# ACTAAP

Arkansas Comprehensive Testing, Assessment, and Accountability Program

# Released Item Booklet

## Geometry
## End-of-Course Examinations

## January and April 2009 Administrations

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**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 who had completed or were completing Geometry by the end of the first semester participated in the *Geometry Mid-Year End-of-Course Examination* in January 2009, and students who had completed or were completing Geometry by the end of the spring semester participated in the *Geometry End-of-Course Examination* in April 2009.

This Released Item Booklet for the *Geometry End-of-Course Examinations* contains test questions or items that were asked of students during the operational administrations in January 2009 and April 2009. The test items included in Parts II and III of this booklet are those items that contributed to the student performance results for that administration.

Students were given approximately an hour and a half each day of testing during the January 2009 administration and approximately two hours each day of testing during the April 2009 administration to complete assigned test sessions during the two days of 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 26 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 IV 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.

Parts V and VI of the Released Item Booklet contain 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. Parts V and VI of the Released Item Booklet provide Arkansas educators with specific information on how the *Geometry End-of-Course Examinations* 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.

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 pre-scored 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 pre-scored papers, and, in order to qualify, each reader must score in exact agreement on at least 80% of the responses and have no more than 5% non-adjacent agreement on the responses. Readers who do not score within the required rate of agreement are not allowed to score the *Geometry End-of-Course Examinations* responses.

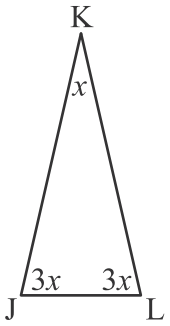
Once scoring of the actual student responses begins, readers are monitored constantly throughout the project to ensure that they are scoring according to the criteria. Daily and cumulative statistics are posted and analyzed, and the Scoring Director or Team Leaders reread selected responses scored by 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 Examinations* 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 End-of-Course Released Geometry Items

**1.** Based on the figure below, which relationship must be true?



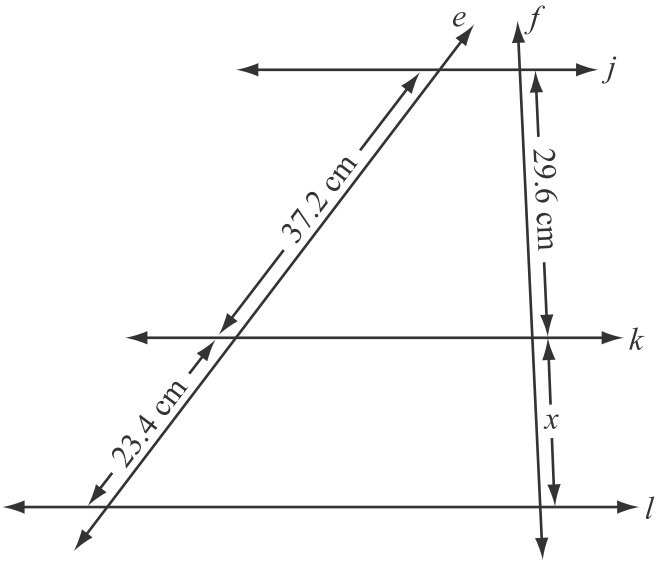

* A. JK = LK

B. JK > LK

C. JK = 3(JL)

D. JK + LK = 6(JL)

**2.** In the figure below, $j \parallel k \parallel l$.




What is the value of $x$? Round your answer to the nearest tenth.

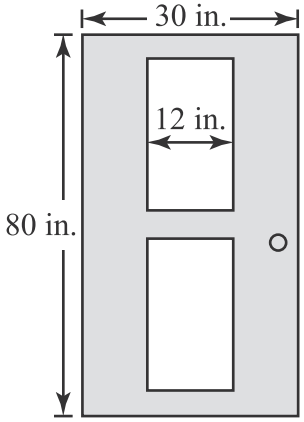
A. 13.8 cm

B. 15.8 cm

* C. 18.6 cm

D. 29.4 cm

**3.** The two picture windows on the door below are geometrically similar in shape to the door.




If the door is 30 inches wide by 80 inches in height, and each window has a width of 12 inches, what is the height of each window?

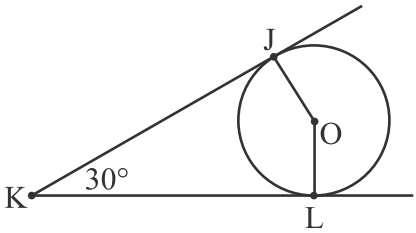
A. 4.5 inches

* B. 32.0 inches

C. 62.0 inches

D. 64.0 inches

**4.** In the figure below, $\overline{KJ}$ and $\overline{KL}$ are tangent to circle O, and m∠JKL = 30°.




What is m∠JOL?

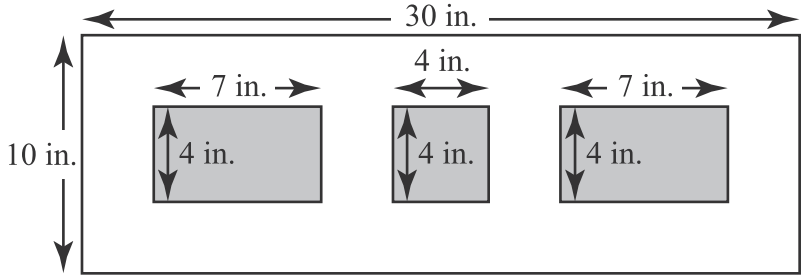
A. 50°

B. 60°

C. 120°

* D. 150°

**5.** The figure below shows a game board.




A top is spun on the game board, and points are awarded based on where the top finally stops. The edges of the board are raised so that the top will stay on the game board. If the top is equally likely to stop anywhere on the board, what is the probability that it will stop in a shaded region?

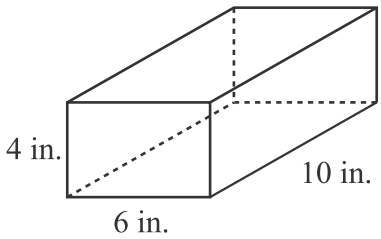
A. 14.67%

B. 18.67%

* C. 24.00%

D. 29.33%

**6.** A box manufacturer sells a shoe box that is 6 inches by 4 inches by 10 inches, as shown below.




The box manufacturer is making a larger version of the box that will be 2 inches wider, 1 inch higher, and 2 inches longer than the one above. What is the ratio of the volume of the larger box to the volume of the original box?

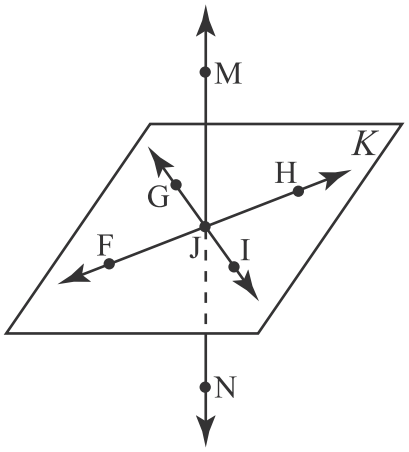
A. 1:4

* B. 2:1

C. 3:4

D. 4:1

**7.** Which is the intersection of $\overleftrightarrow{MN}$ and plane *K*?



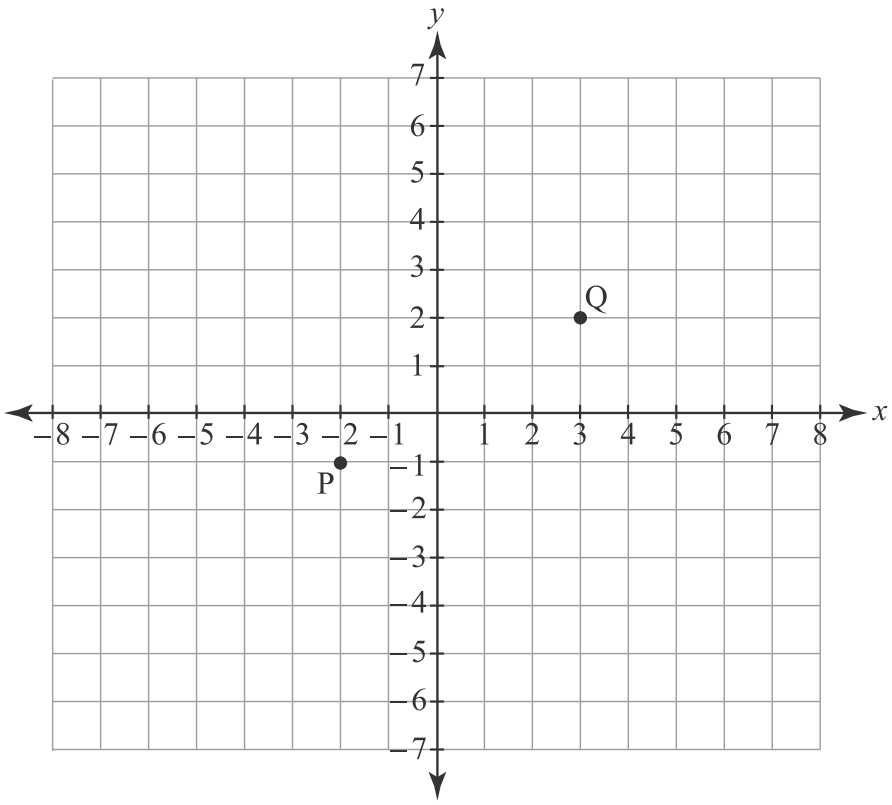

* A. point J

B. ∠HJI

C. $\overleftrightarrow{FH}$

D. $\overleftrightarrow{GI}$

**8.** Points P and Q are shown on the graph below.




Point Q is the midpoint of $\overline{PR}$. What are the coordinates of point R?

A. (0.5, 2.5)

B. (2.5, 1.5)

C. (6, 7)

* D. (8, 5)

---

**9.** Sarah is watching a monitor that shows the locations of ships in the ocean. These locations are displayed on a coordinate grid. To avoid collisions, a safety zone with a radius of 4 units is kept around each ship. Sarah notices one ship at point (–2, 3). Which equation represents the edge of the safety zone for this ship?

