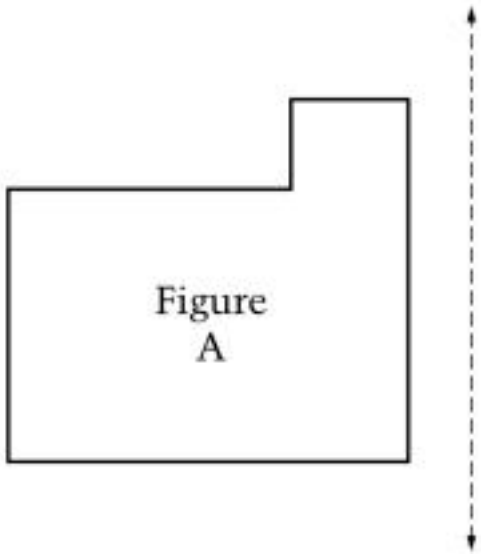
NAEP Released Items Aligned to the Iowa Core

8.G.1 Verify experimentally the properties of rotations, reflections, and translations:

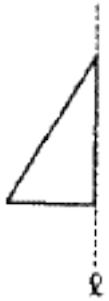
a. Lines are taken to lines, and line segments to line segments of the same length.
b. Angles are taken to angles of the same measure.
c. Parallel lines are taken to parallel lines.



In the space above, draw the image of Figure A after it is reflected (flipped) across the dotted line.

2005-8-12-4

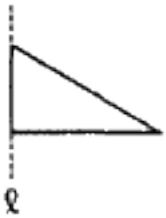
Source: National Assessment of Educational Progress, 2005, Grade 8 Mathematics Assessment.

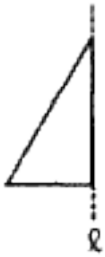


Which of the following shows the result of flipping the above triangle over the line ℓ ?

A.

B.

C. 

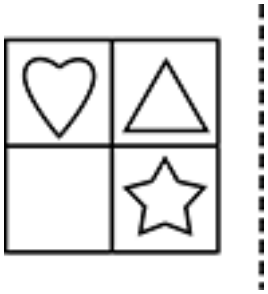
D. 

E.

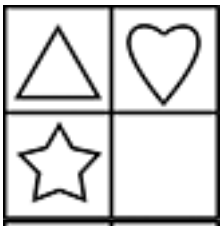
1990-8-7-10
1990-12-7-10

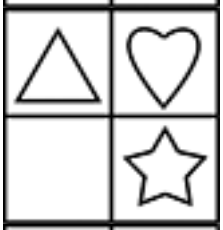
Source: National Assessment of Educational Progress, 1990, Grade 8 and Grade 12 Mathematics Assessments.

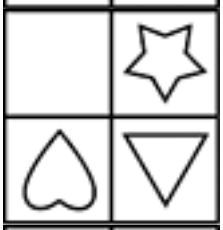
8.G.2 Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

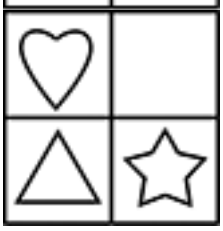


Tony flips the figure over the dotted line. Which picture shows the result of the flip?

A. 

B. 

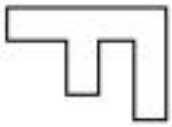
C. 

D. 

2011-4-9-10

Source: National Assessment of Educational Progress, 2011, Grade 4 Mathematics Assessment.

The figure above is shaded on the top side and white on the underside. If the figure were flipped over, its white side could look like which of the following figures?

A. 

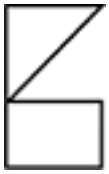
B.

C.

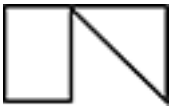
D.

2003-4-6-5
2003-8-6-5

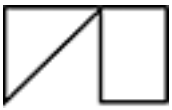
Source: National Assessment of Educational Progress, 2003, Grade 4 and Grade 8 Mathematics Assessments.



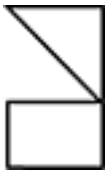
2. When the figure above is rotated 90 degrees clockwise, which of the following is the resulting figure?

A. 

B.

C. 

