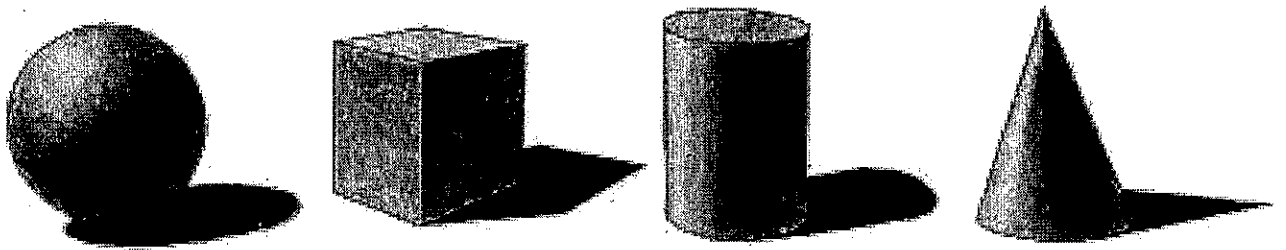


**Pre-Algebra Enriched**  
**Lesson 9.2**  
**Chapter 10**  
**Angles, Area, & Volume**



**Name** \_\_\_\_\_

**Period** \_\_\_\_\_



**Objective:**

**Vocabulary**

|                         | Definition | Example |
|-------------------------|------------|---------|
| <b>Adjacent Angles</b>  |            |         |
| <b>Vertical Angles</b>  |            |         |
| <b>Congruent Angles</b> |            |         |
| <b>Supplementary</b>    |            |         |
| <b>Complementary</b>    |            |         |

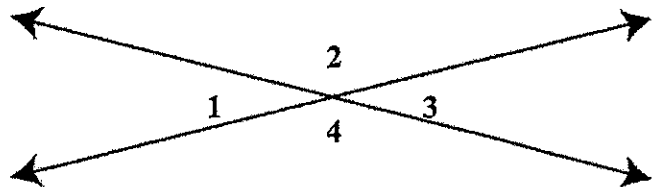
**Example 1:** Find the measure of each angle.

Find  $m\angle 1$ ,  $m\angle 2$ , and  $m\angle 3$  if  $m\angle 4 = 110^\circ$ .

$m\angle 1 = \underline{\hspace{2cm}}$

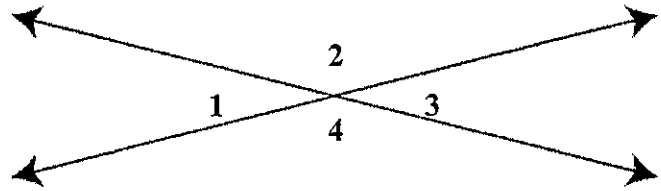
$m\angle 2 = \underline{\hspace{2cm}}$

$m\angle 3 = \underline{\hspace{2cm}}$



**Example 2:** Find the measure of each angle.

Find  $m\angle 2$ ,  $m\angle 3$ , and  $m\angle 4$  if  $m\angle 1 = 28^\circ$ .



$m\angle 2 =$  \_\_\_\_\_

$m\angle 3 =$  \_\_\_\_\_

$m\angle 4 =$  \_\_\_\_\_

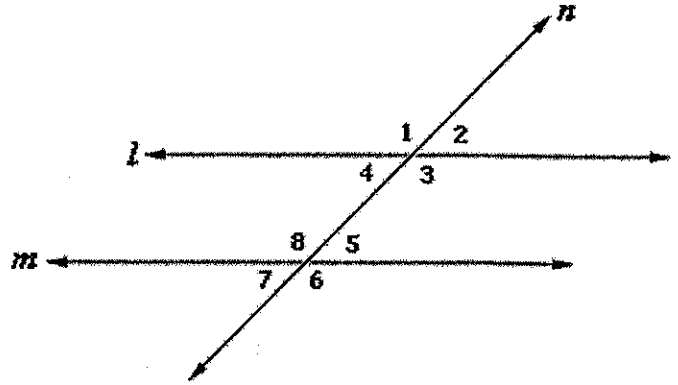
|                                  | Definition | Example |
|----------------------------------|------------|---------|
| <b>Transversal</b>               |            |         |
| <b>Corresponding Angles</b>      |            |         |
| <b>Alternate Interior Angles</b> |            |         |
| <b>Alternate Exterior Angles</b> |            |         |

When a transversal intersects *parallel* lines, the following angles are congruent:

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**Example 3:** In the diagram,  $l \parallel m$ . Identify each of the following:

- (a) congruent corresponding angles
- (b) congruent alternate interior angles
- (c) congruent alternate exterior angles
- (d) vertical angles

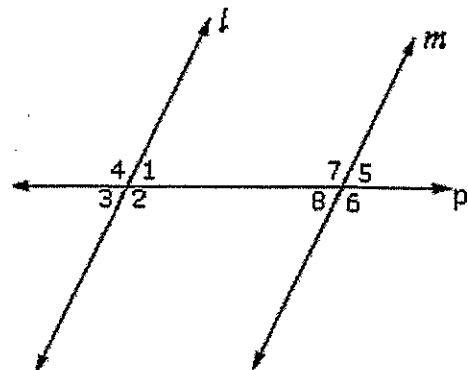


**Example 4:** In Example 3,  $m\angle 3 = 120^\circ$ . Determine the measure of all other angles.

- $m\angle 1 =$
- $m\angle 2 =$
- $m\angle 4 =$
- $m\angle 5 =$
- $m\angle 6 =$
- $m\angle 7 =$
- $m\angle 8 =$

**Example 5:** If  $m\angle 1 = 65^\circ$ , determine the measure of all other angles. Assume  $l \parallel m$ .

- $m\angle 2 =$
- $m\angle 3 =$
- $m\angle 4 =$
- $m\angle 5 =$
- $m\angle 6 =$
- $m\angle 7 =$
- $m\angle 8 =$



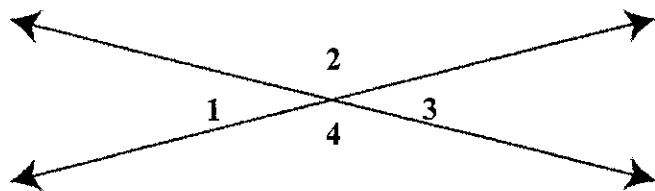
**Extra Practice 1:** Find the measure of each angle.