A. $(x - 3)^2 + (y + 2)^2 = 16$

B. $(x - 2)^2 + (y + 3)^2 = 16$

* C. $(x + 2)^2 + (y - 3)^2 = 16$

D. $(x + 3)^2 + (y - 2)^2 = 16$

**10.** Ray has four different pieces of wood measuring 1.0 foot, 1.5 feet, 2.0 feet, and 4.0 feet in length. He wants to use three of the pieces to make a triangular frame. Which length piece will Ray **not** be able to use in any combination with two of the other pieces to form a triangle?

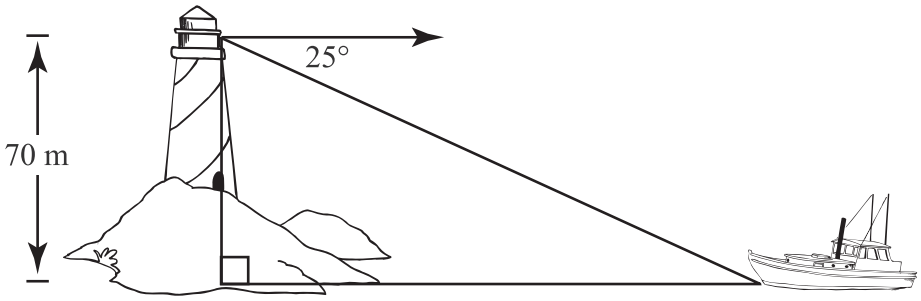
A. 1.0 foot

B. 1.5 feet

C. 2.0 feet

* D. 4.0 feet

**11.** From the observation deck of a lighthouse 70 meters above sea level, the lighthouse keeper can see a fishing boat at a 25-degree angle of depression.




What is the horizontal distance, to the nearest meter, from the base of the lighthouse to the fishing boat?

A. 32 m

B. 77 m

* C. 150 m

D. 165 m

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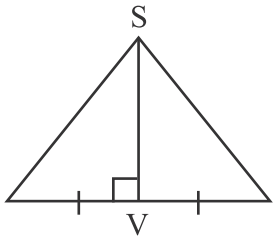
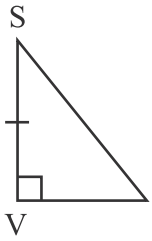
**12.** In which figure is $\overline{SV}$ a perpendicular bisector?

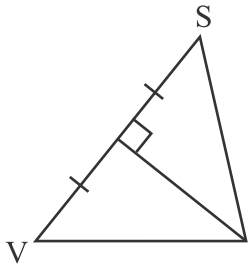
* A.



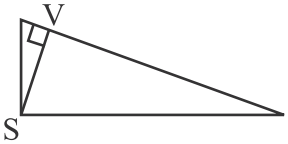

B.




C.




D.



**13.** Each figure shown below is made from equilateral triangles whose sides measure 1 cm.

Figure 1 Perimeter = 3 cm | Figure 2 Perimeter = 6 cm | Figure 3 Perimeter = 9 cm

If the pattern continues, what will be the perimeter of Figure 6?

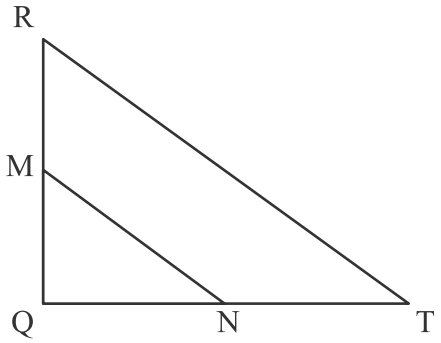
A. 12 cm

* B. 18 cm

C. 21 cm

D. 36 cm

**14.** Points M and N are the midpoints of two sides of ΔQRT.




Which statement **cannot** be proven?

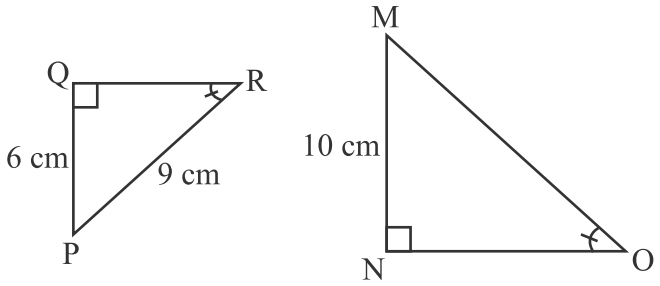
* A. $\overline{QR} \perp \overline{QT}$

B. QN = NT

C. QR = 2QM

D. ∠MNQ ≅ ∠RTQ

**15.** In the figure below, ΔPQR ~ ΔMNO, QP = 6 cm, PR = 9 cm, and MN = 10 cm.




What is the measure of $\overline{MO}$, to the nearest tenth of a centimeter?

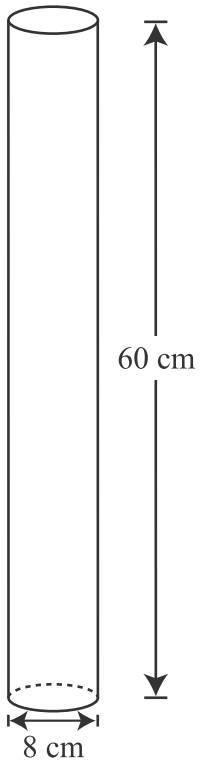
A. 5.4 cm

B. 6.7 cm

C. 10.1 cm

* D. 15.0 cm

**16.** A cardboard tube is shown below.




What is the **approximate** volume of the tube?

A. 754 cubic centimeters

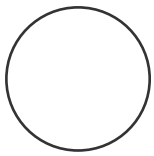
B. 1508 cubic centimeters

* C. 3016 cubic centimeters

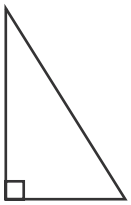
D. 12064 cubic centimeters

**17.** Which figure will **not** tessellate?

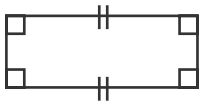
* A.



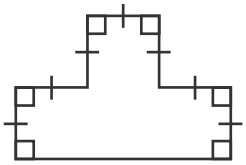
B.



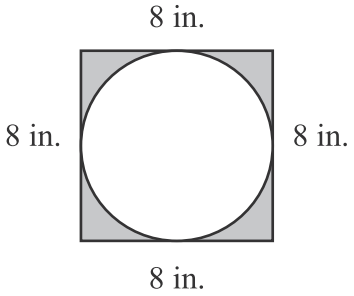
C.



D.



**18.** A book illustrator is creating a bookcover. The book will be square, and the design will have a circle that touches each of the four sides. The book will be 8 inches long on each side, as shown below.




If the illustrator colors the area outside the circle with blue ink, what area of the cover will be colored blue? Round your answer to the nearest square inch.

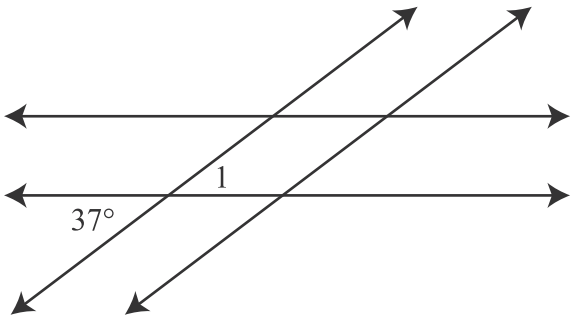
* A. 14 in.$^2$

B. 18 in.$^2$

C. 39 in.$^2$

D. 50 in.$^2$

**19.** The figure below shows the intersection of two sets of railroad tracks.




What is m∠1?

