	2
LG	1	4
T	2	4
LG	1	3
T	2	7
M	3	1
LG	1	6
R	4	9
CGT	5	5
M	3	1
T	2	6
CGT	5	6
M	3	2
R	4	1
R	4	5
M	3	4
LG	1	2
T	2	5
T	2	2
CGT	5	5
LG	1	5
CGT	5	2
CGT	5	5

*Only the predominant Strand, Content Standard, and Student Learning Expectation are listed for the Geometry items.

ACTAAP

Arkansas Comprehensive Testing, Assessment, and Accountability Program

QAI-11636 Geo-RIB AR1304

QAI11636