Find  $m\angle 1$ ,  $m\angle 2$ , and  $m\angle 3$  if  $m\angle 4 = 135^\circ$ .

$m\angle 1 =$  \_\_\_\_\_

$m\angle 2 =$  \_\_\_\_\_

$m\angle 3 =$  \_\_\_\_\_



**Extra Practice 2:** In the diagram,  $l \parallel m$ . If  $m\angle 5 = 25^\circ$ , determine the measure of all other angles.

$m\angle 1 =$  \_\_\_\_\_

$m\angle 2 =$  \_\_\_\_\_

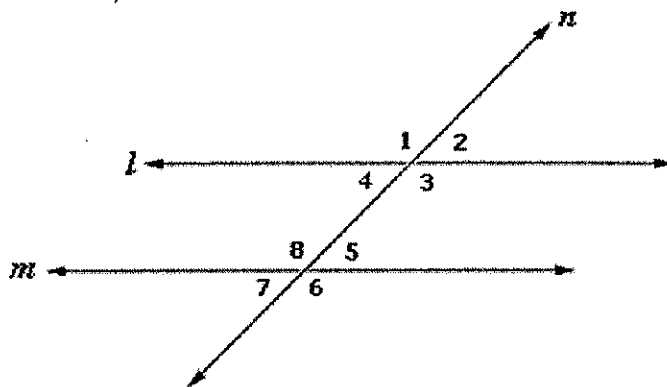
$m\angle 3 =$  \_\_\_\_\_

$m\angle 4 =$  \_\_\_\_\_

$m\angle 6 =$  \_\_\_\_\_

$m\angle 7 =$  \_\_\_\_\_

$m\angle 8 =$  \_\_\_\_\_



What type of angles are  $\angle 2$  and  $\angle 4$ ? \_\_\_\_\_

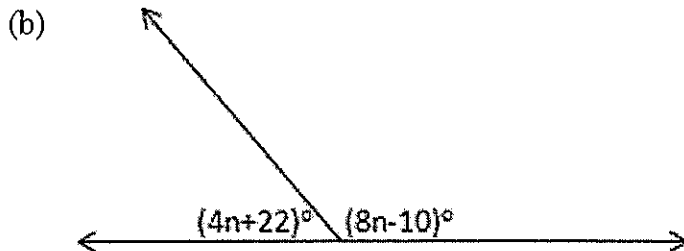
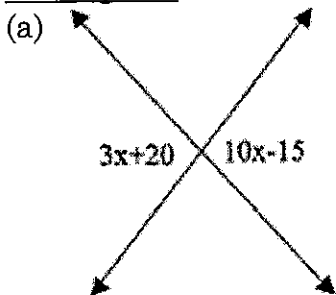
What type of angles are  $\angle 1$  and  $\angle 4$ ? \_\_\_\_\_

What type of angles are  $\angle 2$  and  $\angle 5$ ? \_\_\_\_\_

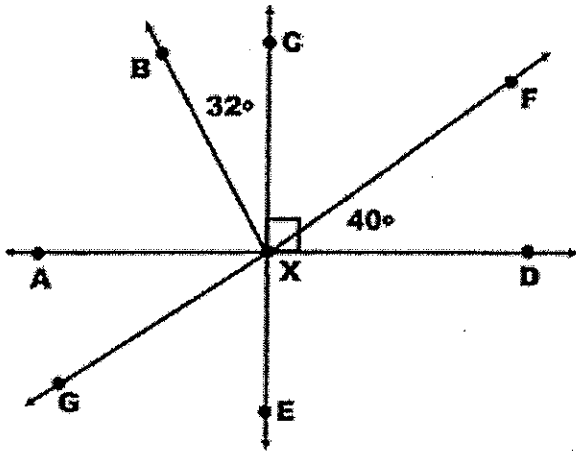
What type of angles are  $\angle 2$  and  $\angle 7$ ? \_\_\_\_\_

What type of angles are  $\angle 3$  and  $\angle 8$ ? \_\_\_\_\_

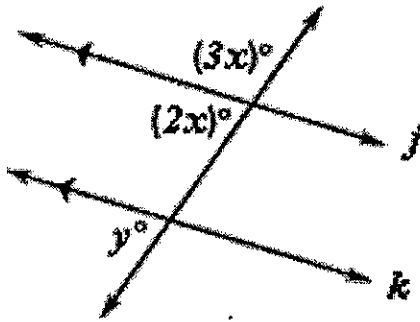
**Example 6:** Find the measure of each angle.



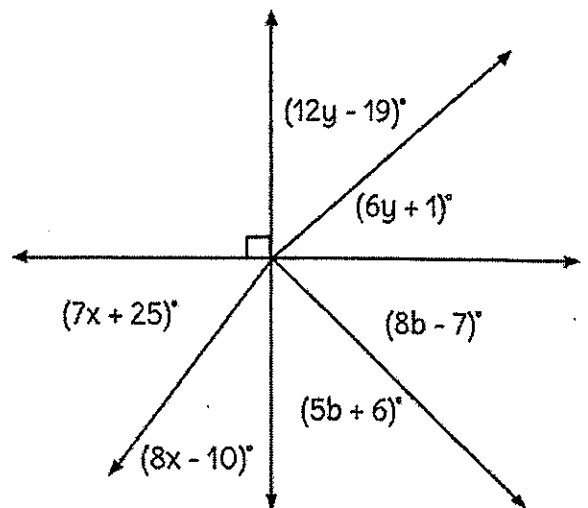
**Example 7:** Determine the measure of each angle in the diagram below. Label the diagram.



