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Review 238

Adding and Subtracting Rational Numbers

To add or subtract fractions and mixed numbers with unlike denominators, first rewrite the fractions using the least common denominator (LCD).

Subtract: $2\frac{3}{4} - 5\frac{1}{3}$

$2\frac{3}{4} - 5\frac{1}{3} = \frac{11}{4} - \frac{16}{3}$

$= \frac{33}{12} - \frac{64}{12}$ ← The LCD is 12.

$= \frac{-31}{12}$ ← Subtract numerators.

$= -2\frac{7}{12}$ ← Simplify.

$2\frac{3}{4} - 5\frac{1}{3} = -2\frac{7}{12}$

You can use addition or subtraction to solve equations with rational numbers.

Solve: $h - \frac{3}{8} = \frac{1}{6}$

$h - \frac{3}{8} + \frac{3}{8} = \frac{1}{6} + \frac{3}{8}$ ← Add $\frac{3}{8}$.

$h = \frac{4}{24} + \frac{9}{24}$ ← The LCD is 24.

$h = \frac{13}{24}$

Find each sum or difference as a fraction or mixed number in simplest form.

1. $6\frac{1}{4} - 2\frac{3}{8}$
   $5\frac{10}{8} - 2\frac{3}{8} = 3\frac{7}{8}$

2. $\frac{5}{6} + \left(-\frac{1}{2}\right)$
   $\frac{5}{6} + \left(-\frac{3}{6}\right) = \frac{2}{6} = \frac{1}{3}$

3. $-4\frac{1}{3} - \left(-\frac{3}{5}\right)$
   $-3\frac{20}{15} + \frac{9}{15} = -3\frac{11}{15}$

4. $\frac{1}{8} - \left(-\frac{1}{6}\right)$
   $\frac{3}{24} + \frac{4}{24} = \frac{7}{24}$

5. $-1\frac{3}{8} - 4\frac{1}{12}$
   $-1\frac{9}{24} + \left(-4\frac{2}{24}\right) = -5\frac{11}{24}$

6. $\frac{7}{10} + \left(-1\frac{2}{5}\right)$
   $\frac{7}{10} + \left(-\frac{14}{10}\right) = -\frac{7}{10}$

7. $1\frac{5}{8} - \left(-2\frac{1}{2}\right)$
   $1\frac{5}{8} + 2\frac{4}{8} = 3\frac{9}{8} = 4\frac{1}{8}$

8. $-2\frac{1}{3} - \left(-1\frac{5}{12}\right)$
   $-2\frac{4}{12} + 1\frac{5}{12} = -\frac{11}{12}$

9. $-10 - \left(3\frac{11}{12}\right)$
   $-13\frac{11}{12}$

10. $1\frac{1}{3} - 4\frac{3}{4}$
    $1\frac{4}{12} - 4\frac{9}{12} = -3\frac{5}{12}$

11. $9 + \left(-6\frac{5}{9}\right)$
    $8\frac{9}{9} + \left(-6\frac{5}{9}\right)$ $2\frac{4}{9}$

12. $-2\frac{5}{6} - 5\frac{5}{12}$
    $-2\frac{10}{12} - 5\frac{5}{12} = -7\frac{15}{12} = -8\frac{1}{4}$

Solve each equation. Write each answer as a mixed number or as a fraction in simplest form.

13. $y + \frac{7}{8} = -\frac{1}{4}$
    $-\frac{7}{8}$ $-\frac{7}{8}$
    $y = -\frac{9}{8} = -1\frac{1}{8}$

14. $c + -\frac{3}{5} = \frac{1}{2}$
    $+\frac{3}{5}$ $+\frac{3}{5}$
    $c = \frac{11}{10} = 1\frac{1}{10}$

15. $m - 3\frac{2}{3} = 1\frac{1}{6}$
    $+3\frac{4}{6}$ $+3\frac{2}{3}$
    $m = 4\frac{5}{6}$

16. $x - 2\frac{1}{4} = -3$
    $+2\frac{1}{4}$ $+2\frac{1}{4}$
    $x = -\frac{3}{4}$

17. $n + \frac{1}{2} = -2\frac{5}{6}$
    $-\frac{1}{2}$ $-\frac{1}{2}$
    $n = -3\frac{1}{3}$

18. $\frac{1}{2} + d = -3\frac{1}{5}$
    $d = -3\frac{7}{10}$

19. $7.3 + g = 1\frac{4}{5}$
    $-7\frac{3}{10}$ $-7\frac{3}{10}$
    $g = -5\frac{1}{2}$

20. $y - 4.1 = 2\frac{3}{4}$
    $y = 6\frac{17}{20}$

21. $z + 2.6 = 0.37$
    -2.6 -2.6
    $z = 2.23$
    $-2\frac{23}{100}$

Course 3 Topics

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Review 239

Multiplying and Dividing Rational Numbers

To multiply rational numbers in fraction form, multiply numerators, then multiply denominators.

Multiply: $\frac{7}{12} \cdot 1\frac{4}{5}$

$\frac{7}{12} \cdot \frac{9}{5}$ ← fraction form

$\frac{7 \cdot 9}{12 \cdot 5}$ ← Multiply numerators. ← Multiply denominators.

$\frac{63}{60} = 1\frac{3}{60} = 1\frac{1}{20}$ ← Simplify.

To divide, multiply by the reciprocal of the divisor.

Divide: $-3\frac{1}{8} \div \frac{2}{3}$

$\frac{-25}{8} \div \frac{2}{3}$ ← fraction form

$\frac{-25}{8} \cdot \frac{3}{2}$ ← reciprocal of divisor

$\frac{-25 \cdot 3}{8 \cdot 2} = \frac{-75}{16}$ ← Multiply.

$= -4\frac{11}{16}$ ← Simplify.

Find each product. Write each answer as a fraction or mixed number in simplest form.