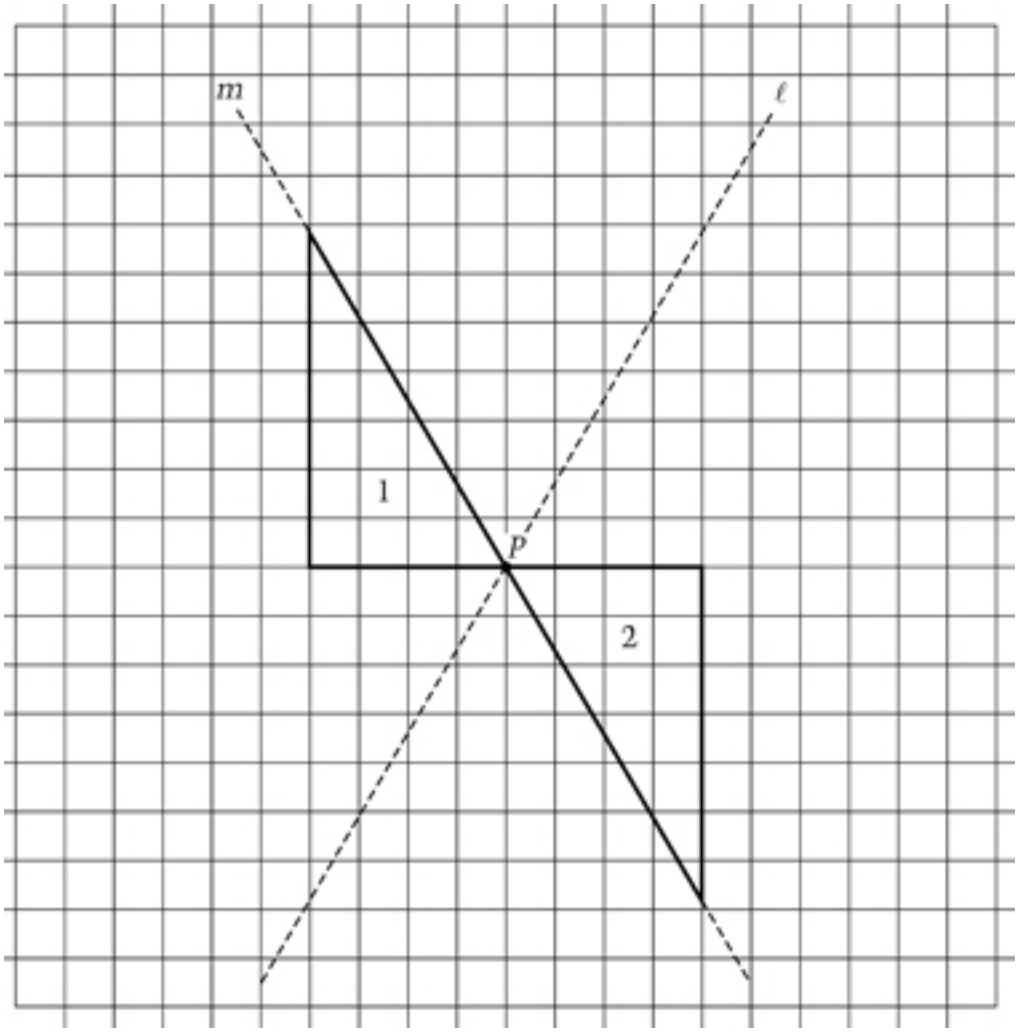
D.

E. 

2011-8-12-4

Source: National Assessment of Educational Progress, 2011, Grade 8 Mathematics Assessment.

The figure below shows two triangles, labeled 1 and 2.