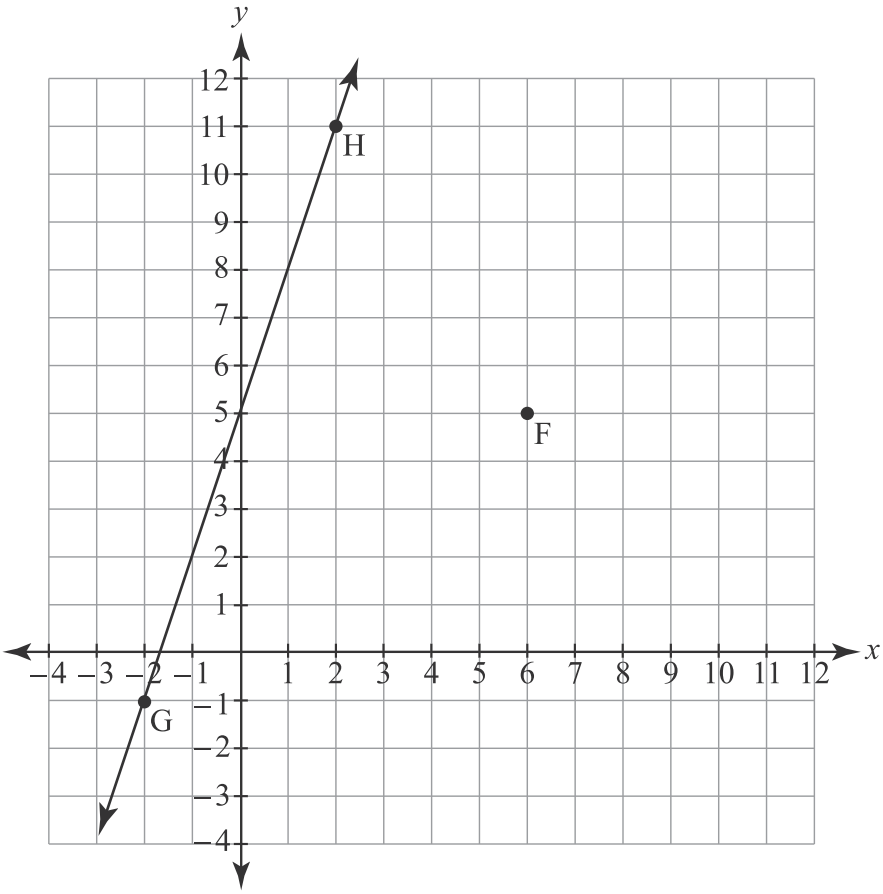
* A. 37°

B. 53°

C. 127°

D. 143°

**20.** What is the equation of the line that goes through point F and is parallel to $\overleftrightarrow{GH}$ below?



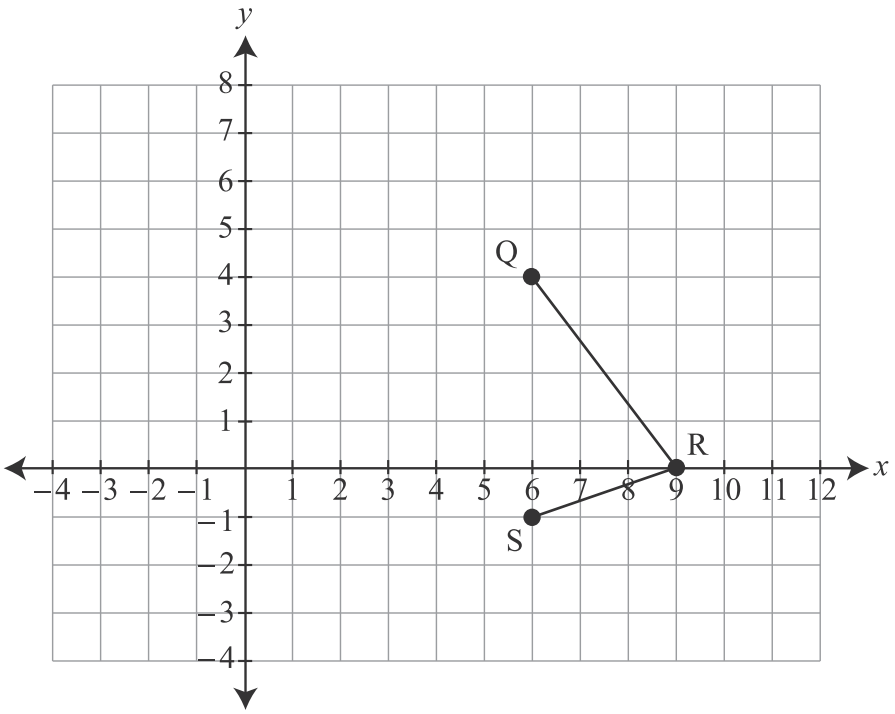

A. $y = -\frac{1}{3}x + 7$

B. $y = \frac{1}{2}x + 2$

* C. $y = 3x - 13$

D. $y = 2x - 7$

**21.** George is constructing parallelogram QRST on a coordinate plane. He has drawn the two segments, $\overline{QR}$ and $\overline{RS}$, shown on the graph below.




Next, he wants to draw the side parallel to $\overline{QR}$. What is the slope-intercept equation of the line passing through point S that is parallel to $\overline{QR}$?

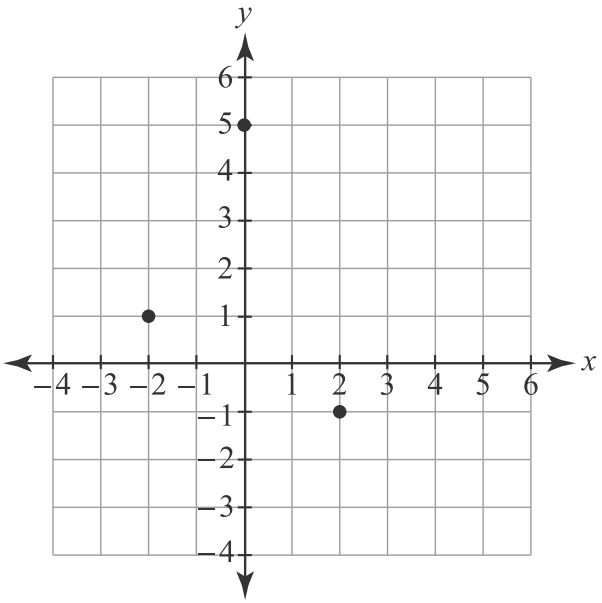
A. $y = -3x + 17$

* B. $y = -\frac{4}{3}x + 7$

C. $y = \frac{3}{4}x + \frac{11}{2}$

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

**22.** The three points shown below, (–2, 1), (0, 5), and (2, –1), are vertices of a square.




What are the coordinates of the fourth vertex?

A. (3, 3)

B. (3, 4)

* C. (4, 3)

D. (5, 0)

**23.** Mr. Brown's art project for his seniors was to design plans for their dream house. He instructed all of the students to use the scale of $\frac{1}{4}$ inch = 1 foot for the dimensions. Devin wants the bedroom in his dream house to be 12.5 feet by 18 feet. What should be the dimensions on the scale drawing of his bedroom? Round your answer to the nearest hundredth of an inch.

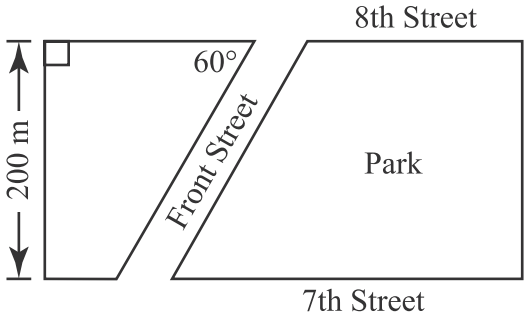
* A. 3.13 inches by 4.50 inches

B. 5.00 inches by 7.20 inches

C. 12.25 inches by 17.75 inches

D. 50.00 inches by 72.00 inches

**24.** The figure below shows part of a map.




How long is the block of Front Street from 7th Street to 8th Street? Round your answer to the nearest meter.

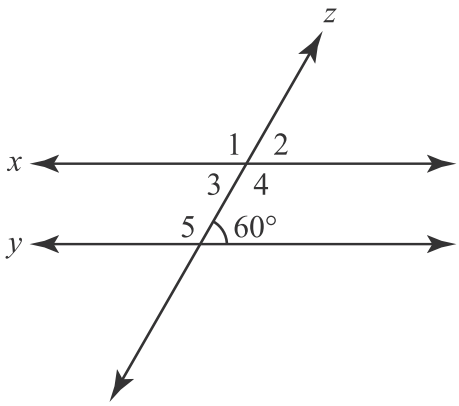
A. 173 m

* B. 231 m

C. 346 m

D. 400 m

**25.** In the figure below, which would prove $x \| y$?



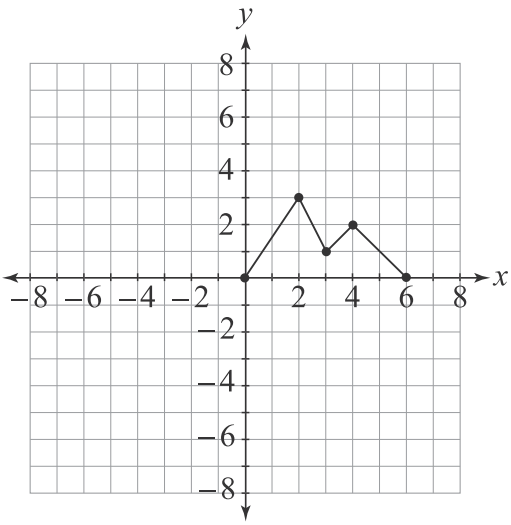

A. m∠1 = 60°

* B. m∠2 = 60°

C. m∠3 = 120°

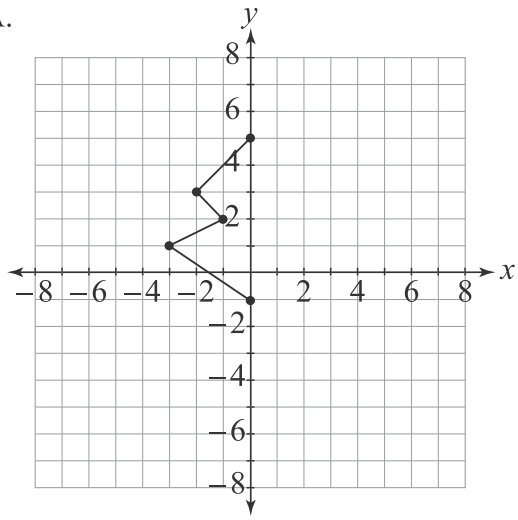
D. m∠5 = 120°

**26.** The figure graphed below is rotated 90° clockwise about the origin and translated up 1 unit.

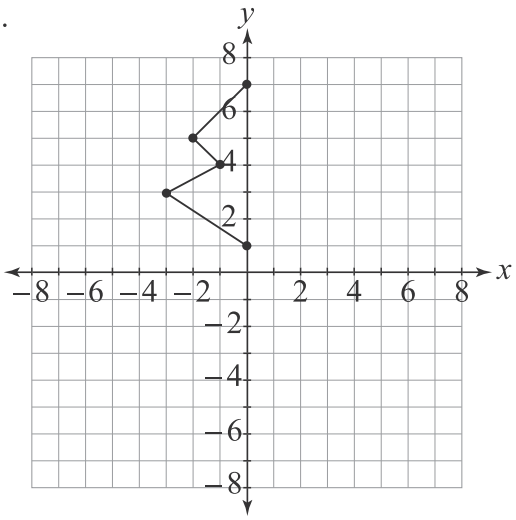



Which is the resulting image?

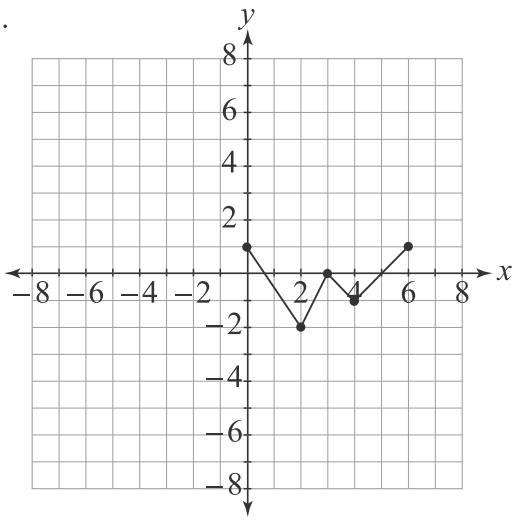
A.