1. $\frac{8}{9} \cdot \left(-\frac{3}{4}\right)$ $-\frac{2}{3}$

2. $-\frac{1}{2} \cdot \frac{4}{5}$ $-\frac{2}{5}$

3. $-\frac{2}{3} \cdot \left(-\frac{1}{8}\right)$ $\frac{1}{12}$

4. $\frac{5}{6} \cdot \frac{3}{7}$ $\frac{5}{14}$

5. $\frac{3}{4} \cdot \left(-\frac{2}{3}\right)$ $-\frac{1}{2}$

6. $3 \cdot 2\frac{1}{4}$ $\frac{3}{1} \times \frac{9}{4}$ $\frac{27}{4} = 6\frac{3}{4}$

7. $-5\frac{1}{2} \cdot 1\frac{3}{4}$ $-\frac{11}{2} \cdot \frac{7}{4} = -\frac{77}{8} = -9\frac{5}{8}$

8. $-2\frac{1}{8} \cdot (-3)$ $-\frac{17}{8} \cdot \left(-\frac{3}{1}\right)$ $\frac{51}{8} = 6\frac{3}{8}$

9. $4\frac{1}{5} \cdot 2\frac{1}{2}$ $\frac{21}{5} \cdot \frac{5}{2} = \frac{21}{2} = 10\frac{1}{2}$

10. $\frac{13}{15} \cdot \frac{5}{6}$ $\frac{13}{18}$

11. $-3\frac{2}{5} \cdot 2\frac{1}{2}$ $-\frac{17}{5}\left(\frac{5}{2}\right) = -\frac{17}{2} = -8\frac{1}{2}$

12. $-5 \cdot \left(-2\frac{1}{4}\right)$ $\left(-\frac{5}{1}\right)\left(-\frac{9}{4}\right) = \frac{45}{4} = 11\frac{1}{4}$

13. $-\frac{5}{8} \cdot 4\frac{2}{3}$ $-\frac{5}{8} \cdot \frac{14}{3} = -\frac{35}{12} = -2\frac{11}{12}$

14. $-5 \cdot 3\frac{3}{10}$ $\left(-\frac{5}{1}\right)\left(\frac{33}{10}\right) = \frac{-33}{2} = -16\frac{1}{2}$

15. $-2\frac{3}{5} \cdot \left(-3\frac{1}{3}\right)$ $\left(-\frac{13}{5}\right)\left(-\frac{10}{3}\right) = \frac{26}{3} = 8\frac{2}{3}$

Find each quotient.

16. $\frac{5}{6} \div \frac{3}{5}$ $\frac{5}{6} \times \frac{5}{3} = \frac{25}{18} = 1\frac{7}{18}$

17. $-\frac{3}{8} \div \left(-\frac{1}{2}\right)$ $-\frac{3}{8} \times \left(-\frac{2}{1}\right) = \frac{3}{4}$

18. $-6 \div \frac{3}{4}$ $-\frac{6}{1} \cdot \frac{4}{3} = -8$

19. $4 \div \left(-\frac{2}{3}\right)$ $\frac{4}{1}\left(-\frac{3}{2}\right) = -6$

20. $5\frac{1}{4} \div 1\frac{1}{2}$ $\frac{21}{4} \cdot \frac{2}{3} = \frac{7}{2} = 3\frac{1}{2}$

21. $1\frac{1}{4} \div \left(-\frac{2}{5}\right)$ $\frac{5}{4} \times \left(-\frac{5}{2}\right) = -\frac{25}{8} = -3\frac{1}{8}$

22. $-\frac{3}{4} \div \left(-1\frac{1}{2}\right)$ $-\frac{3}{4} \times \left(-\frac{2}{3}\right) = \frac{1}{2}$

23. $-1\frac{3}{5} \div \frac{1}{4}$ $\left(-\frac{8}{5}\right) \times \frac{4}{1} = -\frac{32}{5} = -6\frac{2}{5}$

24. $2\frac{1}{2} \div \frac{3}{10}$ $\frac{5}{2} \times \frac{10}{3} = \frac{50}{6} = 8\frac{1}{3}$

25. $-\frac{5}{9} \div \left(-\frac{2}{3}\right)$ $-\frac{5}{9} \cdot \left(-\frac{3}{2}\right) = \frac{5}{6}$

26. $-6 \div 3\frac{5}{8}$ $-\frac{6}{1} \times \frac{8}{29} = -\frac{48}{29} = -1\frac{19}{29}$

27. $\frac{3}{4} \div (-9)$ $\frac{3}{4} \times \left(-\frac{1}{9}\right) = -\frac{1}{12}$

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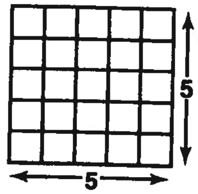
Review 242

Exploring Square Roots and Irrational Numbers

The square of 5 is 25.
$5 \cdot 5 = 5^2 = 25$
The *square root* of 25 is 5 because $5^2 = 25$.

$\sqrt{25} = 5$



$1^2 = 1$
$2^2 = 4$
$3^2 = 9$
$4^2 = 16$
$5^2 = 25$
perfect squares

You can use a calculator to find square roots.
Example: Find $\sqrt{36}$ and $\sqrt{21}$ to the nearest tenth.

36 [√] = 6   21 [√] ≈ 4.5825757 ≈ 4.6

You can estimate square roots like $\sqrt{52}$ and $\sqrt{61}$.

Perfect squares → 49, 52, 64

49		$\sqrt{49} = 7$		$\sqrt{49} = 7$
52	Estimate	$\sqrt{52} \approx 7$	Estimate	$\sqrt{61} \approx 8$
64		$\sqrt{64} = 8$		$\sqrt{64} = 8$

Find each square root. Round to the nearest integer if necessary. Use ≈ to show that a value is rounded.

1. $\sqrt{16}$ 4
2. $\sqrt{85}$ ≈9
3. $\sqrt{26}$ ≈5
4. $\sqrt{36}$ 6
5. $\sqrt{98}$ ≈10
6. $\sqrt{40}$ ≈6
7. $\sqrt{100}$ 10
8. $\sqrt{18}$ ≈4
9. $\sqrt{5}$ ≈2
10. $\sqrt{121}$ 11
11. $\sqrt{68}$ ≈8
12. $\sqrt{144}$ 12
13. $\sqrt{29}$ ≈5
14. $\sqrt{64}$ 8
15. $\sqrt{37}$ ≈6
16. $\sqrt{75}$ ≈9
17. $\sqrt{225}$ 15
18. $\sqrt{54}$ ≈7
19. $\sqrt{169}$ 13
20. $\sqrt{103}$ ≈10
21. $\sqrt{61}$ ≈8
22. $\sqrt{400}$ 20
23. $\sqrt{119}$ ≈11
24. $\sqrt{84}$ ≈9

25. If a whole number is not a perfect square, its square root is an *irrational number.* List the numbers from Exercises 1–24 that are irrational.