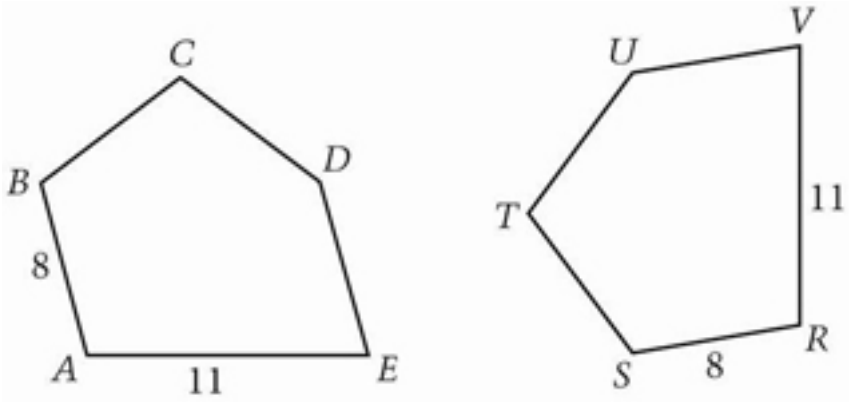


Which one of the following describes a way to move triangle 1 so that it completely covers triangle 2?

F. Turn (rotate) 180 degrees about point *P*.
G. Flip (reflect) over line ℓ.
H. Slide (translate) 5 units to the right followed by 8 units down.
I. Flip (reflect) over line *m*.
J. Slide (translate) 10 units to the right followed by 16 units down.

2009-8-5-5

Source: National Assessment of Educational Progress, 2009, Grade 8 Mathematics Assessment.



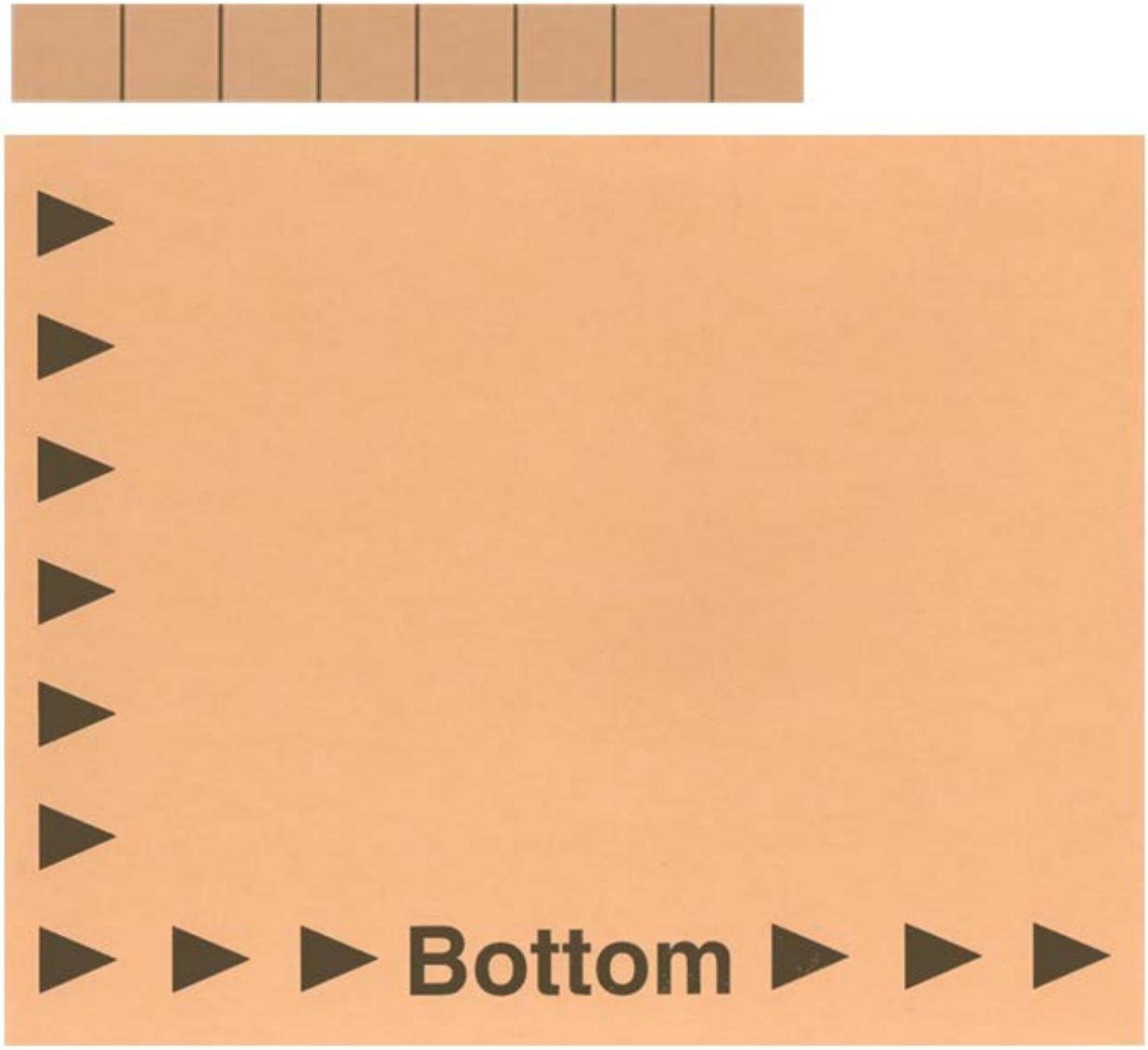
In the figure above, polygons *ABCDE* and *RSTUV* are congruent. Which side must have the same length as side *BC* ?

