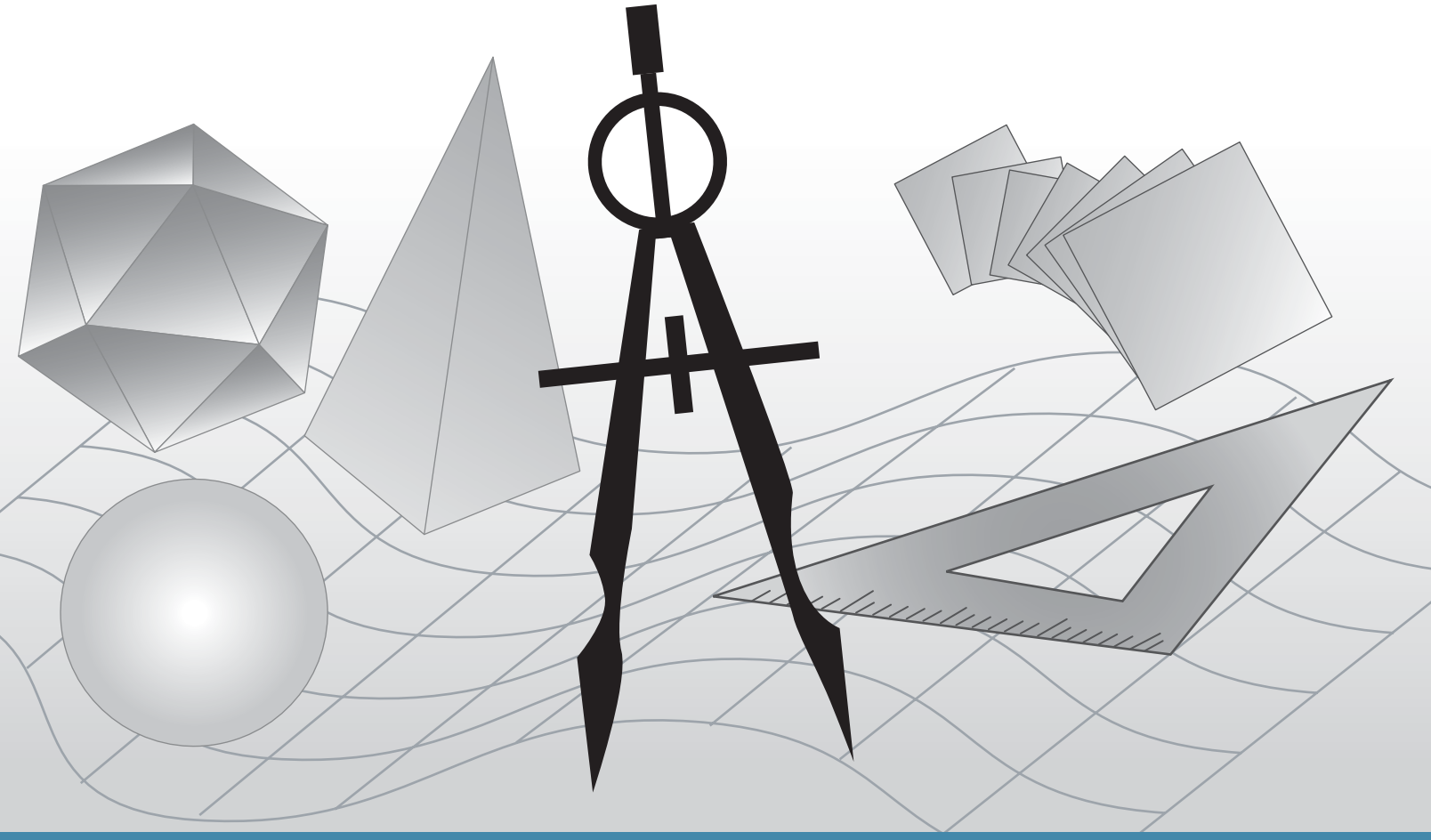
HSA

Maryland High School Assessment

Maryland State Department of Education

Achievement Matters Most



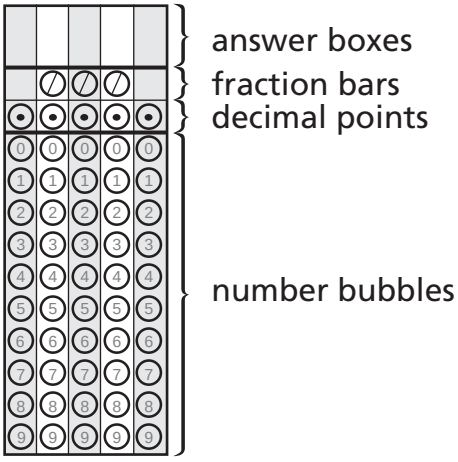
GEOMETRY

Public Release, Fall 2004

Session 1

Response Grid Questions

Several questions in this test require you to enter your answer on a special grid like the one shown below.