$\sqrt{85}$, $\sqrt{26}$, $\sqrt{98}$, $\sqrt{40}$, $\sqrt{18}$, $\sqrt{5}$, $\sqrt{68}$, $\sqrt{29}$, $\sqrt{37}$, $\sqrt{75}$, $\sqrt{54}$, $\sqrt{103}$, $\sqrt{61}$, $\sqrt{119}$, $\sqrt{84}$

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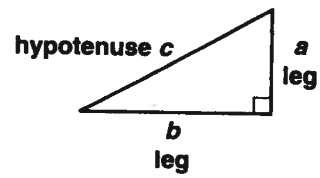
Review 243

The Pythagorean Theorem

The sum of the squares of the lengths of the *legs* of a right triangle is equal to the square of the length of the *hypotenuse.*

Also, if $a^2 + b^2 = c^2$, then the triangle is a right triangle.



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

Example 1: Find the length of a leg of a right triangle if the length of the other leg is 12 cm and the length of the hypotenuse is 13 cm.

$$\begin{aligned} a^2 + b^2 &= c^2 \\ 12^2 + b^2 &= 13^2 \\ 144 + b^2 &= 169 \\ 144 - 144 + b^2 &= 169 - 144 \\ b^2 &= 25 \\ b &= \sqrt{25} \\ b &= 5 \end{aligned}$$

The length of the leg is 5 cm.

Example 2: Is a triangle with sides 6 m, 7 m, and 10 m a right triangle?

$$\begin{aligned} a^2 + b^2 &= c^2 \\ 6^2 + 7^2 &\stackrel{?}{=} 10^2 && \leftarrow \text{Substitute.} \\ 36 + 49 &\stackrel{?}{=} 100 && \leftarrow \text{Simplify.} \\ 85 &\neq 100 \end{aligned}$$

The triangle is *not* a right triangle.

The lengths of two sides of a right triangle are given. Find the length of the third side.

1. legs: 6 ft and 8 ft
   hypotenuse: 10ft
2. leg: 15 m
   hypotenuse: 17 m
   leg: 8m
3. leg: 12 in.
   hypotenuse: 15 in.
   leg: 9in
4. leg: 1.5 km
   hypotenuse: 2.5 km
   leg: 2km
5. legs: 15 in. and 20 in.
   hypotenuse: 25in
6. leg: 16 m
   hypotenuse: 34 m
   leg: 30m

Is a triangle with the given side lengths a right triangle?

7. 10 cm, 24 cm, 26 cm
   yes
8. 5 ft, 7 ft, 9 ft
   no
9. 6 m, 12 m, 15 m
   no
10. 5 in., 12 in., 13 in.
    yes
11. 30 mm, 40 mm, 50 mm
    yes
12. 2 yd, 5 yd, 8 yd
    no

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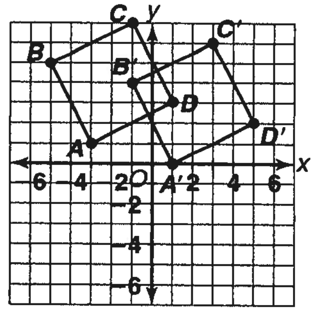
Review 191

Movements of figures on a plane are called **transformations.** A translation, or slide, moves all points the same distance and direction.

The translation $(x, y) \rightarrow (x + 4, y - 1)$ moves *each* point to the right 4 units and down 1 unit.

$A\,(-3, 1)$ moves to $(-3 + 4, 1 - 1)$, where point $A'(1, 0)$ is its **image.**

The square $ABCD$ moves to its image square $A'B'C'D'$.

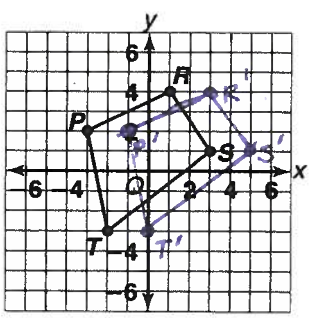


Complete the following for the figure above.

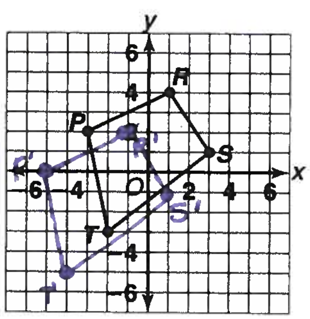
1. $B\,(-5, 5) \rightarrow B'$ (-1 , 4)
2. $C\,(-1, 7) \rightarrow C'$ (3 , 6)
3. D(1 , 3) $\rightarrow D'$(5 , 2)

Graph each translation of figure *PRST*.

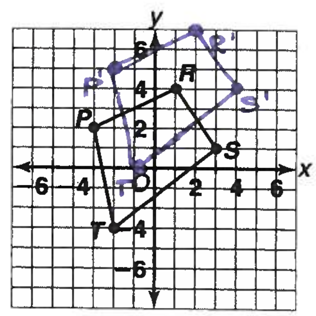
4. right 2 units



5. left 2 units, down 2 units



6. right 1 unit, up 3 units



Complete the rule for each translation.

7. right 3 units, up 1 unit
$(x, y) \rightarrow$ (x+3, y+1)

8. left 4 units, up 5 units
$(x, y) \rightarrow$ (x-4, y+5)

9. left 1 unit, down 9 units
$(x, y) \rightarrow$ (x-1, y-9)

Write a rule for the translation.

10. left 1 unit, down 3 units
(x,y)->(x-1, y-3)

11. right 1 unit, up 2 units
(x,y)->(x+1, y+2)

12. left 3 units, up 2 units
(x,y)->(x-3, y+2)

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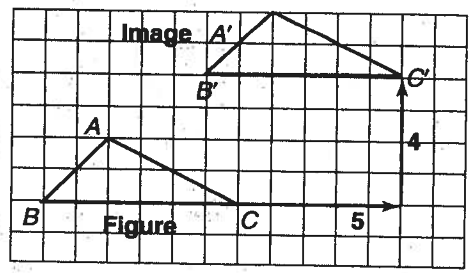
Review 232

Translations

A *translation* moves every point of a figure the same distance in the same direction.

Triangle ABC is translated 5 units to the right and 4 units up. The *image* of $\triangle ABC$ is $\triangle A'B'C'$.



You can write a rule to describe a translation in the coordinate plane.

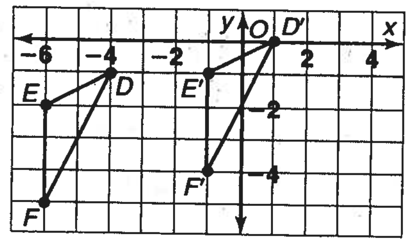
For the translation of $\triangle DEF$, the rule is:

Add 5 to each x-coordinate.
Add 1 to each y-coordinate.