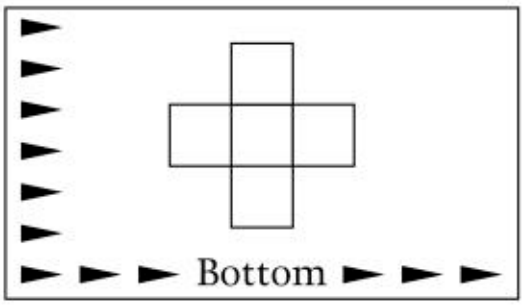
A. *CD*
B. *DE*
C. *ST*
D. *TU*
E. *UV*

2009-8-10-3

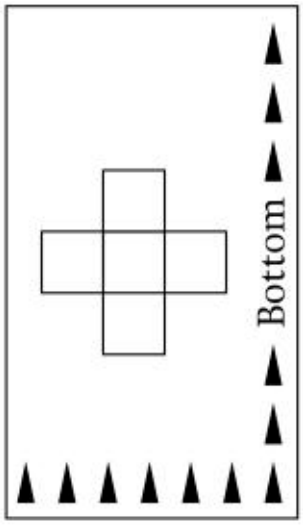
Source: National Assessment of Educational Progress, 2009, Grade 8 Mathematics Assessment.

The following question refers to these additional materials:





Before the Turn



After the Turn

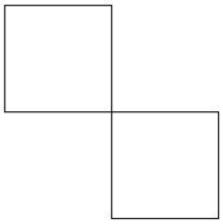
Five tiles are arranged on the work mat above to make a design. Then the work mat is turned. Notice that after the turn, the design looks the same as it did before the turn.

Place your work mat so that the word "Bottom" is closest to you. Place two tiles on the mat as shown on the next page.

Now add three new tiles to your design so that when you turn the work mat, the new design will look <u>different</u> from the design before the turn.

Draw your designs on the next two pages.

Draw your <u>before</u> design in the space below. Then draw your <u>after</u> design on the next page.