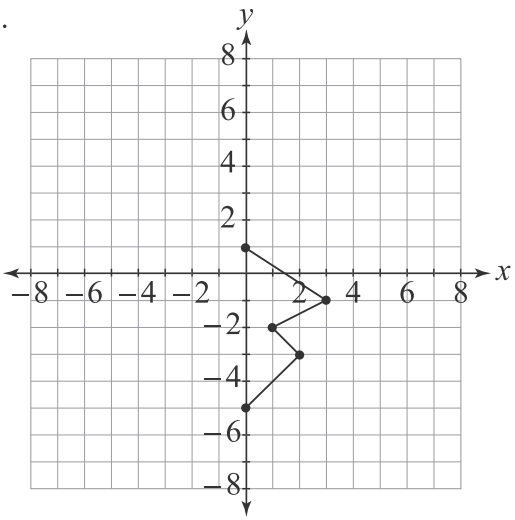

B.



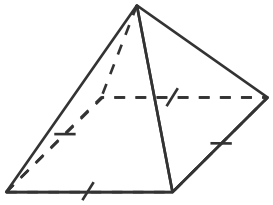

C.




* D.



**27.** The figure below is intersected by a plane parallel to its base.



What shape is the cross section?

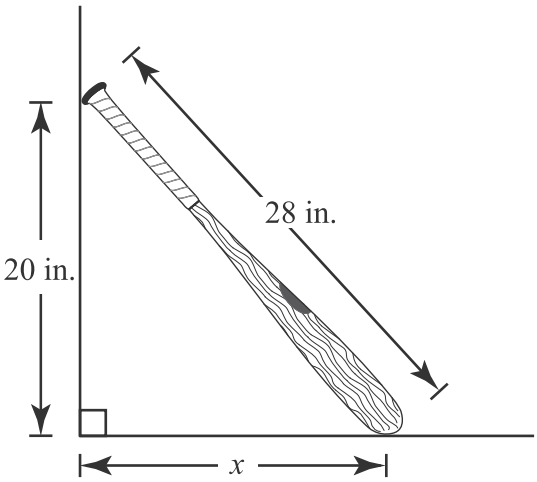
A. pentagon

B. hexagon

C. triangle

* D. square

**28.** Greg leaned his baseball bat against a wall after his game. The bat is 28 inches long and touches the wall 20 inches above the ground, as shown in the figure below.




What is the distance, $x$, from the bottom of the wall to the point where Greg's baseball bat touches the ground? Round your answer to the nearest tenth of an inch.

A. 6.9 inches

* B. 19.6 inches

C. 27.6 inches

D. 34.4 inches

**29.** A dodecahedron is a Platonic solid made of 12 pentagons. How many pentagons meet at each vertex?

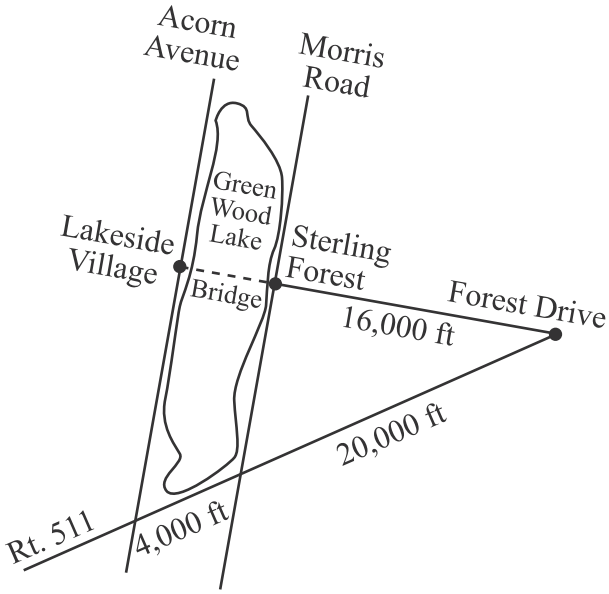
* A. 3

B. 5

C. 10

D. 12

**30.** The map below shows the area surrounding Green Wood Lake. Morris Road and Acorn Avenue run parallel to one another and are separated by Green Wood Lake.




Sterling Forest and Lakeside Village plan to build a bridge over the lake to connect their towns. What is the length of the bridge? Round your answer to the nearest hundred feet.

A. 2,700 feet

* B. 3,200 feet

C. 5,000 feet

D. 80,000 feet

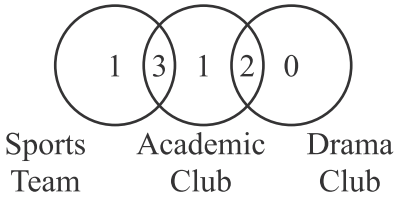
**31.** Ten students have each joined two activities, as shown in the table below.

| Student | Activity 1 | Activity 2 |
|---|---|---|
| Will | Sports Team | Sports Team |
| Lin | Sports Team | Drama Club |
| Emma | Sports Team | Academic Club |
| Jake | Academic Club | Academic Club |
| Hannah | Drama Club | Academic Club |
| Arial | Sports Team | Academic Club |
| Cherie | Drama Club | Sports Team |
| Josh | Sports Team | Academic Club |
| Alexis | Drama Club | Academic Club |
| Matt | Drama Club | Sports Team |

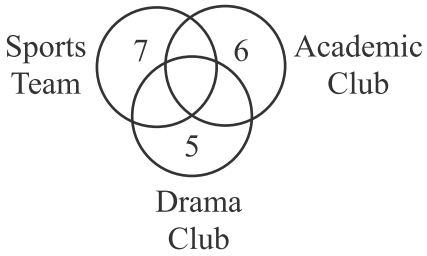
Which Venn diagram shows the distribution of students in the activities?

A.

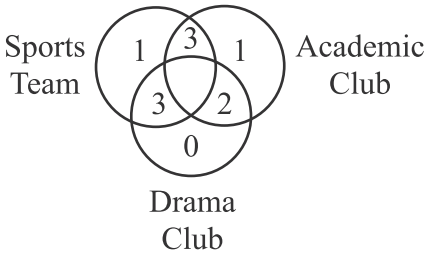
B.



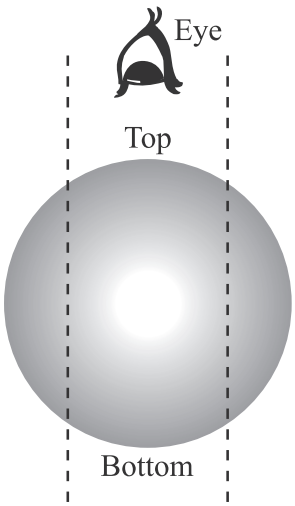

C.



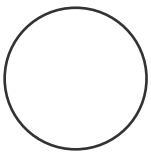

* D.

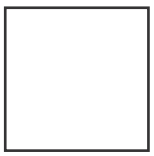


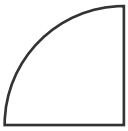
**32.** Michelle has a foam sphere with a radius of six inches. She slices the sphere with two vertical cuts parallel to each other as shown below.

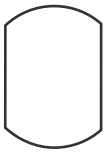



The cut left and right sides of the sphere are disposed. Which is the orthographic view from the top of the remaining portion of the sphere?

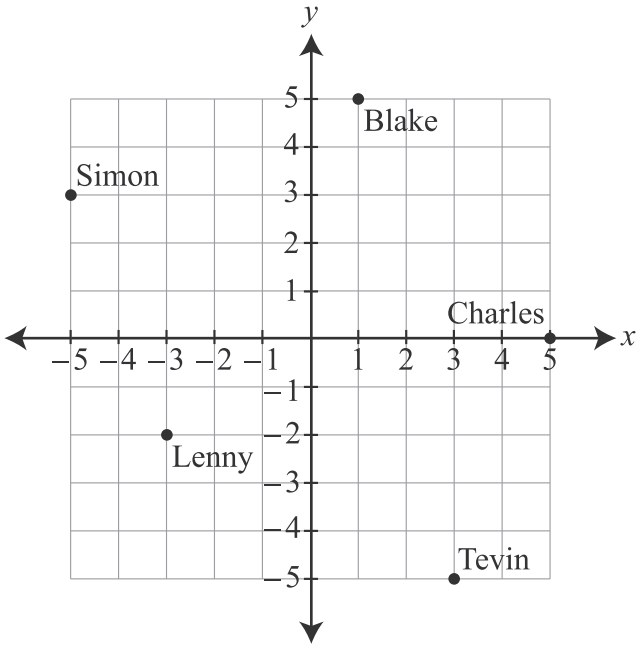
A. 

B. 

C. 

* D. 

**33.** Blake used a coordinate grid to show the locations of his house and his four friends' houses, as shown below.




How far away on the coordinate grid is Blake's house from Lenny's house? Round your answer to the nearest tenth.

A. 2.2 units

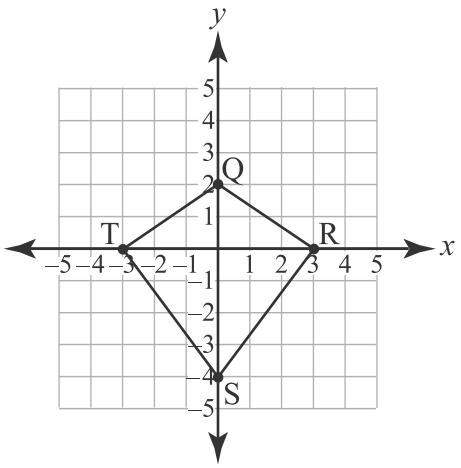
B. 3.6 units

* C. 8.1 units

D. 8.5 units

# PART III End-of-Course Released Geometry Items

**1.** Quadrilateral QRST is shown below.




What type of quadrilateral is QRST?