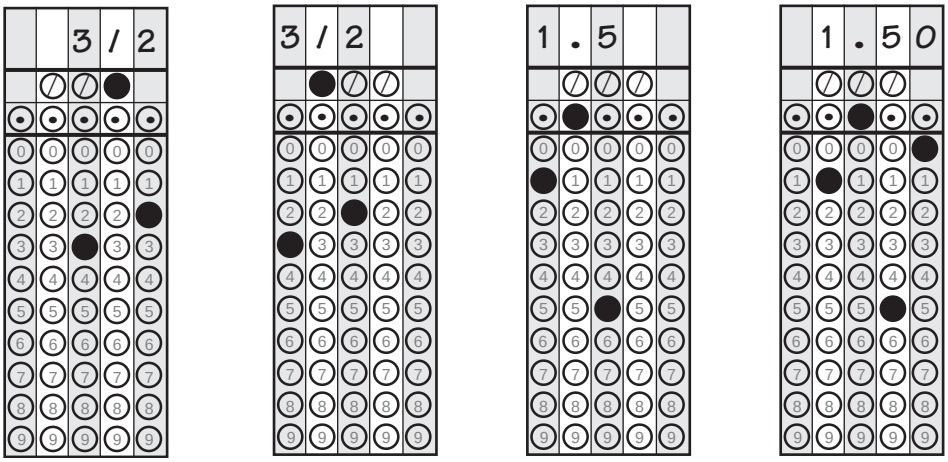
Directions for Completing the Response Grids

1. Find the answer to the problem.
2. Write your answer in the boxes at the top of the grid.
   - Print your answer with the first digit (or symbol) in the left answer box, or with the last digit in the right answer box.
   - Print no more than one digit or symbol in each answer box. Do **not** leave a blank answer box in the middle of an answer.
   - Be sure to write a decimal point or fraction bar in the answer box if it is part of the answer.
3. Fill in the appropriate bubble under each box in which you wrote your answer.
   - Fill in only one bubble for each answer box used in your answer. Do **not** fill in a bubble under an unused answer box.
   - You must fill in the bubbles accurately to receive credit for your answer.

GO ON

Examples of Valid Responses

The Response Grids below show valid ways to enter an answer of $\frac{3}{2}$.



Special Directions for Mixed Numbers, Decimals, Negative Numbers, and Percents

- Mixed numbers must be entered as decimals or improper fractions. For example, an answer of $1\frac{1}{2}$ should be entered as 1.5 or $\frac{3}{2}$.
- Decimal answers should be entered as accurately as possible unless otherwise indicated in the problem. Some answers may need to be rounded in order to fit in the Response Grid space.
- No Response Grid questions have negative answers.
- Percents must be entered as decimals or fractions. For example, an answer of 50% should be entered as .5 or $\frac{1}{2}$.

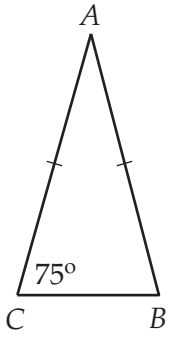
GO ON

Directions

Use the Response Grid in the Answer Book to complete Sample A.

Sample A

Triangle *ABC* is isosceles with $m\angle C = 75°$.

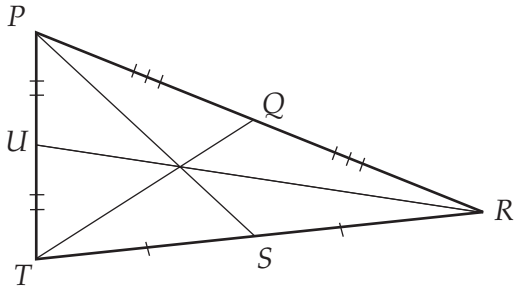


Note: The figure is not drawn to scale.

What is the measure, in degrees, of $\angle B$?

Sample B

Triangle *PRT* is shown below.



Which of these statements must be true about triangle *PRT*?

A $\overline{PQ} \cong \overline{QR}$

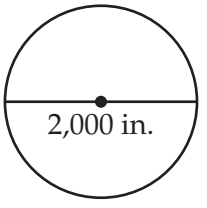
B $\overline{PS} \cong \overline{TQ}$

C $\angle PTQ \cong \angle RTQ$

D $\angle TPR \cong \angle PTR$

Sample C

Look at the circle shown below.



What is the circumference of the circle? Round the answer to the nearest inch.