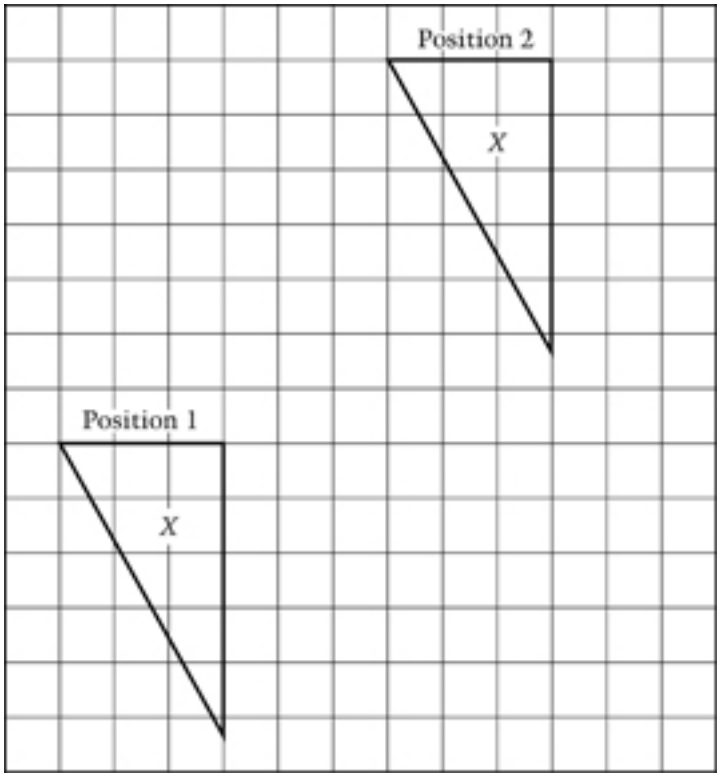


Draw your after design in the space below.

2005-8-4-16

Source: National Assessment of Educational Progress, 2005, Grade 8 Mathematics Assessment.

8.G.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.



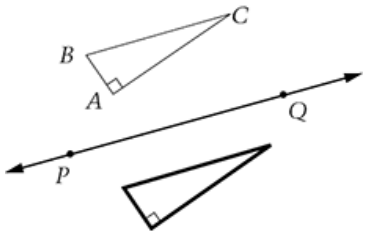
Which word best describes how to move the piece labeled *X* from position 1 to position 2 ?

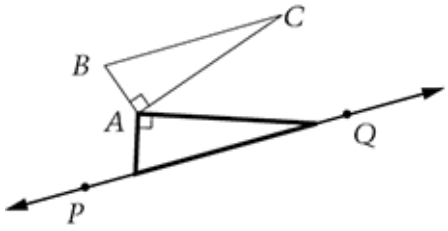
A. Flip
B. Fold
C. Slide
D. Turn

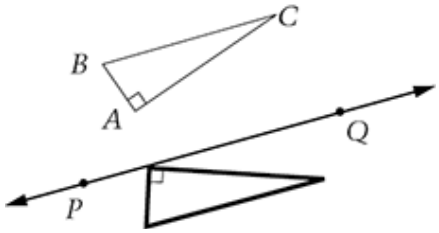
2009-4-5-2

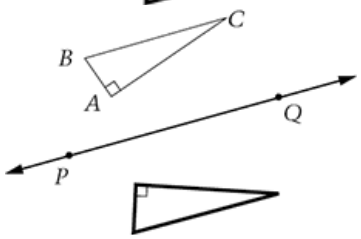
Source: National Assessment of Educational Progress, 2009, Grade 4 Mathematics Assessment.

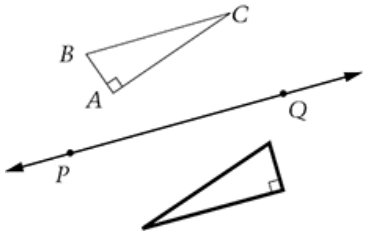
Which of the following figures shows the reflection of triangle ABC over line PQ?

A.


B.


C.


D.


E.


2011-8-8-2

Source: National Assessment of Educational Progress, 2011, Grade 8 Mathematics Assessment.

The point (3, 7) is a vertex of a triangle. When the triangle is reflected over the y-axis, what are the coordinates of the image of the vertex?

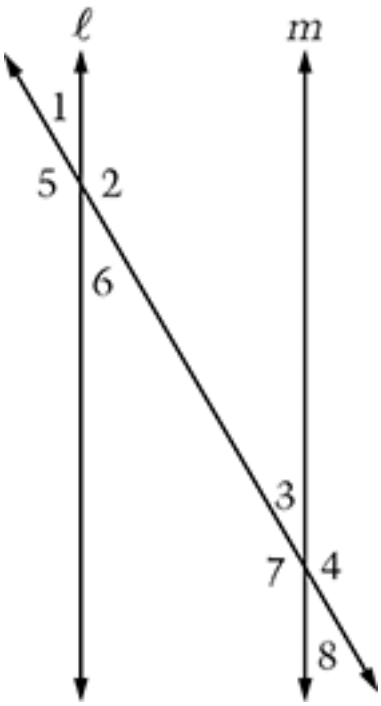
A. (-3, -7)
B. (-3, 7)
C. (3, -7)
D. (3, 7)
E. (7, 3)

2011-8-12-8

Source: National Assessment of Educational Progress, 2011, Grade 8 Mathematics Assessment.