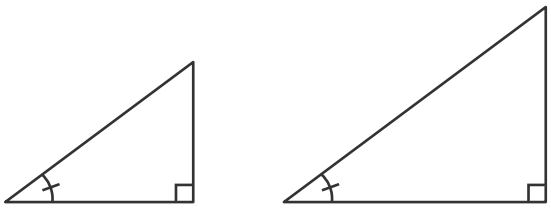
* A. kite

B. rhombus

C. rectangle

D. trapezoid

**2.** Jamal wants to build two ramps to use as bike jumps. The side views of the ramps are shown below.



Ramp 1 Ramp 2

Both ramps will have the same launch angle. What can be said about the side views of the two ramps?

* A. They are similar triangles.

B. They are isosceles triangles.

C. They are congruent triangles.

D. They are equilateral triangles.

**3.** Chloe is using different colored tiles to decorate a wall. In her pattern, the blue tile is next to the green tile, the yellow tile is between the blue tile and the red tile, and the white tile is next to and on the left of the green tile. What is the order of the tiles, from left to right?

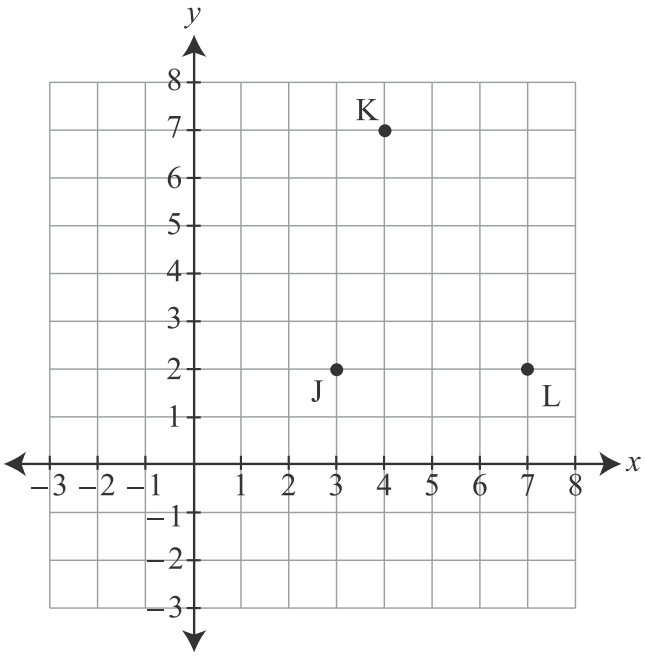
A. blue, green, yellow, red, white

B. red, yellow, blue, green, white

C. red, yellow, blue, white, green

* D. white, green, blue, yellow, red

**4.** Points J, K, and L, shown below, are the vertices of a triangle.




Which is the description of the triangle?

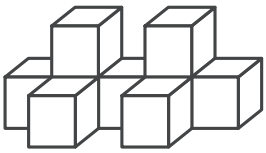
A. a right triangle

* B. a scalene triangle

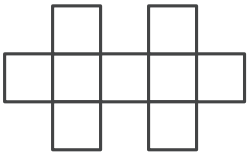
C. an isosceles triangle

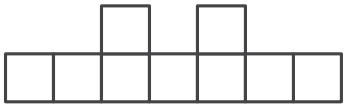
D. an equilateral triangle

**5.** Keith built the figure shown below using nine cubes.

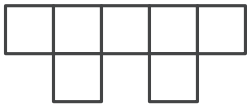


Which of the following would be the top view?

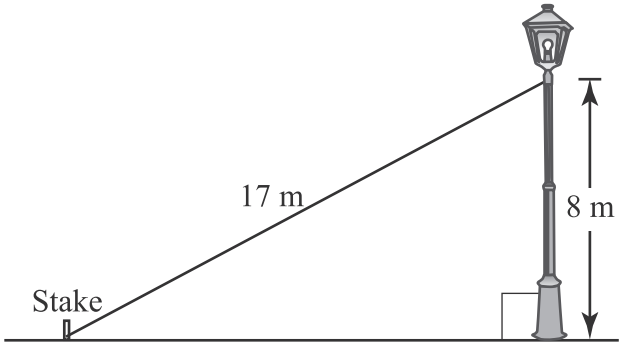
A. 

B. 

C.

* D. 

**6.** Dave has 17 meters of wire that he attaches to a lamppost 8 meters above its base, as shown below. The other end of the wire will attach to a stake in the ground.




If Dave fully extends the wire from the lamppost to the stake, how far from the base of the lamppost will the stake be? Round your answer to the nearest whole number.

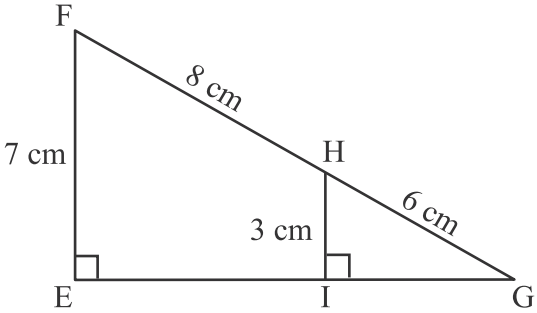
A. 8 meters

B. 9 meters

* C. 15 meters

D. 19 meters

**7.** In the figure below, FH = 8 cm, HG = 6 cm, EF = 7 cm, and IH = 3 cm.




What is sin(G)?

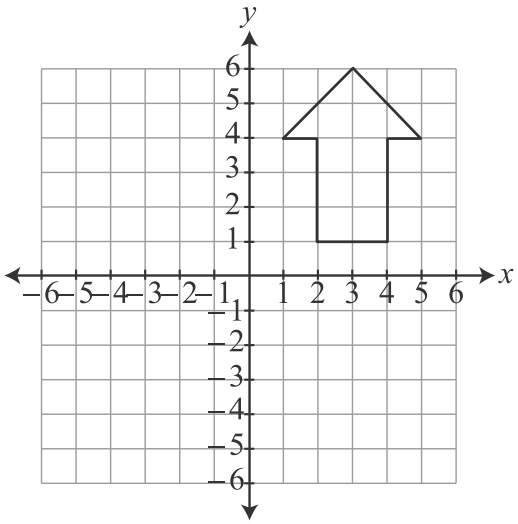
A. $\frac{1}{5}$

* B. $\frac{1}{2}$

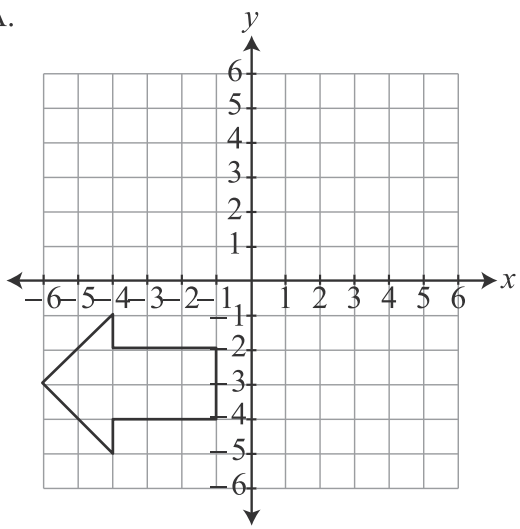
C. $\frac{3}{4}$

D. $\frac{7}{8}$

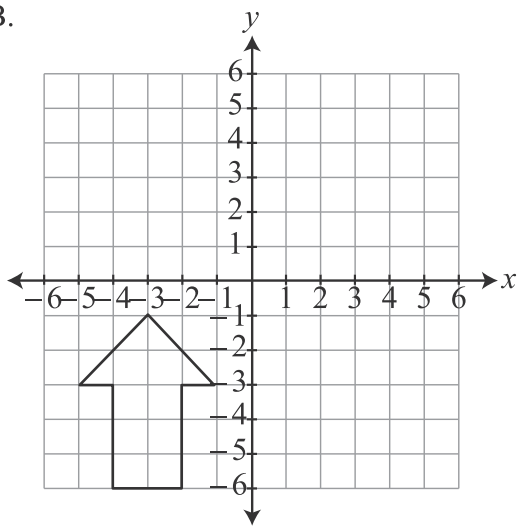
**8.** Which image will result from the figure below being rotated 90° clockwise about the origin and then reflected across the *y*-axis?



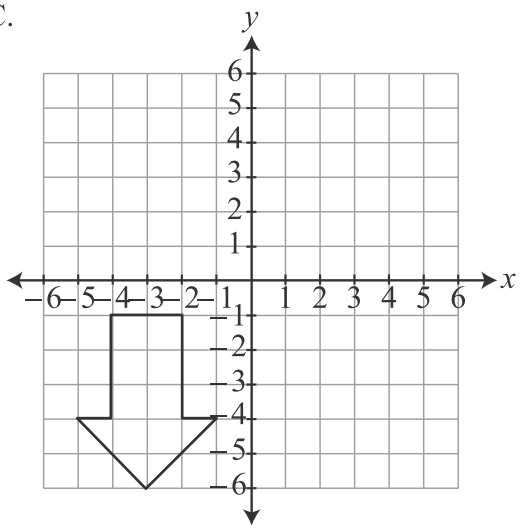

* A.



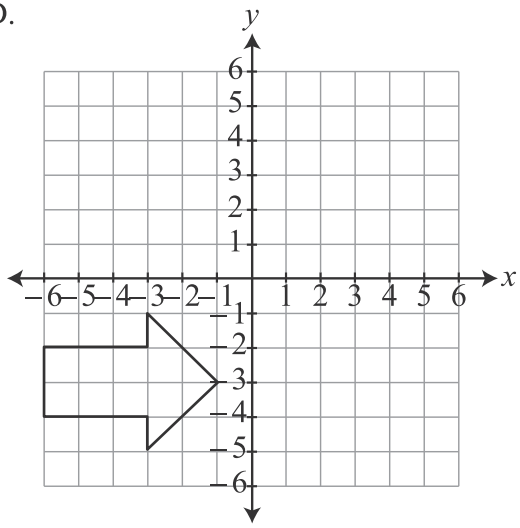

B.