$D(-4, -1) \rightarrow D'(1, 0)$

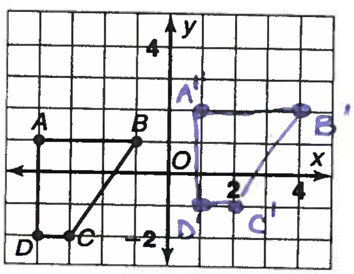
$E(-6, -2) \rightarrow E'(-1, -1)$

$F(-6, -5) \rightarrow F'(-1, -4)$



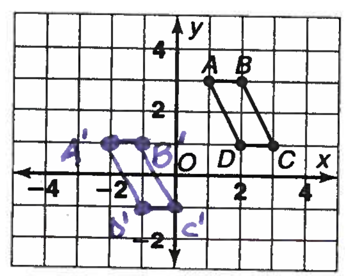
Copy each figure. Then graph the image after the given translation. Name the coordinates of the image.

1. right 5 units, up 1 unit



A'(1,2), B'(4,2)
C'(2,−1), D'(1,−1)

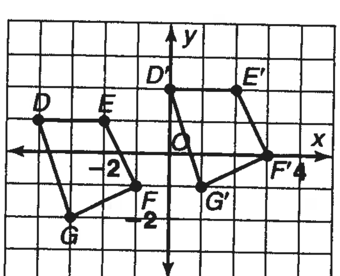
2. left 3 units, down 2 units



A'(−2,1) B'(−1,1)
C'(0,−1) D'(−1,−1)

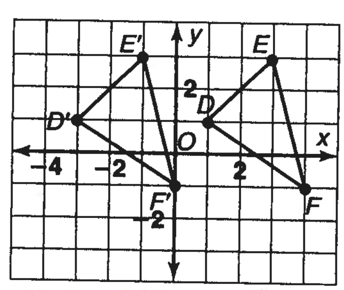
Use arrow notation to write a rule that describes the translation shown on each graph.

3.



$(x,y) \rightarrow (x+4, y+1)$

4.



$(x,y) \rightarrow (x-4, y+0)$

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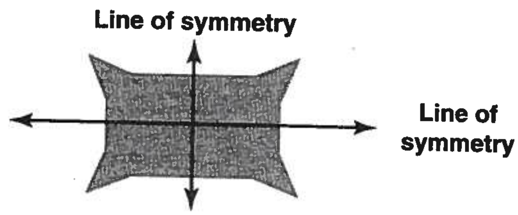
Review 192

Symmetry

A figure is **symmetrical** if one side is a mirror image of the other. The line that divides a figure into two identical parts is called a **line of symmetry.**

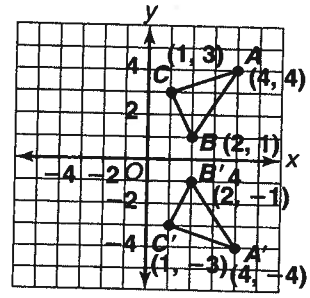
The figure below has 2 lines of symmetry.



You can trace the figure and fold it along either line to see that the two halves match.

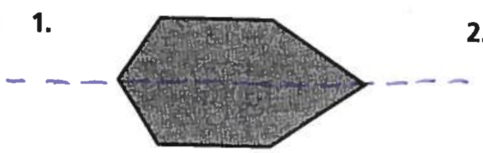
Reflections

A **reflection** is a transformation that creates a mirror image. $\triangle A'B'C'$ is the mirror image of $\triangle ABC$ across the x-axis. The x-axis is the **line of reflection.**



- When you reflect across the x-axis, the y-coordinates change sign.
- When you reflect across the y-axis, the x-coordinates change sign.
- When you reflect across a line of symmetry, the image is the figure itself.

Draw the line(s) of symmetry. If there are no lines of symmetry, write *none.*

1. 

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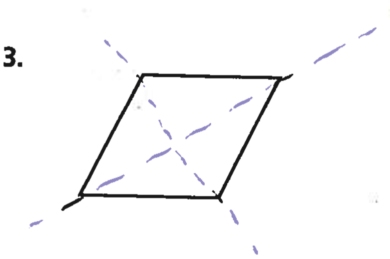
2. 

None

3. 

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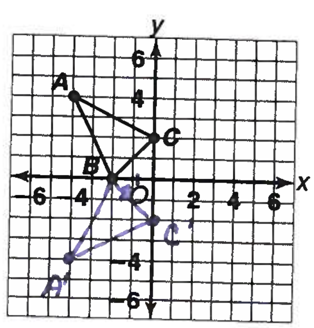
$\triangle ABC$ is shown. Draw $\triangle A'B'C'$ so it is a reflection of $\triangle ABC$ over the specified axis. Then complete each statement.

4. over the x-axis

$A(-4, 4) \rightarrow A'$ (-4,-4)

$B(-2, 0) \rightarrow B'$ (-2,0)

$C(0, 2) \rightarrow C'$ (0,-2)

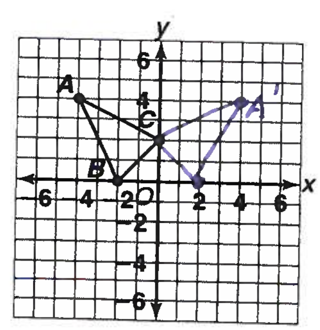


5. over the y-axis

$A(-4, 4) \rightarrow A'$ (4,4)

$B(-2, 0) \rightarrow B'$ (2,0)

$C(0, 2) \rightarrow C'$ (0,2)



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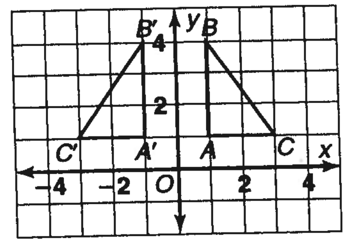
Review 233

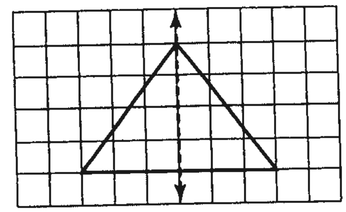
A *reflection* flips a figure over a line (the *line of reflection*). Figure $A'B'C'$ is the image of figure ABC after a reflection over the y-axis.

Each point of the image is the same distance from the line of reflection as the corresponding point of the original figure.

Since A is 1 unit to the right of the y-axis, locate A' 1 unit to the left of the y-axis.