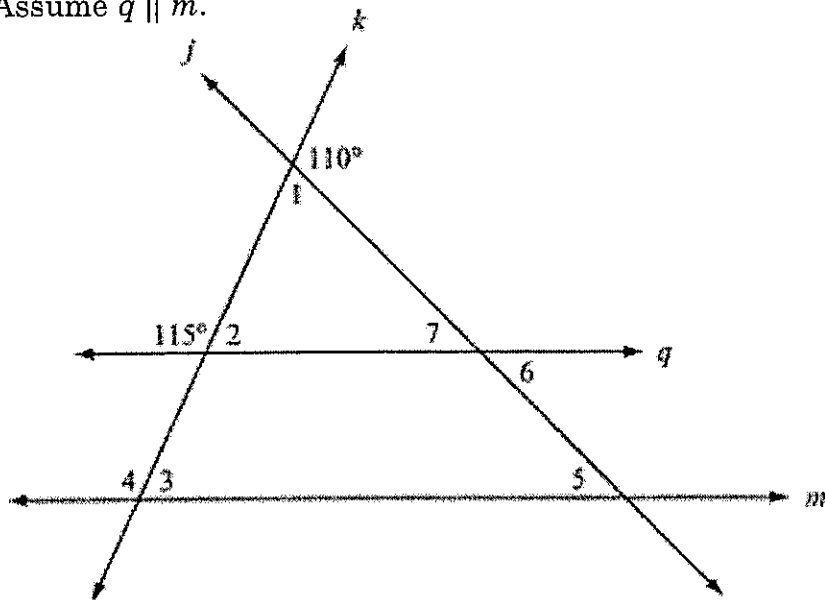
**Example 8:** Determine the measure of each angle in the diagram below. Label the diagram.



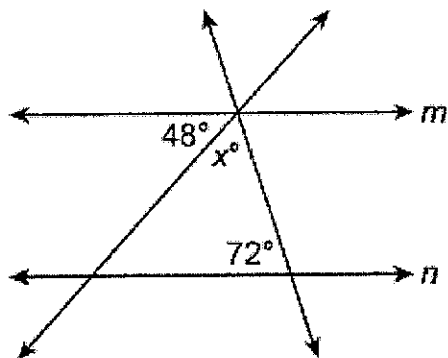
**Example 9:** Determine the measure of each angle in the diagram below. Label the diagram.



**Example 10:** Determine the measure of each numbered angle in the diagram below.  
 Assume  $q \parallel m$ .

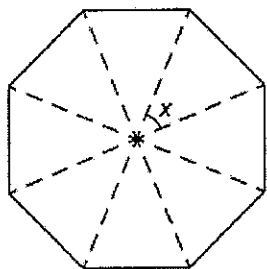


**Example 11:** Determine the measure of  $x$  in the diagram below. Assume  $m \parallel n$ .

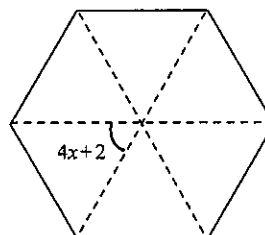


**Example 12:** Determine the value of  $x$ .

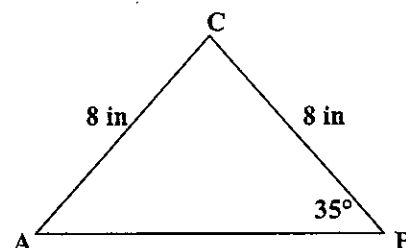
(a)



(b)



**Example 13:** Triangle ABC is shown below.  
 What is the measure of Angle C?





## Angle Relationship

Write the angle relationship for each pair of angles. Also, determine all angle measures in the diagram below.

Angle Relationships:

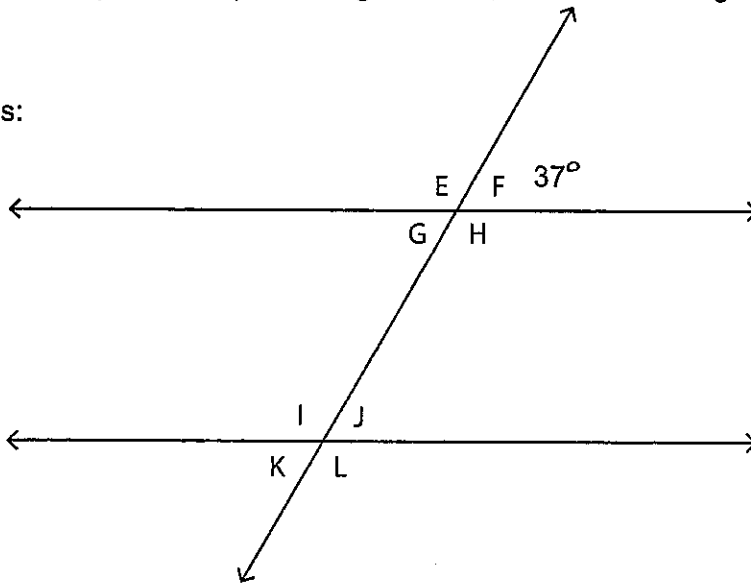
- Corresponding

- Vertical

- Supplementary

- Alternate Interior

- Alternate Exterior



1)  $\angle J$  and  $\angle F$  are \_\_\_\_\_

2)  $\angle E$  and  $\angle G$  are \_\_\_\_\_

3)  $\angle J$  and  $\angle K$  are \_\_\_\_\_

4)  $\angle G$  and  $\angle I$  are \_\_\_\_\_

5)  $\angle H$  and  $\angle L$  are \_\_\_\_\_

6)  $\angle K$  and  $\angle E$  are \_\_\_\_\_

7)  $\angle F$  and  $\angle K$  are \_\_\_\_\_

8)  $\angle H$  and  $\angle G$  are \_\_\_\_\_

9)  $\angle E$  and  $\angle H$  are \_\_\_\_\_

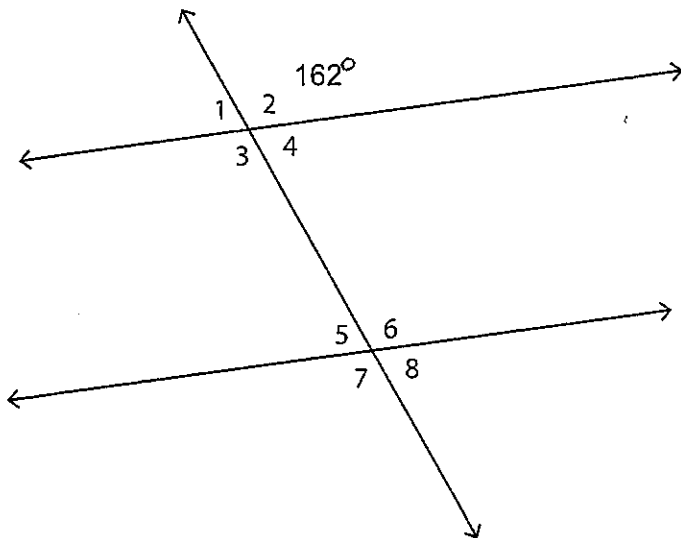
10)  $\angle G$  and  $\angle J$  are \_\_\_\_\_

## Angle Relationship

Find the angle relationship for each pair of angles. Also, determine all angle measures in the diagram below.

Angle Relationships:

- Corresponding
- Vertical
- Supplementary
- Alternate Interior
- Alternate Exterior



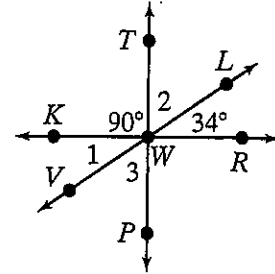
- 1)  $\angle 1$  and  $\angle 4$  are \_\_\_\_\_
- 2)  $\angle 2$  and  $\angle 7$  are \_\_\_\_\_
- 3)  $\angle 4$  and  $\angle 8$  are \_\_\_\_\_
- 4)  $\angle 3$  and  $\angle 5$  are \_\_\_\_\_
- 5)  $\angle 6$  and  $\angle 8$  are \_\_\_\_\_
- 6)  $\angle 1$  and  $\angle 7$  are \_\_\_\_\_
- 7)  $\angle 3$  and  $\angle 6$  are \_\_\_\_\_
- 8)  $\angle 1$  and  $\angle 3$  are \_\_\_\_\_
- 9)  $\angle 2$  and  $\angle 6$  are \_\_\_\_\_
- 10)  $\angle 6$  and  $\angle 7$  are \_\_\_\_\_

# Practice 9-2

## Angle Relationships and Parallel Lines

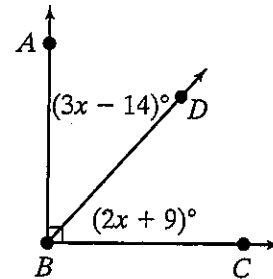
Find the measure of each angle in the figure at the right.

1.  $m\angle 1$  \_\_\_\_\_      2.  $m\angle 2$  \_\_\_\_\_  
 3.  $m\angle 3$  \_\_\_\_\_      4.  $m\angle VWR$  \_\_\_\_\_



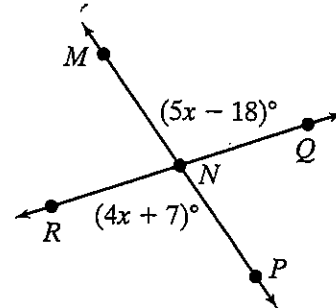
Use the figure at the right for Exercises 5-8.

5. Write an equation. \_\_\_\_\_  
 6. Find the value of  $x$ . \_\_\_\_\_  
 7. Find  $m\angle ABD$ . \_\_\_\_\_  
 8. Find  $m\angle DBC$ . \_\_\_\_\_



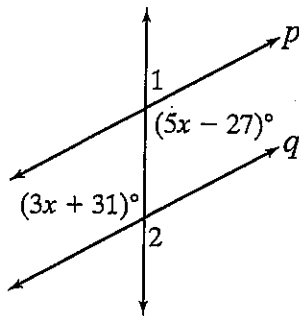
Use the figure at the right for Exercises 9-12.

9. Write an equation. \_\_\_\_\_  
 10. Find the value of  $x$ . \_\_\_\_\_  
 11. Find  $m\angle MNQ$ . \_\_\_\_\_  
 12. Find  $m\angle MNR$ . \_\_\_\_\_



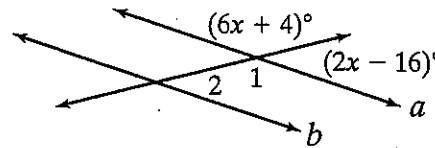
In each figure, find the measures of  $\angle 1$  and  $\angle 2$ .

13. Given  $p \parallel q$ .



$m\angle 1 =$  \_\_\_\_\_  $m\angle 2 =$  \_\_\_\_\_

14. Given  $a \parallel b$ .



$m\angle 1 =$  \_\_\_\_\_  $m\angle 2 =$  \_\_\_\_\_

15. Find a pair of complementary angles such that the difference of their measures is  $12^\circ$ .

\_\_\_\_\_

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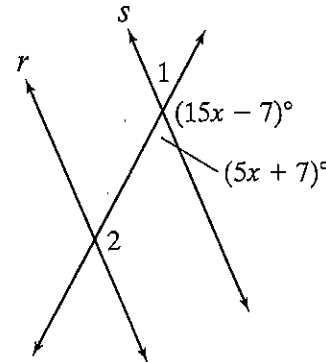
# Reteaching 9-2

## Angle Relationships and Parallel Lines

Find the measures of  $\angle 1$  and  $\angle 2$ . Given:  $r \parallel s$ .