F 3,142 inches

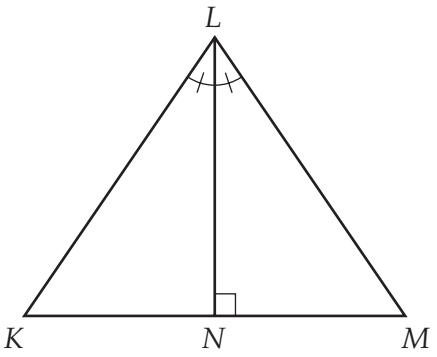
G 6,283 inches

H 3,141,593 inches

J 12,566,371 inches

STOP

1 $\overline{LN}$ **is the perpendicular bisector of** $\overline{KM}$**.** $\overline{LN}$ **also bisects** $\angle KLM$**, as shown in the diagram below.**



What type of triangle must ΔKLM **be?**

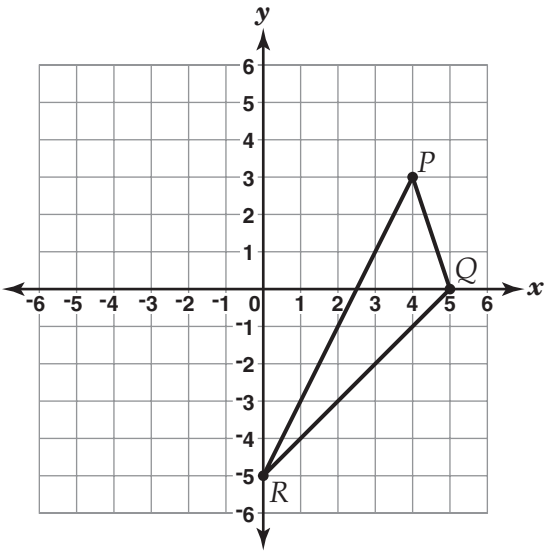
A right

B equilateral

C scalene

D isosceles

2 **Triangle** PQR **is shown below.**



What is the image of point Q **after a rotation of 90° counterclockwise about the origin?**

F (0, 5)

G (−5, 0)

H (0, −5)

J (5, 0)

3 **A boat travels in a straight line from (0, 0) to (12, 30). What are the coordinates of the boat when it is halfway to its destination?**

A (0, 15)

B (6, 30)

C (15, 6)

D (6, 15)

4 **A cylindrical can has a base with a radius of 5 centimeters. The surface area of the can is 500 square centimeters. What is the height of the can? Round the answer to the nearest centimeter.**

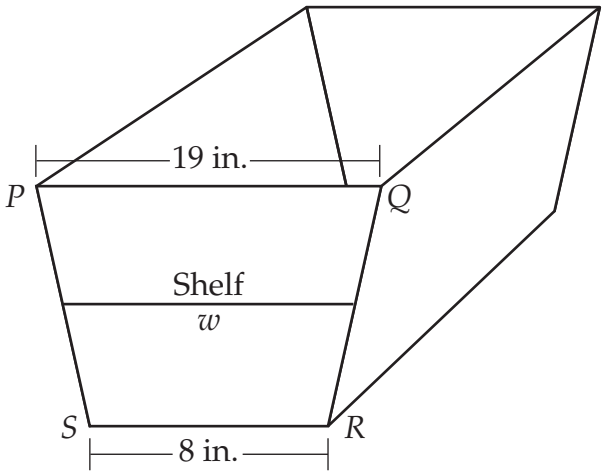
F 6 centimeters

G 11 centimeters

H 16 centimeters

J 22 centimeters

5 **Shannon is making a box. One of the faces, *PQRS*, is an isosceles trapezoid with the measurements shown below. Shannon wants to put a shelf in the middle to hold plants.**



Note: The figure is not drawn to scale.

What is the width (w) of the shelf?

A $9\frac{1}{2}$ inches

B 11 inches

C $13\frac{1}{2}$ inches

D 16 inches

6 **BCR**

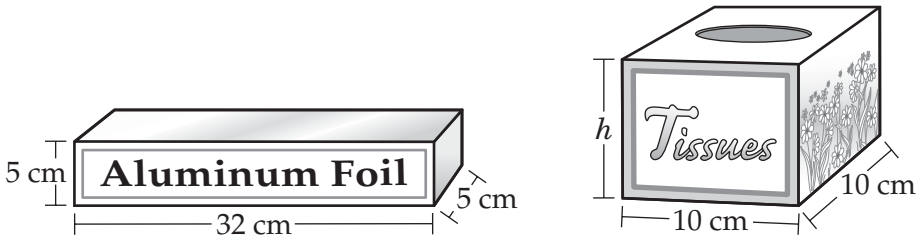
The Smiths designed their family room to measure 16 feet by 20 feet. They designed a guest room to have proportional dimensions with an area of 80 square feet.