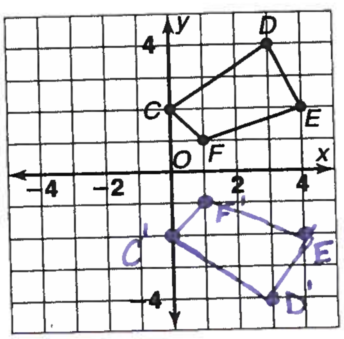
If the image is identical to the original figure, then the figure has *reflectional symmetry* and has a *line of symmetry.*



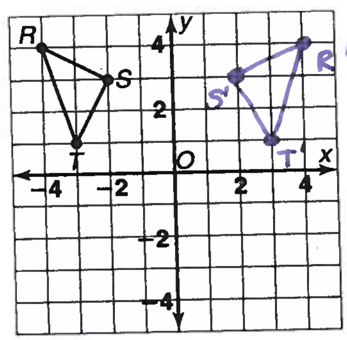


Copy each figure.

1. Reflect the figure over the x-axis.

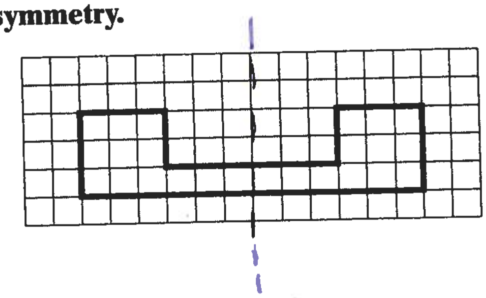


2. Reflect the figure over the y-axis.



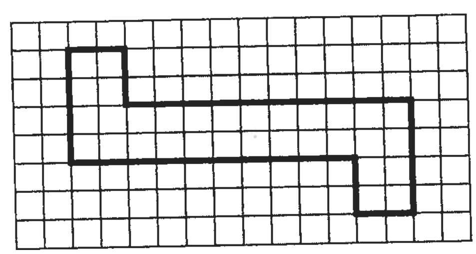
Copy each figure. Does the figure have reflectional symmetry? If it does, draw all the lines of symmetry.

3.



yes

4.



no

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Course 3 Topics

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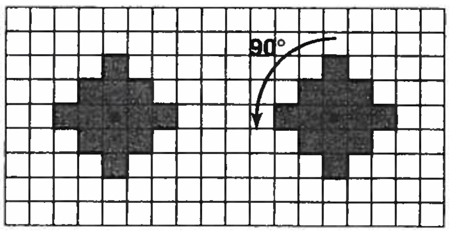
Review 193

Rotations

A **rotation** is a transformation that turns a figure about a fixed point. The fixed point is called the **center of rotation.**

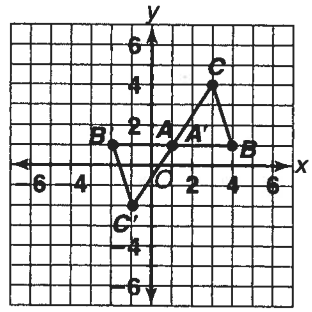
A figure has **rotational symmetry** it can be rotated less than 360° and fit exactly on top of the original figure.

The figure below has rotational symmetry.

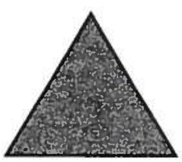


For a rotation of 90° or 180° about its center, the figure fits exactly on top of itself.

To draw a 180° rotation about point A, trace $\triangle ABC$. Place a pencil tip on point A and rotate the tracing 180°. Mark points A', B', and C'. Then draw $\triangle A'B'C'$.



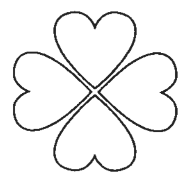
Does each figure have rotational symmetry?

1. 

yes

2. 

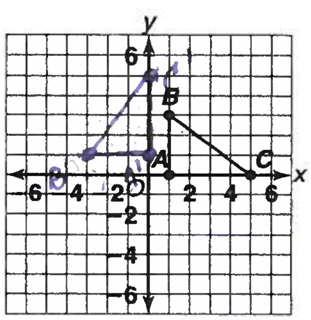
no

3. 

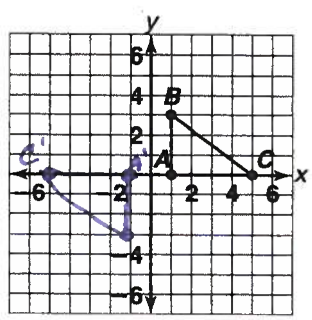
yes

Draw the image of the figure after each rotation about point O.

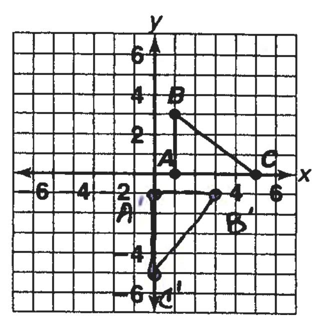
4. rotation of 90°



5. rotation of 180°



6. rotation of 270°



Course 2 Topics

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Review 234

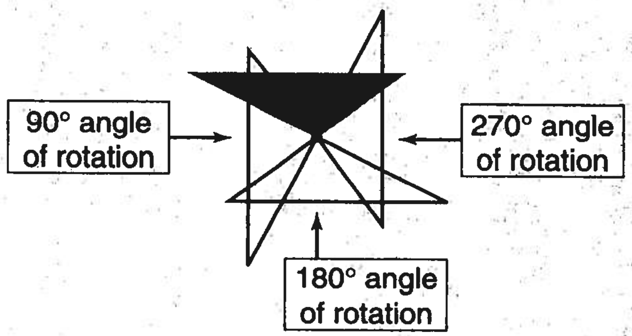
A *rotation* is a turn of a figure about a center point, the *center of rotation.*

A figure can be rotated up to 360° counterclockwise.

A figure has *rotational symmetry* if an image matches the original figure after a rotation of 180° or less.

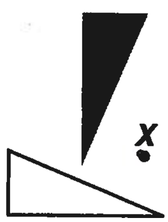
The angle measure the figure rotates is the *angle of rotation.*

The shaded triangle is rotated about its lower vertex.



The triangle does not have rotational symmetry.

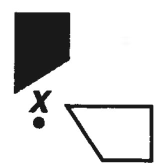
The shaded figure is rotated 90°, 180°, or 270° about point *X*. The unshaded figure is its image. What is the angle of rotation?

1. 

90°

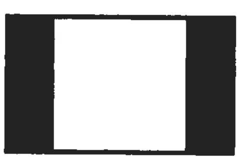
2. 

180°

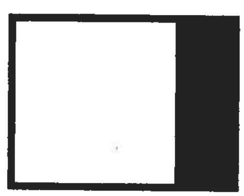
3. 