Write an equation and solve for  $x$ .

$$\begin{aligned} (5x + 7) + (15x - 7) &= 180 && \text{These angles are supplementary.} \\ 5x + 15x + 7 - 7 &= 180 && \text{Simplify.} \\ 20x &= 180 && \text{Simplify.} \\ \frac{20x}{20} &= \frac{180}{20} && \text{Divide each side by 20.} \\ x &= 9 && \text{Simplify.} \end{aligned}$$



Find the measure of the angle marked  $(5x + 7)^\circ$  by substituting  $x = 9$ .

$$5x + 7 = 5(9) + 7 = 45 + 7 = 52$$

Since this angle and  $\angle 1$  are vertical, they have the same measure.

Thus,  $m\angle 1 = 52^\circ$ .

We can find the measure of  $\angle 2$  several ways. The angle marked  $(15x - 7)^\circ$  and  $\angle 2$  are corresponding angles, so they have the same measure. We can find this measure by substituting  $x = 9$  into  $15x - 7$  or by realizing that this angle and  $\angle 1$  are supplementary.

$$180 - 52 = 128$$

$$15x - 7 = 15(9) - 7 = 135 - 7 = 128$$

Either way,  $m\angle 2 = 128^\circ$ .

**Use the figure at the right.**

Given:  $p \parallel q$ .

1. Write an equation.

\_\_\_\_\_

2. Find the value of  $x$ .

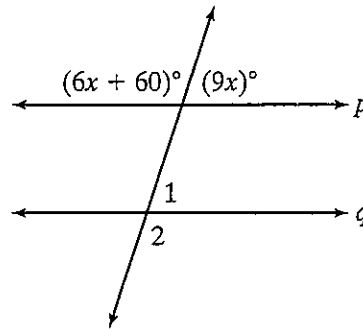
$x =$  \_\_\_\_\_

3. Find  $m\angle 1$ .

$m\angle 1 =$  \_\_\_\_\_

4. Find  $m\angle 2$ .

$m\angle 2 =$  \_\_\_\_\_

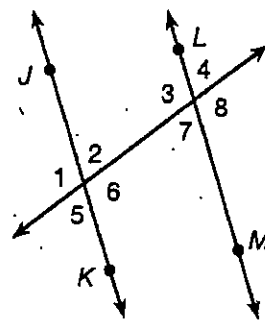


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Practice

Use figure at right to answer Exercises 9–16.  
 $\overleftrightarrow{JK} \parallel \overleftrightarrow{LM}$ . If  $m\angle 2 = 70^\circ$ , find each angle measure.

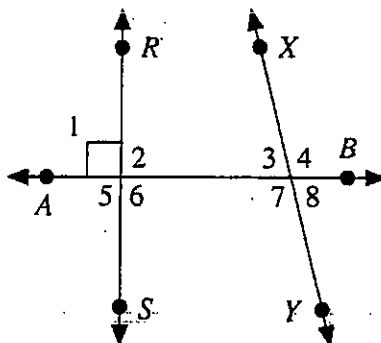


1.  $m\angle 4$  \_\_\_\_\_    2.  $m\angle 7$  \_\_\_\_\_  
 3.  $m\angle 5$  \_\_\_\_\_    4.  $m\angle 3$  \_\_\_\_\_

Match each pair of angles with the angle classification.

- |                                    |                              |
|------------------------------------|------------------------------|
| 5. $\angle 6$ and $\angle 8$ _____ | A. alternate interior angles |
| 6. $\angle 3$ and $\angle 6$ _____ | B. alternate exterior angles |
| 7. $\angle 4$ and $\angle 7$ _____ | C. corresponding angles      |
| 8. $\angle 1$ and $\angle 8$ _____ | D. vertical angles           |

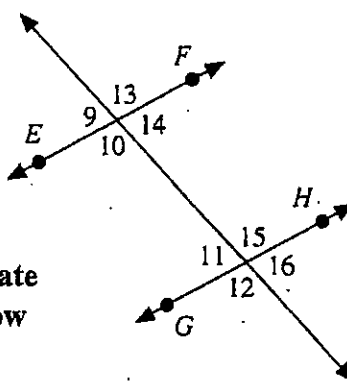
Use the figure at the right. Tell whether the given angles are a pair of corresponding angles or alternate interior angles.



9.  $\angle 1$  and  $\angle 3$                       10.  $\angle 2$  and  $\angle 7$   
 11.  $\angle 6$  and  $\angle 3$                       12.  $\angle 4$  and  $\angle 2$

9. \_\_\_\_\_  
 10. \_\_\_\_\_  
 11. \_\_\_\_\_  
 12. \_\_\_\_\_

In the figure at the right,  $\overleftrightarrow{EF} \parallel \overleftrightarrow{GH}$  and  $m\angle 9 = 75^\circ$ . Find the measure of each angle.



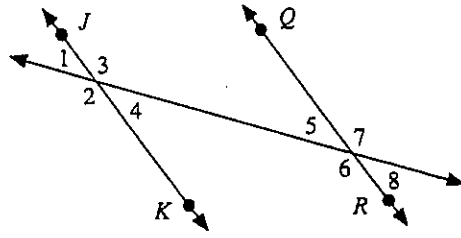
13.  $\angle 10$     14.  $\angle 11$     15.  $\angle 12$   
 16.  $\angle 13$     17.  $\angle 14$     18.  $\angle 15$

« 19. Draw a line parallel to the transversal and state how many angles are *congruent* to  $\angle 9$  and how many angles are *supplementary* to  $\angle 12$ .

13. \_\_\_\_\_  
 14. \_\_\_\_\_  
 15. \_\_\_\_\_  
 16. \_\_\_\_\_  
 17. \_\_\_\_\_  
 18. \_\_\_\_\_  
 19. \_\_\_\_\_  
 \_\_\_\_\_

Use the figure at the right and tell whether each pair of angles are adjacent(A), Vertical(V), corresponding(C), or Alternate interior angles(AI).