Complete the following in the Answer Book:

- **What are the dimensions of the guest room? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.**

GO ON

7 **A box of aluminum foil and a box of tissues are rectangular prisms, as shown below. They have the same volumes.**



Note: The figures are not drawn to scale.

What is the height (*h*) of the tissue box?

A 4 centimeters

B 8 centimeters

C 16 centimeters

D 64 centimeters

8 **What is the length of the line segment connecting the points (⁻6, 7) and (4, 9)? Round the answer to the nearest tenth of a unit.**

F 10.2 units

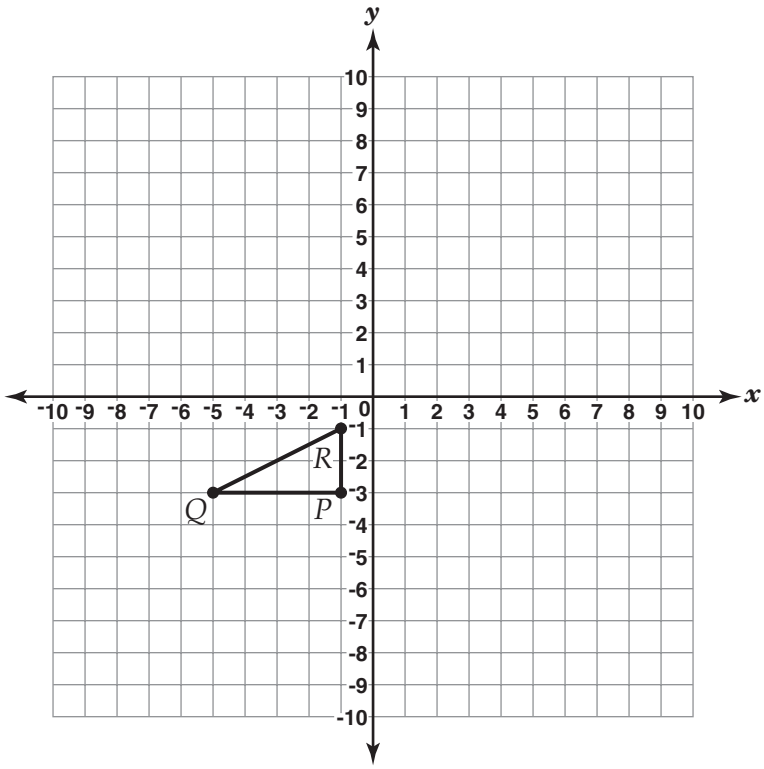
G 13.9 units

H 15.3 units

J 16.1 units

GO ON

9 **Triangle *PQR* is shown below. Triangle *PQR* will be mapped to its image *P′Q′R′*. This will be done by increasing each of its *x*-coordinates by 5.**



Which term best describes the transformation?

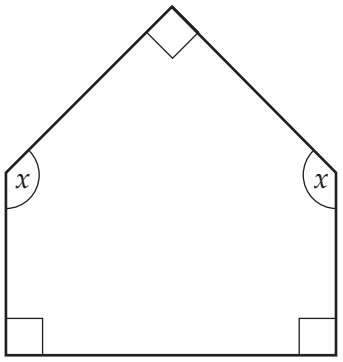
A dilation

B reflection

C rotation

D translation

10 **In the game of baseball, home plate is shaped like a pentagon, as shown below. Three of the angles are 90° angles, and the other two angles are congruent to each other.**



Note: The figure is not drawn to scale.

What is the measure (x) of each of the other two angles?

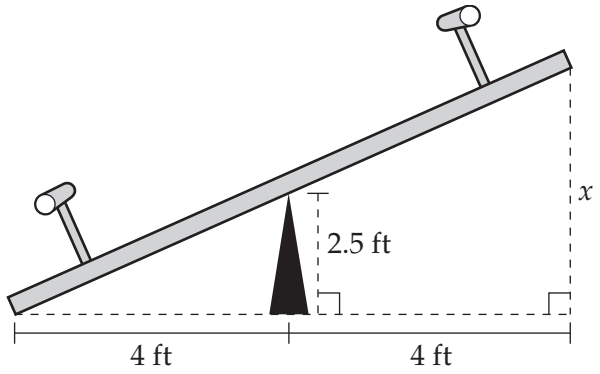
F 45°

G 108°

H 135°

J 270°

11 **Kathryn designs a see-saw, as shown below.**



Note: The figure is not drawn to scale.

What is the maximum height (x) that the see-saw will reach?