270°

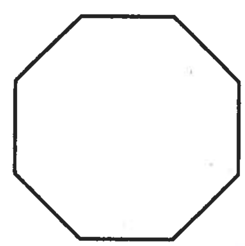
Judging by appearance, determine whether each figure has rotational symmetry. If it does, find the angle of rotation.

4. 

180°

5. 

none

6. 

45°

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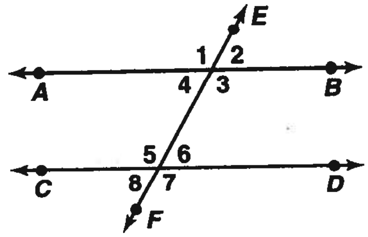
Review 269

Look at the figure at the right.

- Line $\overleftrightarrow{AB}$ is parallel to line $\overleftrightarrow{CD}$ ($\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$)
- Line $\overleftrightarrow{EF}$ is a *transversal.*



Alternate interior angles lie within a pair of lines and on opposite sides of the transversal.

Example 1: $\angle 3$ and $\angle 5$, $\angle 4$ and $\angle 6$

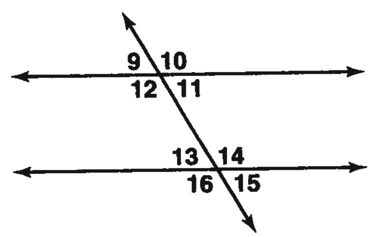
Alternate interior angles are congruent. If $m\angle 4$ is 60°, then $m\angle 6$ is also 60°.

Corresponding angles lie on the same side of the transversal and in corresponding positions.

Example 2: $\angle 1$ and $\angle 5$, $\angle 3$ and $\angle 7$

Corresponding angles are congruent. If $m\angle 1$ is 120°, then $m\angle 5$ is also 120°.

Use the diagram at the right to complete Exercises 1–2.



1. Name the alternate interior angles.

   a. $\angle 11$ and $\angle$? ∠13

   b. $\angle 12$ and $\angle$? ∠14

2. Name the corresponding angles.

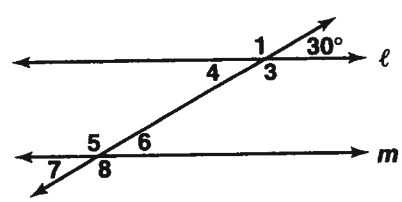
   a. $\angle 16$ and $\angle$? ∠12

   b. $\angle 14$ and $\angle$? ∠10

   c. $\angle 9$ and $\angle$? ∠13

   d. $\angle 11$ and $\angle$? ∠15

In the diagram at the right, $\ell \parallel m$. Find the measure of each angle.



3. $\angle 1$ 150°

4. $\angle 3$ 150°

5. $\angle 6$ 30°

6. $\angle 5$ 150°

7. $\angle 8$ 150°

8. $\angle 7$ 30°

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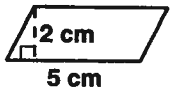
Review 274

Areas of Polygons

Example 1: Find the area of the parallelogram. Use the formula below.

Area = base × height



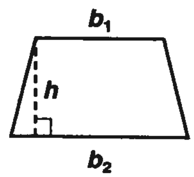
$A = bh$

$= 5 \times 2$

$= 10\text{ cm}^2$

The area of a trapezoid is half the product of the height and the sum of the lengths of the bases.

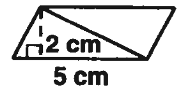
$A = \frac{1}{2}h(b_1 + b_2)$



Example 2: Find the area of the triangle. You can cut a parallelogram into two congruent triangles. So, the area of a triangle is half the area of a parallelogram.

To find the area of a triangle, use this formula.

Area = $\frac{1}{2}$base × height

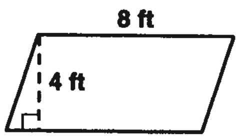


$A = \frac{1}{2}bh$

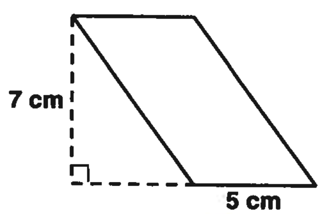
$= \frac{1}{2} \times 5 \times 2$

$= 5\text{ cm}^2$

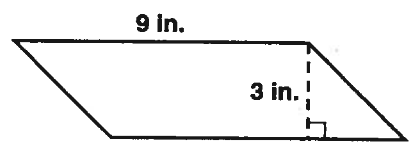
Find the area of each parallelogram.

1. 

$A =$ 32ft²

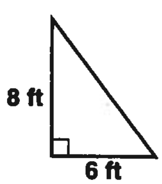
2. 

$A =$ 35cm²

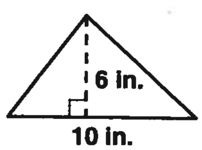
3. 

$A =$ 27in²

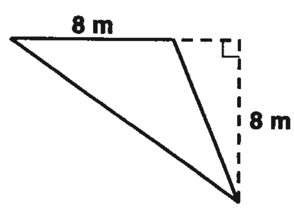
Find the area of each triangle.

4. 

$A =$ 24ft²

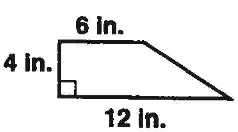
5. 

$A =$ 30in²

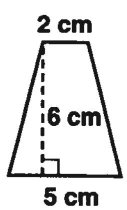
6. 

$A =$ 32m²

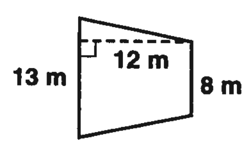
Find the area of each trapezoid.

7. 

$A =$ 36in²

8. 

$A =$ 21cm²

9. 

$A =$ 126m²

Course 3 Topics

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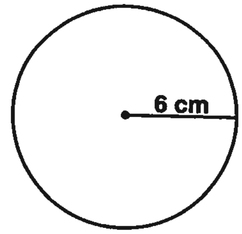
Review 275

Circumferences and Areas of Circles

The distance around a circle is called the *circumference.*



- You can use a formula to find the circumference (C) of a circle. *Pi* (π) is approximately equal to ($\approx$) 3.14.