8.G.4 Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

8.G.5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.

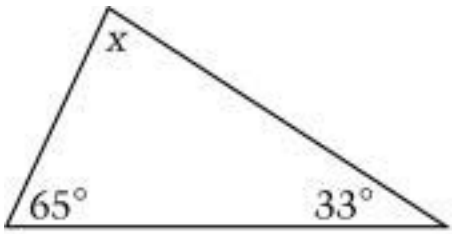


In the figure above, line ℓ is parallel to line m. Which of the following pairs of angles must have the same measure?

A. Angles 1 and 2
B. Angles 1 and 5
C. Angles 2 and 3
D. Angles 4 and 5
E. Angles 4 and 8

2011-8-12-1

Source: National Assessment of Educational Progress, 2011, Grade 8 Mathematics Assessment.



What is the value of x in the triangle above?

A. 65°
B. 82°
C. 90°
D. 92°
E. 98°

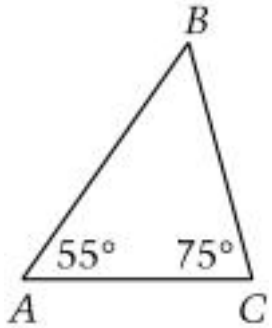
2011-8-8-2

Source: National Assessment of Educational Progress, 2011, Grade 8 Mathematics Assessment.

The sum of the measures of the 24 angles in a 24-sided regular polygon is 3,960°. What is the measure in degrees of one of the angles?

1992-8-12-7

Source: National Assessment of Educational Progress, 1992, Grade 8 Mathematics Assessment.



In Δ *ABC* shown above, what is the measure of $\angle B$?

A. 30°
B. 40°
C. 50°
D. 60°
E. 70°

2005-12-3-6

Source: National Assessment of Educational Progress, 2005, Grade 12 Mathematics Assessment.

8.G.6 Explain a proof of the Pythagorean Theorem and its converse.

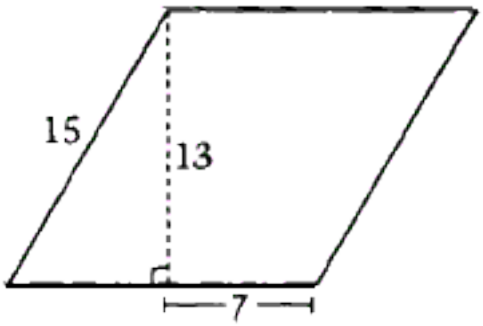
8.G.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

In the right triangle above, what is the length of *AB* ?

A. 8.5
B. 12
C. 13
D. 17
E. 30

2009-8-5-15

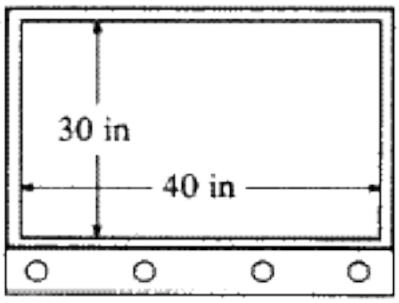
Source: National Assessment of Educational Progress, 2009, Grade 8 Mathematics Assessment.



To the nearest whole number, what is the area of the parallelogram above?

1992-12-7-11

Source: National Assessment of Educational Progress, 1992, Grade 12 Mathematics Assessment.



What is the diagonal measurement of the TV screen shown in the figure above?

A. 25 inches
B. 35 inches
C. 50 inches
D. 70 inches
E. 1,200 inches

1990-8-7-13
1990-12-7-13

Source: National Assessment of Educational Progress, 1990, Grade 8 and Grade 12 Mathematics Assessments

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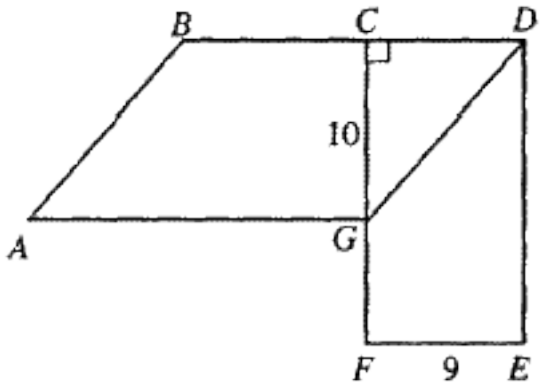


In the figure above, *ABDG* is a parallelogram and *CDEF* is a rectangle. If *EF* = 9 and *CG* = 10, what is *AB* to the nearest hundredth?