A 2.5 feet

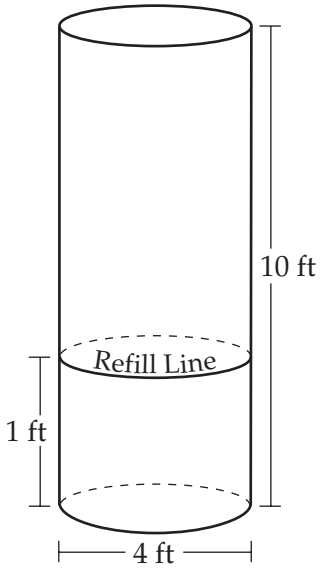
B 5.0 feet

C 6.4 feet

D 8.0 feet

GO ON

12 ECR **A cylindrical tank is shown below. The tank is refilled when the water level reaches the refill line.**



Note: The figure is not drawn to scale.

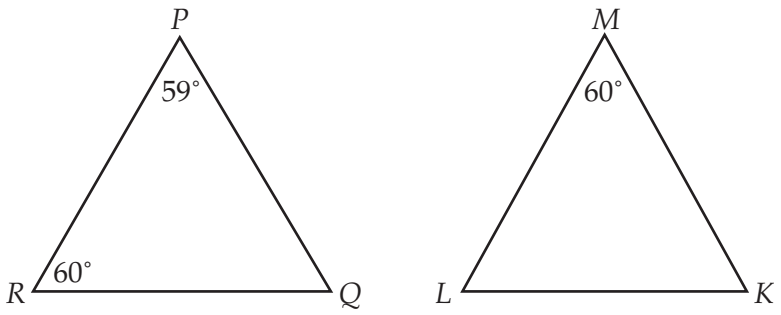
Complete the following in the Answer Book:

- **How much water can the entire tank hold? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.**
- **At the beginning of the day the tank is full. How much water can be removed from the tank before it is necessary to refill the tank? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.**

Directions

Use the Response Grids in the Answer Book to complete Numbers 13 through 16.

13 **Two triangles are shown below. $\Delta PQR \cong \Delta LKM$.**

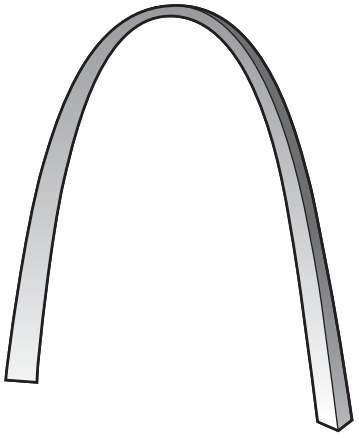


Note: The figures are not drawn to scale.

What is the measure, in degrees, of $\angle K$?

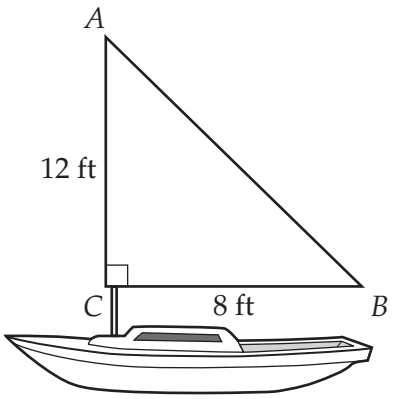
14 **A stack of paper has a volume of 280.5 cubic inches. Each sheet of paper in the stack measures 8.5 inches by 11 inches and is 0.004 inch thick. How many sheets of paper are in this stack?**

15 **The height of the St. Louis Gateway Arch is 630 feet. A miniature version of the St. Louis Gateway Arch is sold as a souvenir. The scale factor of the real arch to the souvenir arch is 2,520:1.**



What is the height, in inches, of the souvenir arch?