C.




D.



**9.** If the pattern below continues, how many small squares will be in Figure 8?

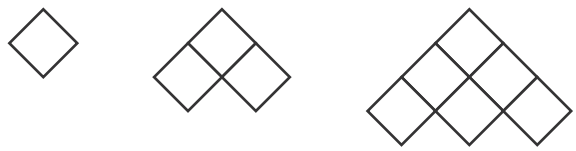


Figure 1 Figure 2 Figure 3

* A. 36

B. 33

C. 27

D. 22

**10.** Which of the following is an example of a Platonic solid?

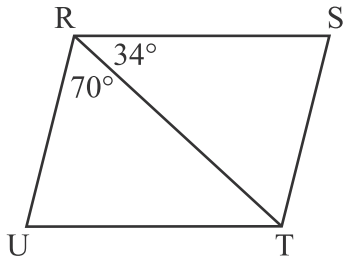
A. cone

* B. cube

C. square pyramid

D. triangular prism

**11.** In the figure below, RSTU is a parallelogram.




What is m∠S?

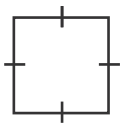
A. 34°

B. 70°

* C. 76°

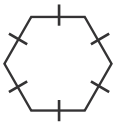
D. 104°

**12.** Which figure does **not** tessellate on a plane?

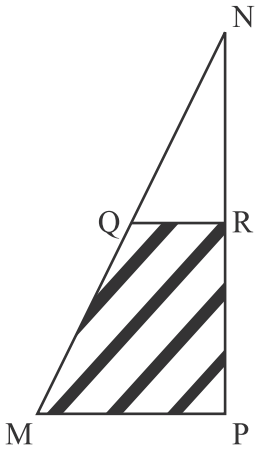
A. 

B.

* C.

D. 

**13.** Tyler's sailboat has a triangular sail, as shown below.




Point Q is the midpoint of $\overline{MN}$, and point R is the midpoint of $\overline{NP}$. What does $\overline{QR}$ represent in ΔMNP?

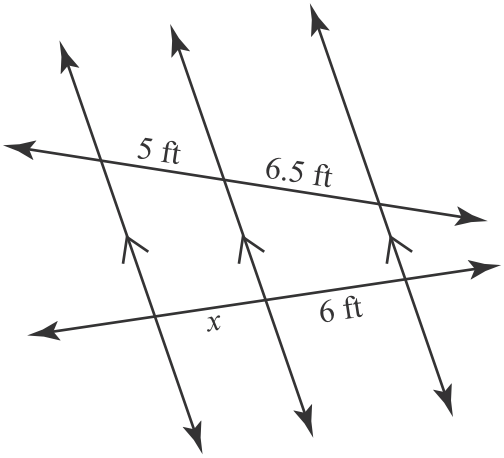
A. the altitude

B. the median

C. the midpoint

* D. the midsegment

**14.** The figure below shows the pathways between booths in a section of the school fair. The distances between select pathways are shown.




Rounded to the nearest tenth of a foot, what is the value of $x$?

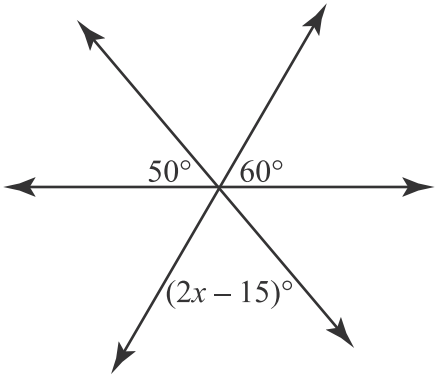
* A. 4.6 feet

B. 5.4 feet

C. 5.5 feet

D. 7.8 feet

**15.** What is the value of $x$ in the figure below?




A. 37.5

* B. 42.5

C. 47.5

D. 62.5

**16.** Nira is creating a game board with a coordinate grid. She has drawn a road whose endpoints are at (21, 15) and (53, 39). Nira wants to place a game piece so that it is at the midpoint of the road. What are the coordinates of the midpoint?

A. (16, 12)

B. (18, 46)

C. (27, 37)

* D. (37, 27)

**17.** A forest fire is estimated to have started at point S, located at (7, 5) on a map of the forest. The burned area has a radius of approximately 13 miles. What is the equation of the circle representing the area burned by the fire?

A. $(x - 5)^2 + (y - 7)^2 = 13$

B. $(x + 5)^2 + (y + 7)^2 = 13$

* C. $(x - 7)^2 + (y - 5)^2 = 169$

D. $(x + 7)^2 + (y + 5)^2 = 169$

**18.** Which of the following must be true using deductive reasoning?

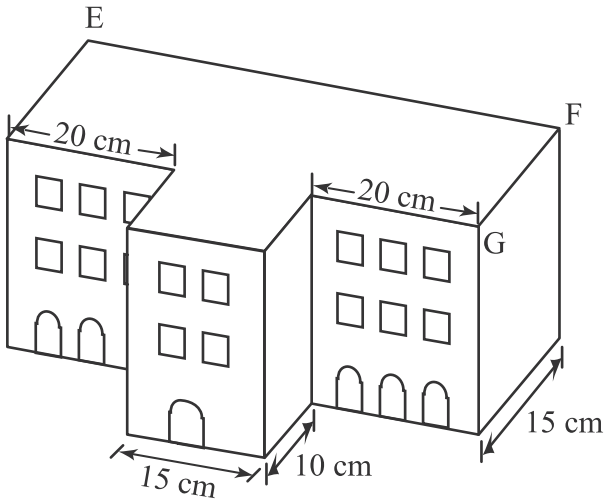
A. Dogs have four legs. Pierre has four legs. Pierre is a dog.

B. People have two legs. Jaquine has two legs. Jaquine is a person.

C. A chef cooks food. Alfred cooks food. Alfred is a chef.

* D. A polygon with three sides is a triangle. Polygon E has three sides. Polygon E is a triangle.

**19.** The figure below is a scale model of a proposed school building.




If edge $\overline{FG}$ on the actual building will have a length of 30 meters, how long will edge $\overline{EF}$ measure on the actual building?

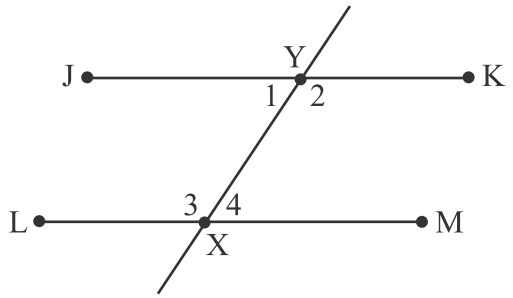
A. 40 m

B. 80 m

C. 100 m

* D. 110 m

**20.** Which would be sufficient to prove $\overline{JK} \parallel \overline{LM}$?



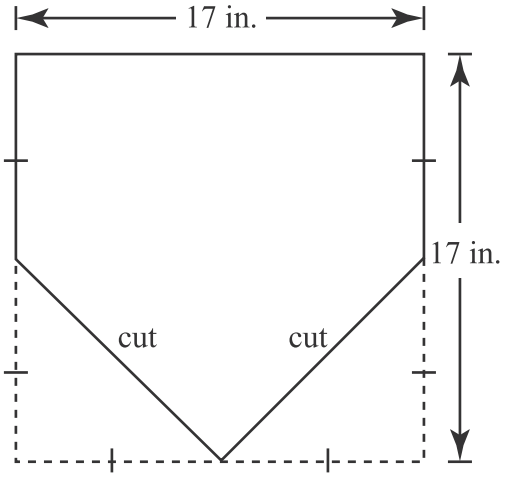

* A. $m\angle 2 = m\angle 3$

B. $m\angle 2 = m\angle 4$

C. $m\angle 1 + m\angle 3 = 90°$

D. $m\angle 2 + m\angle 3 = 180°$

**21.** Diane constructed a wooden home plate for her softball team. She started with a square with sides measuring 17 inches, found the midpoints of three sides, and cut off two corners, as shown below.




What portion of her original square was **not** used?

A. $\frac{1}{8}$

* B. $\frac{1}{4}$

C. $\frac{1}{2}$

D. $\frac{3}{4}$

**22.** Kristen is designing a triangular ramp so she can practice jumps with her bike. She has three pieces of wood. Which could be the possible measurements of these three pieces?

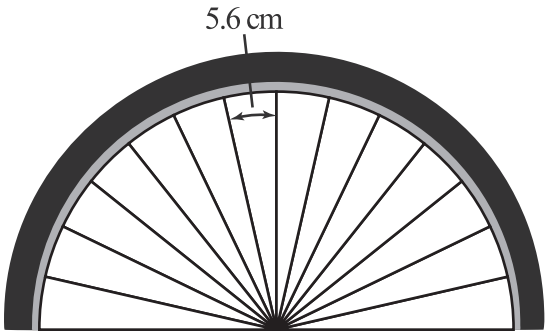
A. 2 feet, 5 feet, 9 feet

B. 3 feet, 4 feet, 8 feet

* C. 3 feet, 6 feet, 8 feet

D. 4 feet, 5 feet, 9 feet

**23.** A wheel is being made with spokes that are 25 cm long, as shown in the figure below. The spokes meet at the center of the wheel and will be separated so that there is 5.6 cm along the curved part of the wheel between any two ends of a spoke.




What is the central angle between any two consecutive spokes? Round your answer to the nearest degree.

* A. 13°

B. 14°

C. 26°

D. 28°

**24.** The slope-intercept form of a line is $y = \frac{2}{3}x + 2$. Which line is parallel to the given line?

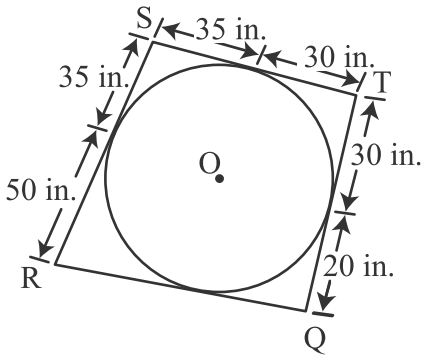
A. $y = \frac{1}{3}x + 2$

* B. $y = \frac{2}{3}x - 3$

C. $y = \frac{3}{2}x - \frac{2}{3}$

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

**25.** Circle O is inscribed in quadrilateral QRST, as shown below.




What is RQ?