  Circumference $= 2 \times \pi \times$ radius
  $C = 2\pi r$

- If you know the diameter, use this formula:
  Circumference $= \pi \times$ diameter
  $C = \pi d$

Circumference $= 2 \times \pi \times r$
$C = 2 \times \pi \times 6$
≈ 37.7 cm

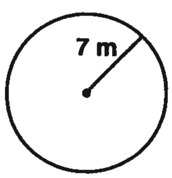
To find the *area of a circle,* use this formula:

Area $= \pi \times$ radius^2
$A = \pi r^2$

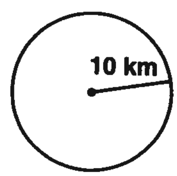
Area $= \pi \times r^2$
$A = \pi \times 6^2$
≈ 113.1 cm^2

The circumference of the circle is about 37.7 cm. The area of the circle is about 113.1 cm^2.

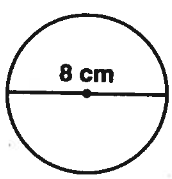
Find the circumference and area of each circle. Round to the nearest tenth.

1. 

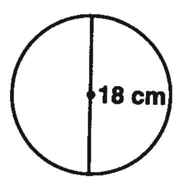
$C \approx$ 44.0 m $A \approx$ 153.9 m^2

2. 

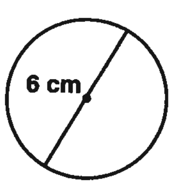
$C \approx$ 62.8 km $A \approx$ 314 km^2

3. 

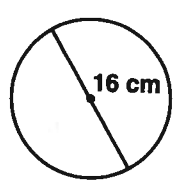
$C \approx$ 25.1 cm $A \approx$ 50.2 cm^2

4. 

$C \approx$ 56.5 cm $A \approx$ 254.3 cm^2

5. 

$C \approx$ 18.8 cm $A \approx$ 28.3 cm^2

6. 

$C \approx$ 50.2 cm $A \approx$ 201.0 cm^2

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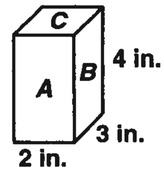
Review 280

Surface Areas of Prisms and Cylinders

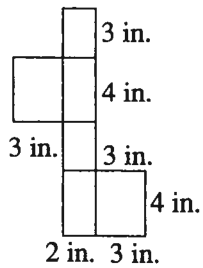
The *surface area* of a solid is the sum of the areas of its surfaces. S.A. stands for *surface area* and L.A. stand for *lateral area.*



Example 1: Find the surface area of the prism.

Using a Net to Find Surface Area of a Prism

Draw a net of the prism and find the area of each rectangle in the net.



S.A. =

$(2 \cdot 3) + (2 \cdot 3) + (3 \cdot 4) + (3 \cdot 4) + (2 \cdot 4) + (2 \cdot 4)$

$= 6 + 6 + 12 + 12 + 8 + 8$

$= 52 \text{ in.}^2$

Using the Prism Surface Area Formula

The lateral area of a prism is the product of the perimeter of the base and the height of the prism.

$\text{L.A.} = ph$

$\text{S.A.} = \text{L.A.} + 2B$

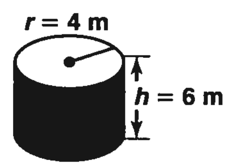
$= ph + 2B$

$= (2 + 2 + 3 + 3)4 + 2(2 \cdot 3)$

$= 10(4) + 2(6)$

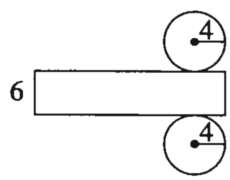
$= 40 + 12 = 52 \text{ in.}^2$

Example 2: Find the surface area of the cylinder.



Using a Net to Find Surface Area of a Cylinder

Draw a net of the cylinder and find the area of each shape in the net.



$\text{S.A.} = 16\pi + 16\pi + 48\pi$

$= 80\pi$

≈ 251.33

Using the Cylinder Surface Area Formula

$\text{S.A.} = 2\pi rh + 2\pi r^2$

$= 2\pi(4)(6) + 2\pi(4^2)$

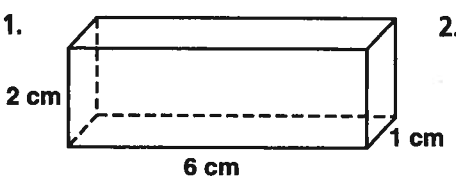
$= 48\pi + 32\pi$

$= 80\pi$

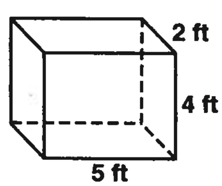
≈ 251.33

Find the lateral and surface area of each figure to the nearest whole unit.

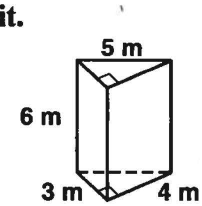
1.



2.

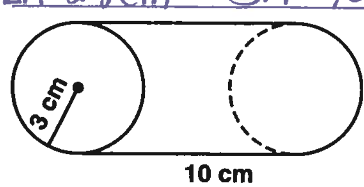


3.

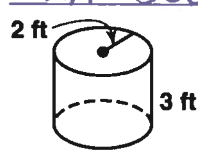


LA=28cm² SA=40cm² LA=56cm² SA=76cm² LA=72m² SA=84m²

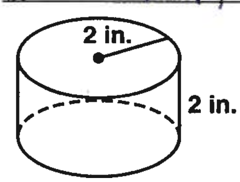
4.



5.



6.



LA=188 cm² SA=245 cm² LA=38 ft² SA=63 ft² LA=25 in² SA=50 in²

Course 3 Topics

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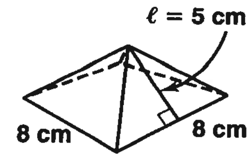
Review 281

Surface Areas of Pyramids and Cones

Example 1: Find the surface area of the prism.



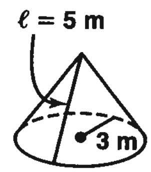
The lateral area of a square pyramid is four times the area of one of the lateral faces.

$$\text{L.A.} = 4 \cdot \left(\tfrac{1}{2}b\ell\right) = 2b\ell$$

The surface area of a square pyramid is the sum of the lateral area and the area of the base.

$$\begin{aligned}\text{S.A.} &= \text{L.A.} + B\\ &= 2b\ell + b^2\\ &= 2(8)(5) + 8^2\\ &= 80 + 64\\ &= 144 \text{ cm}^2\end{aligned}$$

Example 2: Find the surface area of the cone.

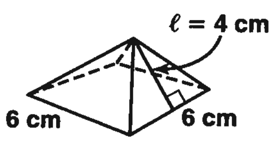


The lateral area of a cone is one half the product of the circumference of the base and the slant height.