16 **The mainsail of a boat is shown below.**

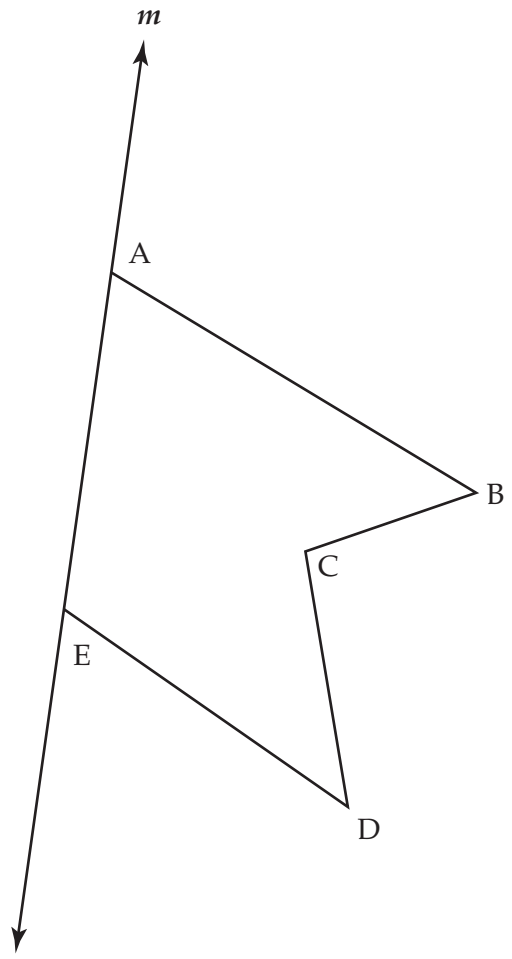


Note: The figure is not drawn to scale.

What is the length, in feet, of $\overline{AB}$?

17 **BCR**

Look at figure *ABCDE* below.

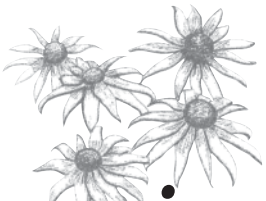


Complete the following in the Answer Book:

- **Draw the reflection of figure *ABCDE* over line *m*. Label the corresponding vertices *A′B′C′D′E′*.**
- **What is the relationship between $\angle ABC$ and $\angle A'B'C'$? Use mathematics to justify your answer.**

STOP

No test material on this page



Session 2

18 **A rectangle with area A and perimeter P is cut into two congruent pieces. Which of these must be true?**

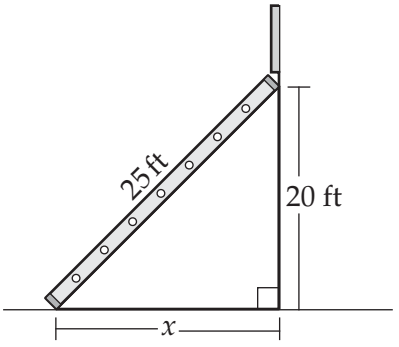
F Each piece has area $\frac{A}{2}$.

G Each piece is a triangle.

H Each piece is a rectangle.

J Each piece has perimeter $\frac{P}{2}$.

19 **A firefighter placed a 25-foot ladder against the side of a house. The top of the ladder is 20 feet above the ground, as shown below.**



Note: The figure is not drawn to scale.

What is the distance (x) between the base of the ladder and the house?

A 5 feet

B 14 feet

C 15 feet

D 32 feet

20 **Look at the statements below:**

If a triangle has a right angle, then it is a right triangle.

If a triangle is a right triangle, then it has two acute angles.

In $\triangle PQR$, $m\angle Q = 90°$.

Which of these statements must be true?

F $m\angle P = m\angle R$

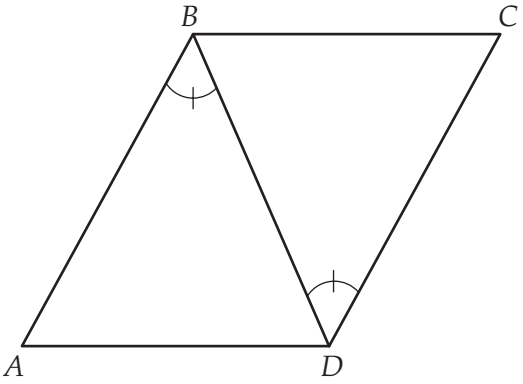
G $\angle P$ is obtuse

H $\angle P$ and $\angle Q$ are acute

J $\angle P$ and $\angle R$ are acute

21 **ECR**

In the figure below, ΔABD and ΔCDB are isosceles triangles. The vertex angles, $\angle ABD$ and $\angle CDB$, are congruent as shown below.



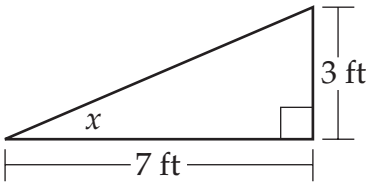
Note: The figure is not drawn to scale.

Complete the following in the Answer Book:

- **Prove that quadrilateral *ABCD* is a parallelogram.**

22

Ralph and Sara built the ramp shown below for a skateboard competition.



Note: The figure is not drawn to scale.

What is the angle of elevation (x) of the ramp? Round the answer to the nearest degree.

F 23°

G 25°

H 65°

J 67°

23

Earth has a diameter of approximately 8,000 miles. Jupiter's diameter is approximately 88,000 miles. How many times greater is the volume of Jupiter than the volume of Earth?