20.  $\angle 8$  and  $\angle 5$  \_\_\_\_\_ 21.  $\angle 1$  and  $\angle 3$  \_\_\_\_\_  
 22.  $\angle 8$  and  $\angle 4$  \_\_\_\_\_ 23.  $\angle 3$  and  $\angle 6$  \_\_\_\_\_  
 24.  $\angle 6$  and  $\angle 8$  \_\_\_\_\_ 25.  $\angle 3$  and  $\angle 7$  \_\_\_\_\_  
 26.  $\angle 7$  and  $\angle 6$  \_\_\_\_\_ 27.  $\angle 2$  and  $\angle 6$  \_\_\_\_\_

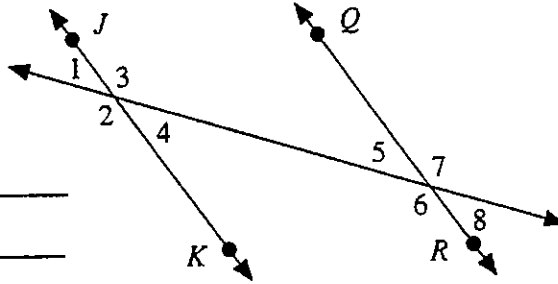


In the figure at the right,

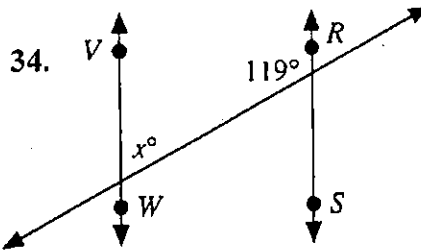
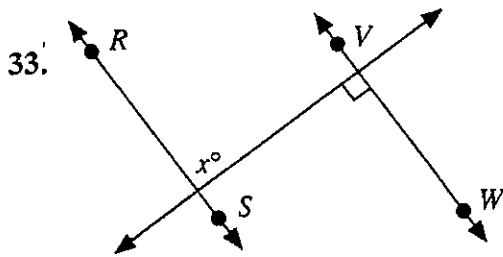
$\overleftrightarrow{JK} \parallel \overleftrightarrow{QR}$  and  $m\angle 7 = 143^\circ$ .

Find the measure of each angle.

28.  $\angle 1$  \_\_\_\_\_ 29.  $\angle 2$  \_\_\_\_\_  
 29.  $\angle 3$  \_\_\_\_\_ 30.  $\angle 4$  \_\_\_\_\_  
 31.  $\angle 5$  \_\_\_\_\_ 32.  $\angle 6$  \_\_\_\_\_



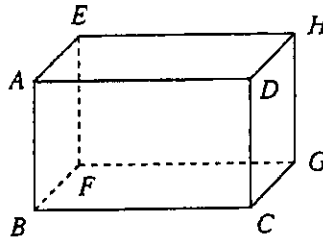
In each figure,  $\overleftrightarrow{RS} \parallel \overleftrightarrow{VW}$ . Find the value of  $x$ .



33. \_\_\_\_\_

34. \_\_\_\_\_

35. The figure at the right represents a box, similar to an ordinary packing carton. Classify each pair of line segments as *parallel*, *perpendicular*, or *skew*.



35. \_\_\_\_\_

- a.  $\overline{AB}$  and  $\overline{DC}$       b.  $\overline{EF}$  and  $\overline{DH}$   
 c.  $\overline{CG}$  and  $\overline{FG}$       d.  $\overline{AB}$  and  $\overline{GH}$

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

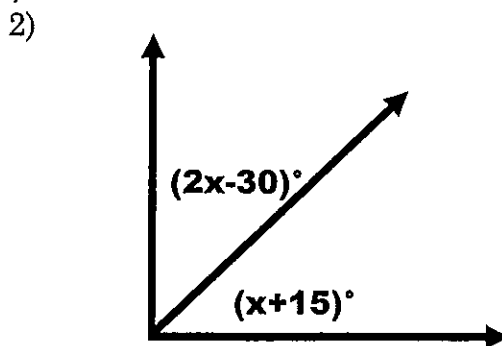
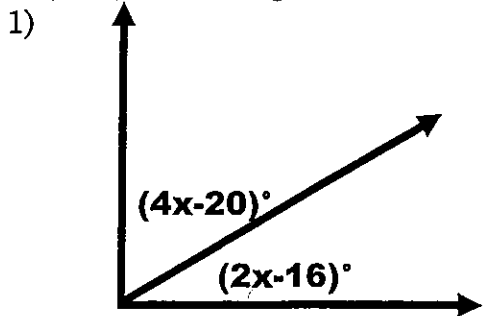
36. Determine whether the following statement is true or false.  
 Any two lines in space are related in exactly one of these ways:  
 the lines either intersect, they are parallel, or they are skew.