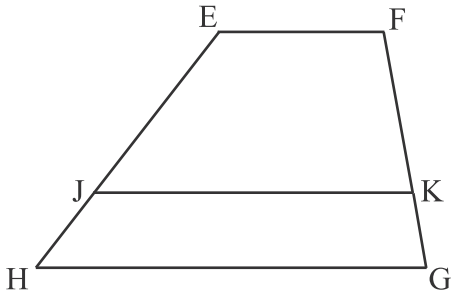
A. 50 in.

B. 65 in.

* C. 70 in.

D. 85 in.

**26.** In trapezoid EFGH below, $\overline{EF} \parallel \overline{JK} \parallel \overline{HG}$, JE = 15 cm, FK = 12 cm, and HJ = 5.5 cm.




What is GK?

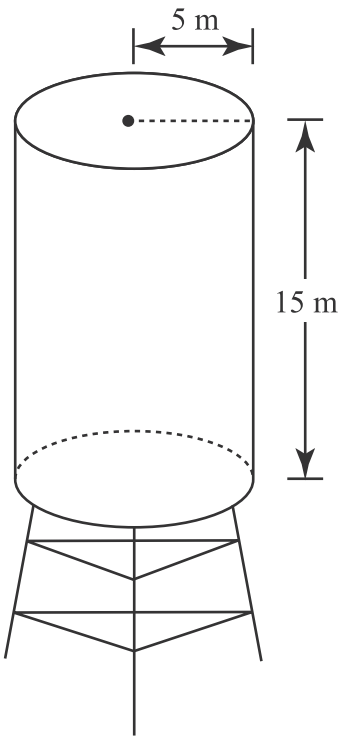
A. 2.5 cm

* B. 4.4 cm

C. 6.9 cm

D. 8.5 cm

**27.** A cylindrical water tower with a height of 15 m and a radius of 5 m is shown in the figure below.




What is the largest volume of water that the tower can hold? Round your answer to the nearest cubic meter.

A. 236 $m^3$

B. 375 $m^3$

* C. 1178 $m^3$

D. 3533 $m^3$

**28.** The equation of a circle is:

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

Which point is the center of the circle?

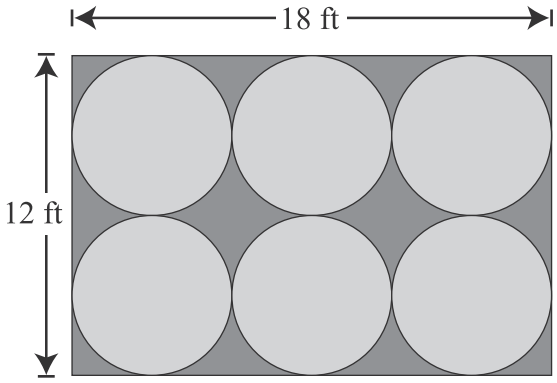
A. (–3, 1)

B. (–1, 3)

* C. (1, –3)

D. (3, –1)

**29.** The outdoor garden of the Municipal Building has six circular grass areas, as shown below.




A ball is dropped from a hot air balloon and lands somewhere in the rectangular garden. If the ball is equally likely to land anywhere in the garden, what is the probability that it lands on any of the circular grass areas? Express your answer as a decimal rounded to the nearest hundredth.

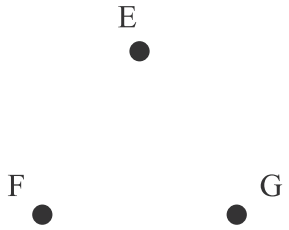
A. 0.13

B. 0.21

C. 0.52

* D. 0.79

**30.** Which can be identified using all three points E, F, and G?



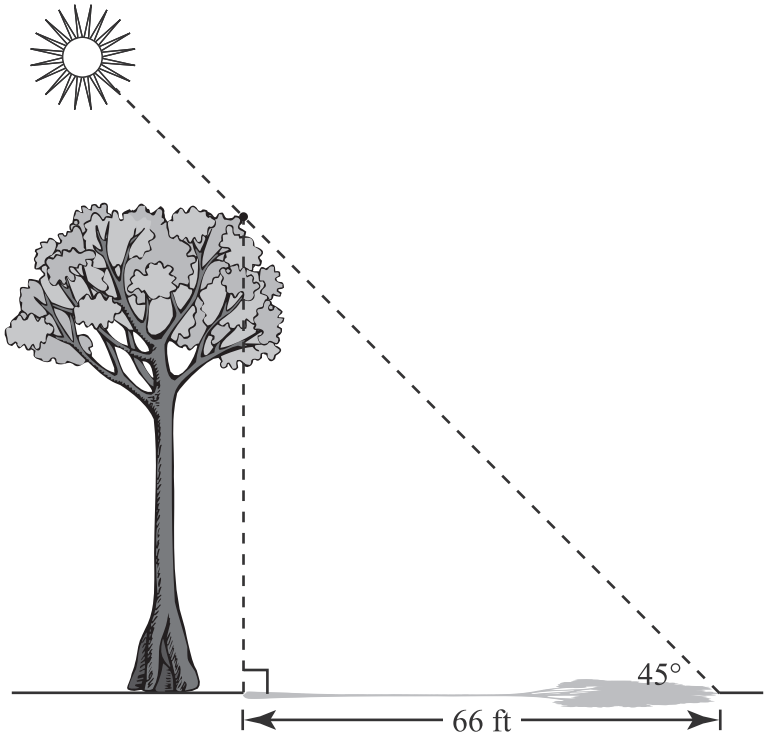

A. a ray

* B. a plane

C. a chord

D. a line segment

**31.** When the Sun is at an elevation of 45°, a tree casts a shadow 66 feet in length, as shown in the figure below.




How tall is the tree?

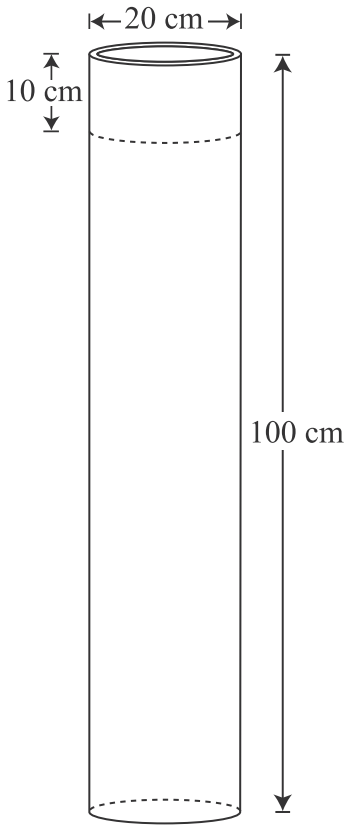
* A. 66 feet

B. $44\sqrt{3}$ feet

C. $66\sqrt{2}$ feet

D. $66\sqrt{3}$ feet

**32.** Concrete columns are made by pouring the wet mixture into waxed cardboard tubes. These tubes are sold with neither a top nor a bottom circular face.




A construction worker saws 10 centimeters off of a column-casting tube. By how much has she decreased the tube's surface area? Round your answer to the nearest square centimeter.

* A. 628 square centimeters

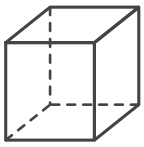
B. 1246 square centimeters

C. 3142 square centimeters

D. 5655 square centimeters

**33.** Which figure does **not** have triangular cross sections?

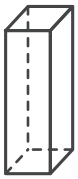
A.



B.

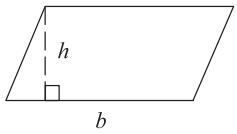
* C.

D.