A 11

B 256

C 512

D 1,331

24 **Which of these transformations in the coordinate plane can change the area of a geometric figure?**

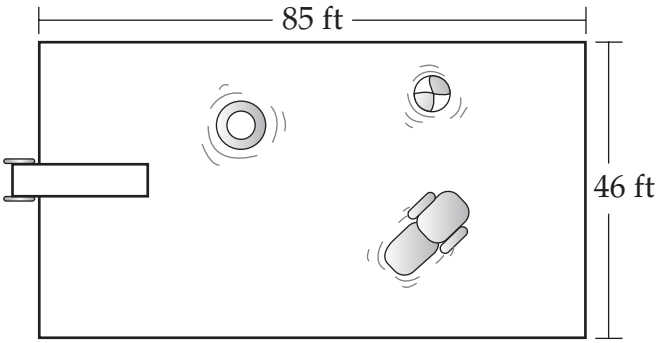
F dilation

G reflection

H rotation

J translation

25 **Each lifeguard at a swimming pool can supervise no more than 2,000 square feet of water.**



Note: The figure is not drawn to scale.

What is the minimum number of lifeguards needed to supervise the pool shown above?

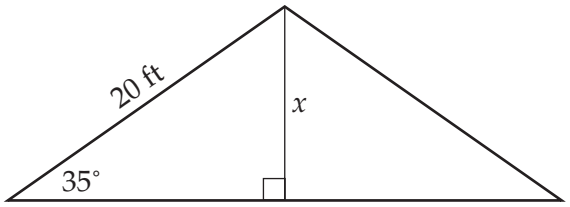
A 1

B 2

C 3

D 4

26 **A roof support is shown below.**



Note: The figure is not drawn to scale.

Which of these equations should be used to find the height (x) of the support?

F $\cos 35° = \frac{x}{20}$

G $\cos 35° = \frac{20}{x}$

H $\sin 35° = \frac{x}{20}$

J $\sin 35° = \frac{20}{x}$

27 **A certain triangle has exactly two congruent angles. Which of these conclusions must be true?**

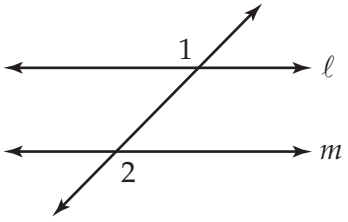
A The triangle has no obtuse angles.

B Each congruent angle measures 60°.

C The triangle is a $45° - 45° - 90°$ right triangle.

D The triangle has exactly two congruent sides.

28 **In the figure below, line ℓ is parallel to line m.**



Which of these best describes the relationship between $\angle 1$ and $\angle 2$?

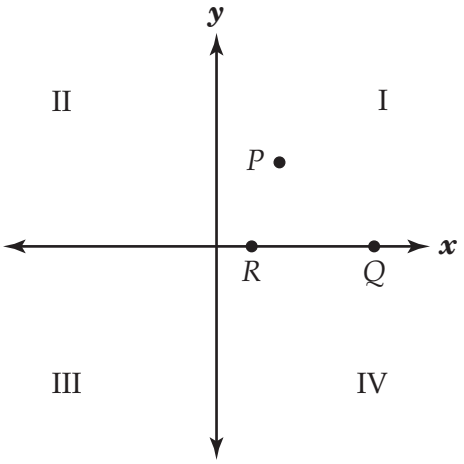
F congruent angles

G adjacent angles

H corresponding angles

J supplementary angles

29 **Three vertices (P, Q, and R) of a parallelogram are shown below.**



Which of these is the only quadrant that could <u>not</u> contain the fourth vertex?

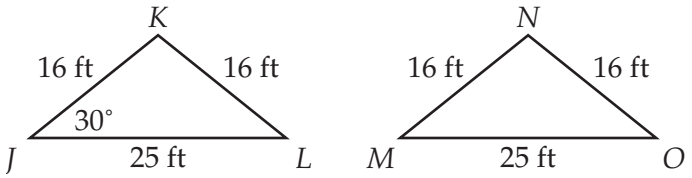
A I

B II

C III

D IV

30 **A builder receives two shipments of roof trusses (triangular supports). The sides of the triangles have the lengths shown below.**



Note: The figures are not drawn to scale.

If the measure of $\angle J$ is 30°, what is the measure of $\angle N$?

F 30°

G 90°

H 120°

J 150°

31 **ECR**

Kerry plans to build a picnic table. She needs to create a drawing of the picnic table surface.

Complete the following in the Answer Book:

- **Draw a regular hexagon with side lengths of 4 centimeters each. Label the vertices of your hexagon *A, B, C, D, E,* and *F.* Label the center of your hexagon *O*. Explain the steps you used in your drawing.**
- **Classify ΔAOF according to its sides and/or angles. Use mathematics to justify your answers.**
- **Classify ΔABD according to its sides and/or angles. Use mathematics to justify your answer.**
- **Classify ΔABC according to its sides and/or angles. Use mathematics to justify your answer.**

32

The area of a trapezoid is 39 square meters. The trapezoid has two bases that measure 8 meters and 18 meters. What is the height of the trapezoid?