36. \_\_\_\_\_

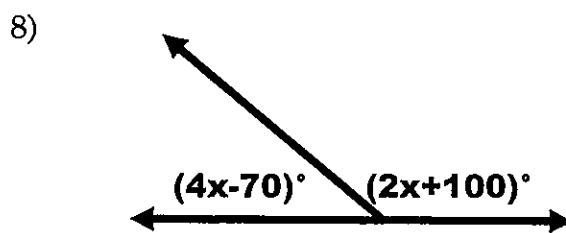
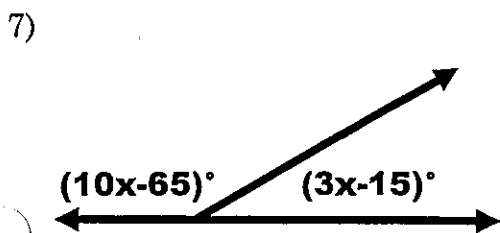
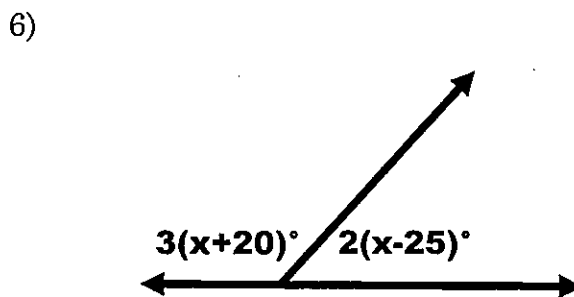
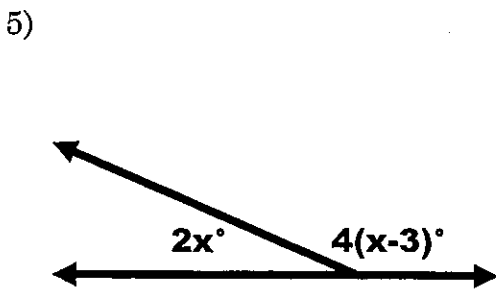
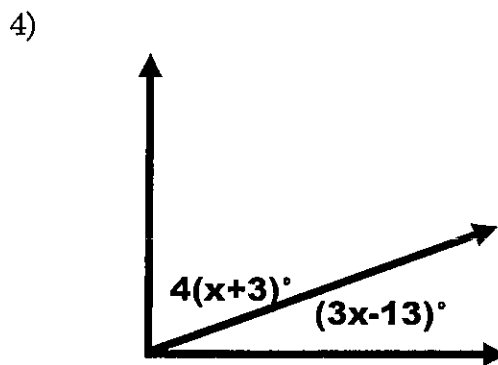
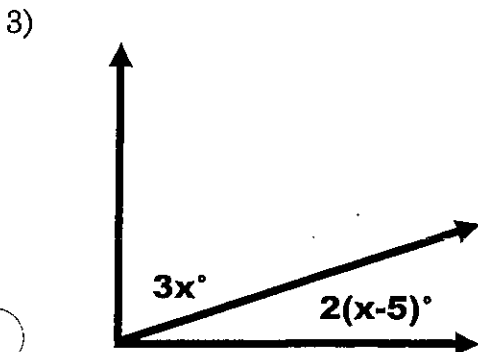
**Section 9-2 Worksheet**

Name \_\_\_\_\_  
 Period \_\_\_\_\_

**Directions:** Write an equation for each figure and solve for  $x$ . Then, find the measure of each angle. (**NOTE:** Figures are not drawn to scale).

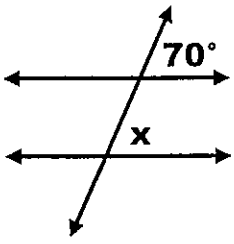


#1-4 are right angles



**Directions:** Give the measure of angle  $x$  and the relationship between the two angles.

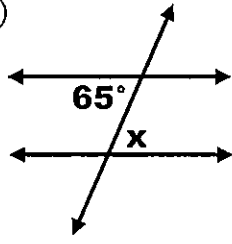
9)



$x =$  \_\_\_\_\_

\_\_\_\_\_

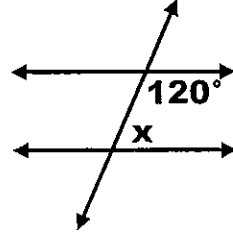
10)



$x =$  \_\_\_\_\_

\_\_\_\_\_

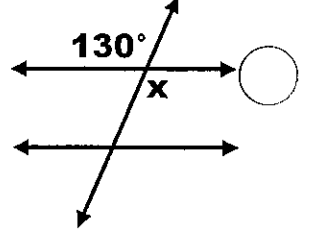
11)



$x =$  \_\_\_\_\_

\_\_\_\_\_

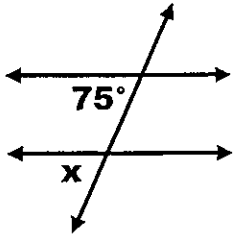
12)



$x =$  \_\_\_\_\_

\_\_\_\_\_

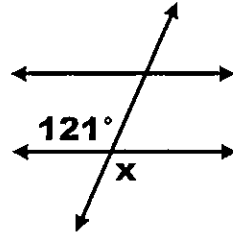
13)



$x =$  \_\_\_\_\_

\_\_\_\_\_

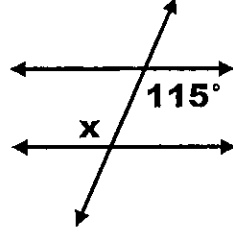
14)



$x =$  \_\_\_\_\_

\_\_\_\_\_

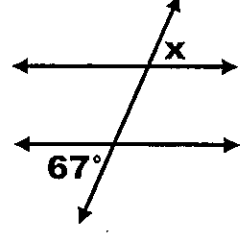
15)



$x =$  \_\_\_\_\_

\_\_\_\_\_

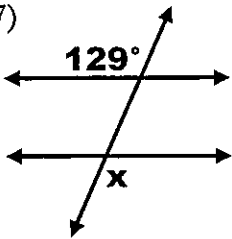
16)



$x =$  \_\_\_\_\_

\_\_\_\_\_

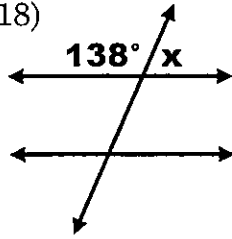
17)



$x =$  \_\_\_\_\_

\_\_\_\_\_

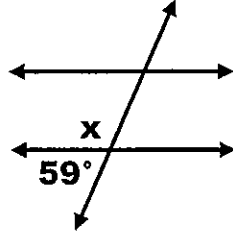
18)



$x =$  \_\_\_\_\_

\_\_\_\_\_

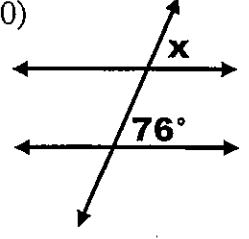
19)