1990-12-9-9

Source: National Assessment of Educational Progress, 1990, Grade 12 Mathematics Assessment.

8.G.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

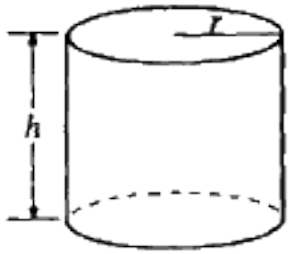
8.G.9 Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

A cereal company packs its oatmeal into cylindrical containers. The height of each container is 10 inches and the radius of the bottom is 3 inches. What is the volume of the box to the nearest cubic inch? (The formula for the volume of a cylinder is $V = \pi r^2 h$.)

Answer: _____ cubic inches

1996-8-12-6

Source: National Assessment of Educational Progress, 1996, Grade 8 Mathematics Assessment.

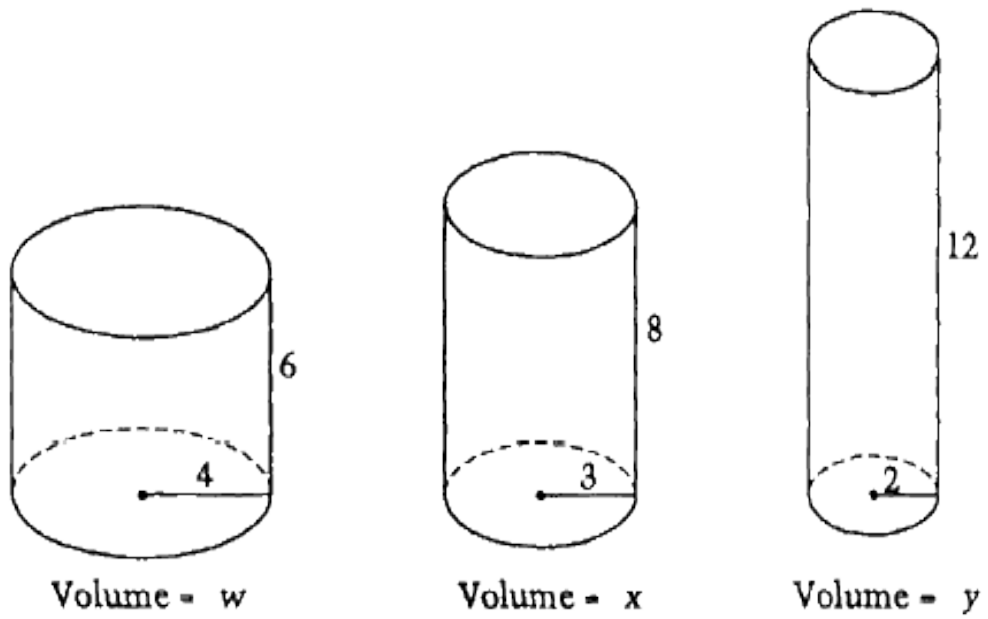


The volume *V* of a right circular cylinder like the one in the figure above is given by the formula $V = \pi r^2 h$. In terms of π, what is the volume of a cylinder with radius *r* = 4 and height *h* = 10 ?

A. 18π
B. 26π
C. 80π
D. 160π
E. $1{,}600\pi$

1992-12-5-12

Source: National Assessment of Educational Progress, 1992, Grade 12 Mathematics Assessment.



In the figures above, the radius and height of each right circular cylinder are given. If *w*, *x*, and *y* represent the respective volumes of the cylinders, which of the following statements is true?

A. $y = w = x$
B. $y < x < w$
C. $y < w < x$
D. $w < y < x$
E. $w < x < y$

1992-12-15-9

Source: National Assessment of Educational Progress, 1992, Grade 12 Mathematics Assessment.