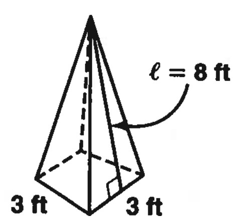
$$\text{L.A.} = \tfrac{1}{2}(2\pi r)\ell = \pi r\ell$$

$$\begin{aligned}\text{S.A.} &= \text{L.A.} + B\\ &= \pi r\ell + \pi r^2\\ &= \pi(3)(5) + \pi(3^2)\\ &= 15\pi + 9\pi\\ &= 24\pi \approx 75.4 \text{ m}^2\end{aligned}$$

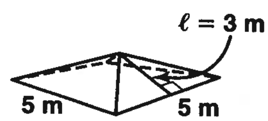
Find the lateral and surface area of each square pyramid.

1. 

LA = 48 cm^2 SA = 84 cm^2

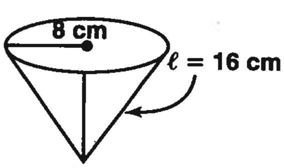
2. 

LA = 48 ft^2 SA = 57 ft^2

3. 

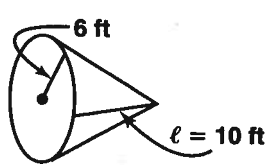
LA = 30 ft^2 SA = 55 ft^2

Find the surface area of each cone to the nearest whole unit.

4. 

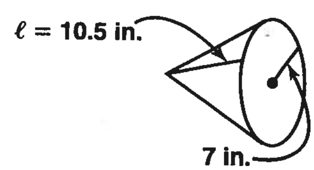
SA = $64\pi + 128\pi$

SA = 603 cm^2

5. 

SA = $36\pi + 60\pi$

SA = 301 ft^2

6. 

SA = $49\pi + 73.5\pi$

SA = 385 in^2

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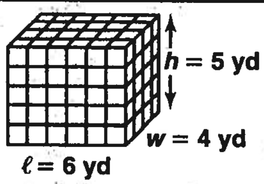
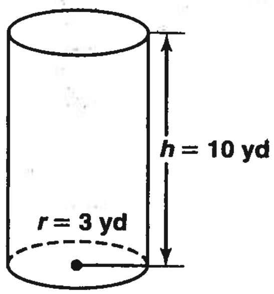
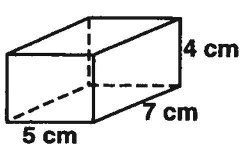
Review 282

Volumes of Prisms and Cylinders

To find the volume of a prism or a cylinder, multiply the base area B and the height h.

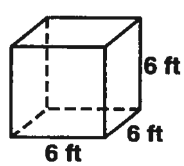
	① Find the base area B.	② Multiply base area B and height h. $V = Bh$
	$B = \ell w$ $= 6 \cdot 4$ $= 24\ \text{yd}^2$	$V = Bh$ $= 24 \cdot 5$ $= 120\ \text{yd}^3$ The volume is 120 yd^3.
	$B = \pi r^2$ $= \pi \cdot 3^2$ $\approx 28.27\ \text{yd}^2$	$V = Bh$ $\approx 28.27 \cdot 10$ $\approx 282.7\ \text{yd}^3$ The volume is about 283 yd^3.

Find the base area and volume of each prism.

1. 

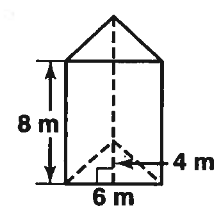
$B =$ 35cm²

$V =$ 140cm³

2. 

$B =$ 36ft²

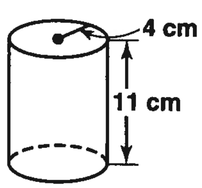
$V =$ 216ft³

3. 

$B =$ 12 m²

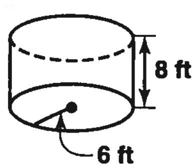
$V =$ 96m³

Find the base area of each cylinder to the nearest hundredth. Then find the volume of each cylinder to the nearest whole unit.

4. 

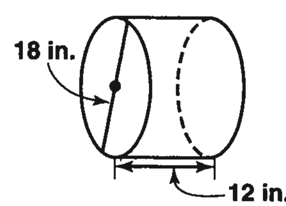
$B \approx$ 50.24cm²

$V \approx$ 553cm³

5. 

$B \approx$ 113.04cm²

$V \approx$ 904 cm³

6. 

$B \approx$ 254.34cm²

$V \approx$ 3052 cm³

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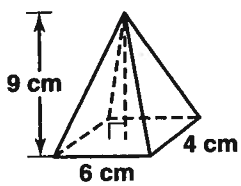
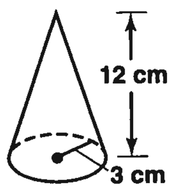
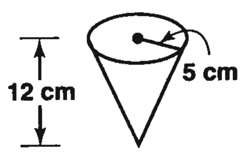
Review 283

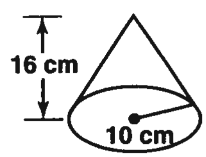
To find the volume of a pyramid or cone, multiply $\frac{1}{3}$, the base area B, and the height h.

	① Find the base area B.	② Multiply $\frac{1}{3}$, the base area B, and the height h. $V = \frac{1}{3}Bh$
	$B = \ell w$ $= 6 \cdot 4$ $= 24 \text{ cm}^2$	$V = \frac{1}{3}Bh$ $= \frac{1}{3}(24)(9)$ $= 72 \text{ cm}^3$ The volume is 72 cm^3.
	$B = \pi r^2$ $= \pi \cdot 3^2$ $\approx 28.27 \text{ cm}^2$	$V = \frac{1}{3}Bh$ $\approx \frac{1}{3}(28.27)(12)$ $\approx 113.08 \text{ cm}^3$ The volume is about 113.08 cm^3.

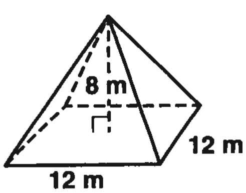
Find the volume of each figure to the nearest whole unit.

1. 

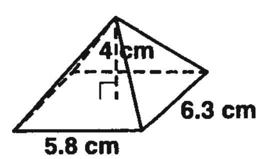
$V = 314 \text{cm}^3$

2. 

$V = 1675 \text{ cm}^3$

3. 

384m^3

4. 

49cm^3

5. Find the height of a cone with an approximate volume of 134 cm^3 and a radius of 4 cm.

8cm

$V = \frac{1}{3}\pi r^2 h$

$134 = \frac{1}{3}\pi(16)h$

$8 = h$

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