# End-of-Course Mathematics Reference Sheet

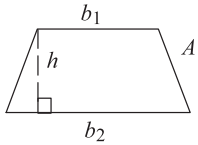
**Parallelogram**




$P =$ sum of all sides

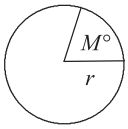
$A = bh$

**Trapezoid**




$A = \frac{h(b_1 + b_2)}{2}$

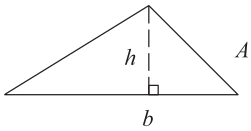
**Arc and Sector**




Arc Length $= \left(\frac{M}{360}\right) \times 2\pi r$

Sector area $= \left(\frac{M}{360}\right) \times \pi r^2$

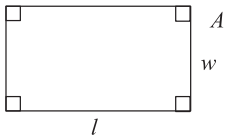
**Triangle**




$P =$ sum of all sides

$A = \frac{bh}{2}$

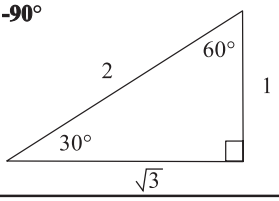
**Rectangle**



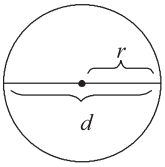

$P = 2l + 2w$

$A = l\,w$

**30° -60° -90°**




**Circle**




$C = 2\pi r$

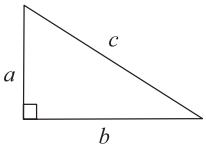
$C = \pi d$

$A = \pi r^2$

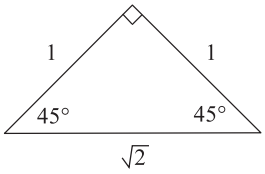
$\pi \approx 3.14$

**Pythagorean Theorem**

$a^2 + b^2 = c^2$

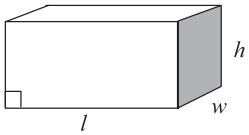



**45° -45° -90°**




**Rectangular Solid**

Volume $= lwh$

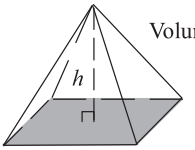



Surface area $= 2lw + 2lh + 2wh$

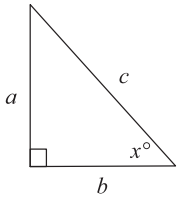
**Pyramid**

$B =$ *area of base (shaded)*

Volume $= \frac{Bh}{3}$




**Trigonometric Ratios**

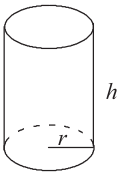



$\sin x° = \frac{a}{c}$

$\cos x° = \frac{b}{c}$

$\tan x° = \frac{a}{b}$

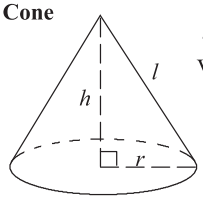
**Cylinder**




Volume $= \pi r^2 h$

Surface area $= 2\pi rh + 2\pi r^2$

**Cone**

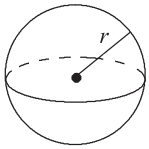



$l =$ slant height

Volume $= \frac{\pi r^2 h}{3}$

Surface area $= \pi rl + \pi r^2$

**Sphere**




Volume $= \frac{4\pi r^3}{3}$

Surface area $= 4\pi r^2$

**Miscellaneous Formulas**

| | |
|---|---|
| Area of an equilateral triangle | $A = \frac{s^2\sqrt{3}}{4}$ $\quad s =$ length of a side |
| Distance | rate × time |
| Interest | principal × rate × 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 | $\left(\frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2}\right)$ |
| 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<br>Last term of a geometric series (where $n \geq 1$) | $a_n = a + (n - 1)d$<br>$a_n = ar^{n-1}$ |
| 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 | $A = \frac{1}{2}ap$ $\quad a =$ apothem, $p =$ perimeter |

# PART IV Curriculum Framework

## 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.<br>• Venn diagrams<br>• matrix logic<br>• conditional statements (statement, inverse, converse, and contrapositive)<br>• figural patterns<br>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.<br>3. Describe relationships derived from geometric figures or figural patterns.<br>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.<br>5. Explore, with and without appropriate technology, the relationship between angles formed by two lines cut by a transversal to justify when lines are parallel.<br>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 it's 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.<br>2. Investigate the measures of segments to determine the existence of triangles (triangle inequality theorem).<br>3. Identify and use the special segments of triangles (altitude, median, angle bisector, perpendicular bisector, and midsegment) to solve problems.<br>4. Apply the Pythagorean Theorem and its converse in solving practical problems.<br>5. Use the special right triangle relationships (30°-60°-90° and 45°-45°-90°) to solve problems.<br>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.<br>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 released test items in this document.

## The Arkansas Geometry Mathematics Curriculum Framework* (continued)

| 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.)<br>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.<br>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?)<br>4. Use (given similar geometric objects) proportional reasoning to solve practical problems (including scale drawings).<br>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.<br>2. Solve problems using properties of polygons.<br>• sum of the measures of the interior angles of a polygon<br>• interior and exterior angle measure of a regular polygon or irregular polygon<br>• number of sides or angles of a polygon<br>3. Identify and explain why figures tessellate.<br>4. Identify the attributes of the five Platonic Solids.<br>5. Investigate and use the properties of angles (central and inscribed), arcs, chords, tangents, and secants to solve problems involving circles.<br>6. Solve problems using inscribed and circumscribed figures.<br>7. Use orthographic drawings (top, front, side) and isometric drawings (corner) to represent three-dimensional objects.<br>8. Draw, examine, and classify cross-sections of three-dimensional objects. |
| 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.<br>2. Write the equation of a line parallel to a line through a given point not on the line.<br>3. Write the equation of a line perpendicular to a line through a given point.<br>4. Write the equation of the perpendicular bisector of a line segment.<br>5. Determine, given a set of points, the type of figure based on its properties (parallelogram, isosceles triangle, trapezoid).<br>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.<br>7. Draw and interpret the results of transformations and successive transformations on figures in the coordinate plane.<br>• translations<br>• reflections<br>• rotations (90°, 180°, clockwise and counterclockwise about the origin)<br>• dilations (scale factor) |

*The Content Standards and Student Learning Expectations listed are those that specifically relate to the released test items in this document.

# PART V Mid-Year End-of-Course Item Correlation with Curriculum Framework

## Released Items for Mid-Year End-of-Course Geometry*

| 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 | R | 4 | 2 |
| 2 | M | 3 | 5 |
| 3 | M | 3 | 4 |
| 4 | R | 4 | 5 |
| 5 | M | 3 | 1 |
| 6 | M | 3 | 3 |
| 7 | LG | 1 | 2 |
| 8 | CGT | 5 | 1 |
| 9 | CGT | 5 | 6 |
| 10 | T | 2 | 2 |
| 11 | T | 2 | 6 |
| 12 | T | 2 | 3 |
| 13 | LG | 1 | 3 |
| 14 | LG | 1 | 6 |
| 15 | T | 2 | 1 |
| 16 | M | 3 | 2 |
| 17 | R | 4 | 3 |
| 18 | R | 4 | 6 |
| 19 | LG | 1 | 4 |
| 20 | CGT | 5 | 2 |
| 21 | CGT | 5 | 2 |
| 22 | CGT | 5 | 5 |
| 23 | M | 3 | 4 |
| 24 | T | 2 | 5 |
| 25 | LG | 1 | 5 |
| 26 | CGT | 5 | 7 |
| 27 | R | 4 | 8 |
| 28 | T | 2 | 4 |
| 29 | R | 4 | 4 |
| 30 | M | 3 | 5 |
| 31 | LG | 1 | 1 |
| 32 | R | 4 | 7 |
| 33 | CGT | 5 | 1 |

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

# PART V Mid-Year End-of-Course Item Correlation with Curriculum Framework

## Non-Released Items for Mid-Year End-of-Course Geometry*

| 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 | LG | 1 | 1 |
| 3 | T | 2 | 4 |
| 4 | CGT | 5 | 7 |
| 5 | T | 2 | 5 |
| 6 | R | 4 | 1 |
| 7 | CGT | 5 | 5 |
| 8 | LG | 1 | 5 |
| 9 | R | 4 | 6 |
| 10 | R | 4 | 2 |
| 11 | R | 4 | 7 |
| 12 | M | 3 | 5 |
| 13 | LG | 1 | 4 |
| 14 | T | 2 | 3 |
| 15 | LG | 1 | 2 |
| 16 | M | 3 | 1 |
| 17 | T | 2 | 7 |
| 18 | LG | 1 | 3 |
| 19 | M | 3 | 3 |
| 20 | CGT | 5 | 4 |
| 21 | R | 4 | 1 |
| 22 | M | 3 | 2 |
| 23 | CGT | 5 | 6 |
| 24 | T | 2 | 6 |
| 25 | LG | 1 | 6 |
| 26 | M | 3 | 4 |
| 27 | T | 2 | 1 |
| A | CGT | 5 | 5 |
| B | LG | 1 | 1 |
| C | M | 3 | 2 |
| D | R | 4 | 6 |
| E | T | 2 | 5 |

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

# PART VI End-of-Course Item Correlation with Curriculum Framework

## Released Items for End-of-Course Geometry*

| 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 | 5 |
| 2 | T | 2 | 1 |
| 3 | LG | 1 | 1 |
| 4 | CGT | 5 | 5 |
| 5 | R | 4 | 7 |
| 6 | T | 2 | 4 |
| 7 | T | 2 | 7 |
| 8 | CGT | 5 | 7 |
| 9 | LG | 1 | 3 |
| 10 | R | 4 | 4 |
| 11 | R | 4 | 1 |
| 12 | R | 4 | 3 |
| 13 | T | 2 | 3 |
| 14 | M | 3 | 5 |
| 15 | LG | 1 | 4 |
| 16 | CGT | 5 | 1 |
| 17 | CGT | 5 | 6 |
| 18 | LG | 1 | 6 |
| 19 | M | 3 | 4 |
| 20 | LG | 1 | 5 |
| 21 | M | 3 | 2 |
| 22 | T | 2 | 2 |
| 23 | R | 4 | 5 |
| 24 | CGT | 5 | 2 |
| 25 | R | 4 | 6 |
| 26 | M | 3 | 5 |
| 27 | M | 3 | 2 |
| 28 | CGT | 5 | 6 |
| 29 | M | 3 | 1 |
| 30 | LG | 1 | 2 |
| 31 | T | 2 | 5 |
| 32 | M | 3 | 3 |
| 33 | R | 4 | 8 |

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

# PART VI End-of-Course Item Correlation with Curriculum Framework

## Non-Released Items for End-of-Course Geometry*

| 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 | M | 3 | 1 |
| 2 | R | 4 | 8 |
| 3 | M | 3 | 4 |
| 4 | LG | 1 | 5 |
| 5 | M | 3 | 3 |
| 6 | CGT | 5 | 5 |
| 7 | M | 3 | 2 |
| 8 | LG | 1 | 2 |
| 9 | T | 2 | 1 |
| 10 | LG | 1 | 6 |
| 11 | T | 2 | 5 |
| 12 | CGT | 5 | 3 |
| 13 | R | 4 | 3 |
| 14 | LG | 1 | 3 |
| 15 | M | 3 | 4 |
| 16 | T | 2 | 4 |
| 17 | CGT | 5 | 1 |
| 18 | LG | 1 | 4 |
| 19 | R | 4 | 5 |
| 20 | CGT | 5 | 1 |
| 21 | T | 2 | 3 |
| 22 | LG | 1 | 1 |
| 23 | CGT | 5 | 7 |
| 24 | R | 4 | 3 |
| 25 | T | 2 | 2 |
| 26 | T | 2 | 6 |
| 27 | R | 4 | 7 |
| A | LG | 1 | 1 |
| B | CGT | 5 | 1 |
| C | R | 4 | 2 |
| D | T | 2 | 6 |
| E | M | 3 | 2 |

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

ACTAAP

**Arkansas Comprehensive Testing, Assessment, and Accountability Program**

DEVELOPED FOR THE ARKANSAS DEPARTMENT OF EDUCATION, LITTLE ROCK, AR 72201

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