F 1.5 meters

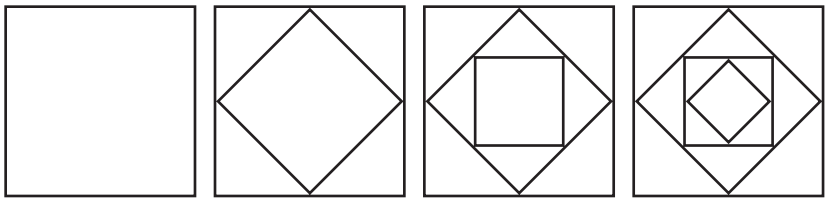
G 3.0 meters

H 8.0 meters

J 13.0 meters

GO ON

33 **Look at the pattern below.**



If the pattern continues, how many triangles will be in the next figure?

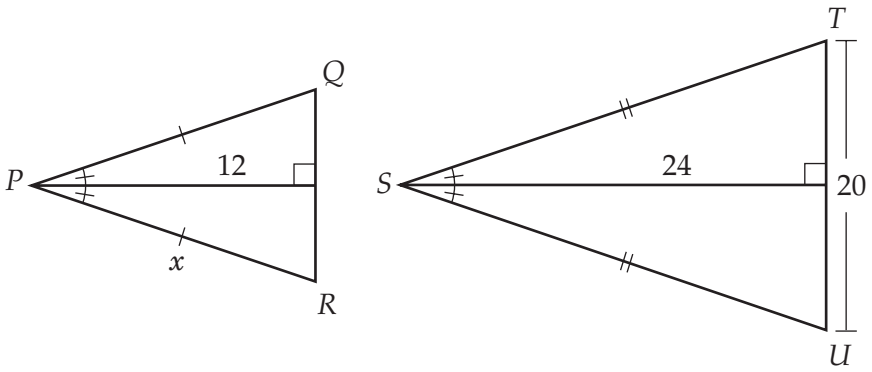
A 12

B 14

C 16

D 17

34 **Triangles *PQR* and *STU* are similar.**



Note: The figures are not drawn to scale.

What is the value of *x*?

F 10

G 13

H 16

J 26

35 **A refrigerator has the dimensions 6 feet by 3 feet by 4 feet. A dollhouse and its contents are being built to a scale in which 1 inch represents 2 feet. What should the dimensions of the dollhouse refrigerator be?**

A $1 \text{ inch} \times \frac{1}{2} \text{ inch} \times \frac{2}{3} \text{ inch}$

B $3 \text{ inches} \times 1\frac{1}{2} \text{ inches} \times 2 \text{ inches}$

C $6 \text{ inches} \times 3 \text{ inches} \times 4 \text{ inches}$

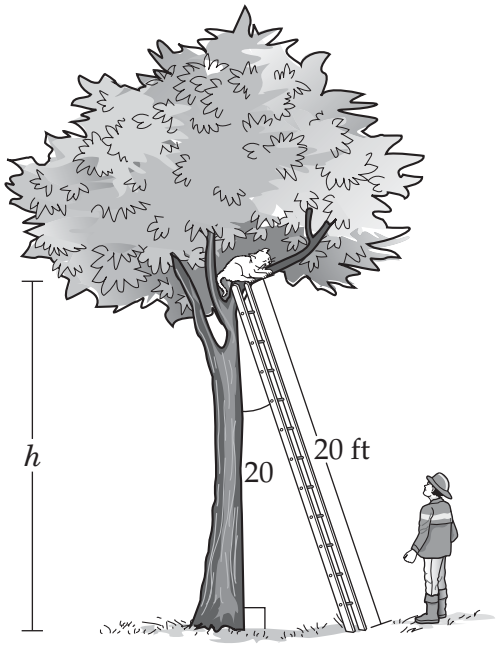
D $12 \text{ inches} \times 6 \text{ inches} \times 8 \text{ inches}$

GO ON

Directions

Use the Response Grids in the Answer Book to complete Numbers 36 and 37.

36 **A cat is stuck in a tree as shown below. The firefighter places a ladder at a 20° angle with the tree. The ladder is 20 feet long.**



Note: The figure is not drawn to scale.

How high (*h*), in feet, is the cat above the ground?

37 **A triangle has an area of 24 square centimeters. Its base measures 12 centimeters. What is the height, in centimeters, of the triangle?**

STOP

GEOMETRY

Public Release, Fall 2004

I.N.724007