$x =$  \_\_\_\_\_

\_\_\_\_\_

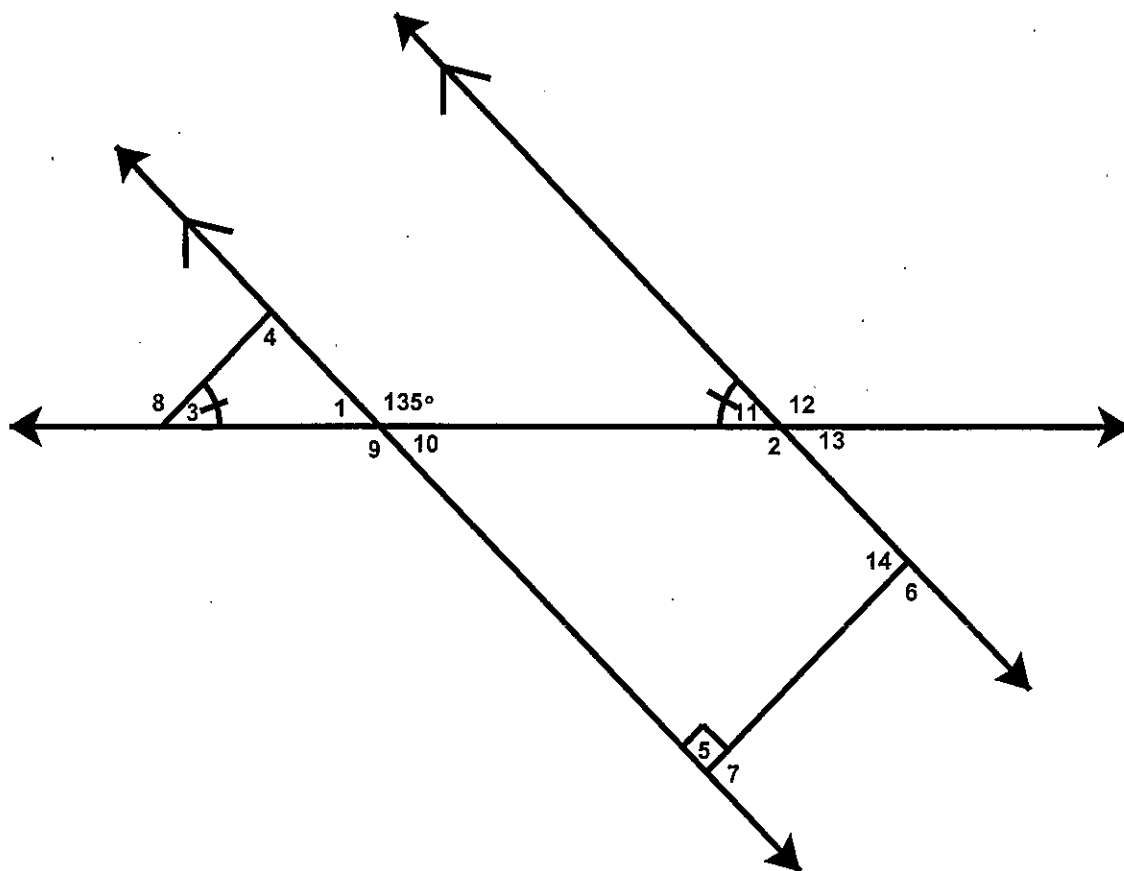
20)



$x =$  \_\_\_\_\_

\_\_\_\_\_





$m\angle 1 =$  \_\_\_\_\_

$m\angle 8 =$  \_\_\_\_\_

$m\angle 2 =$  \_\_\_\_\_

$m\angle 9 =$  \_\_\_\_\_

$m\angle 3 =$  \_\_\_\_\_

$m\angle 10 =$  \_\_\_\_\_

$m\angle 4 =$  \_\_\_\_\_

$m\angle 11 =$  \_\_\_\_\_

$m\angle 5 =$  \_\_\_\_\_

$m\angle 12 =$  \_\_\_\_\_

$m\angle 6 =$  \_\_\_\_\_

$m\angle 13 =$  \_\_\_\_\_

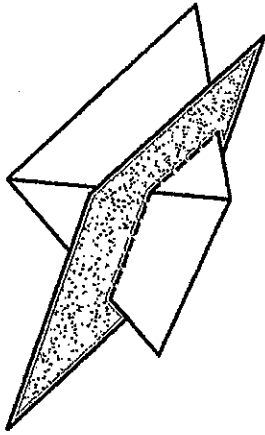
$m\angle 7 =$  \_\_\_\_\_

$m\angle 14 =$  \_\_\_\_\_

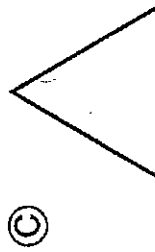
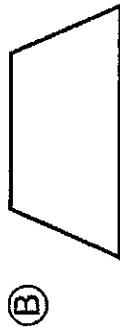
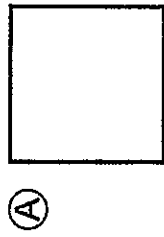


CROSS-SECTIONS

(1) A square pyramid is cut along the shaded plane shown below.

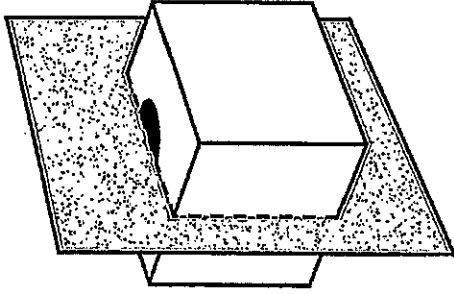


Which of the following is the cross-section of this solid?

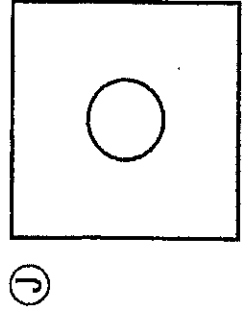
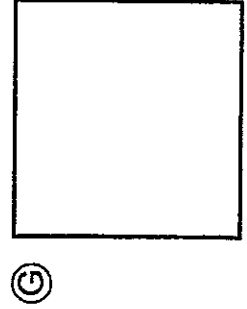
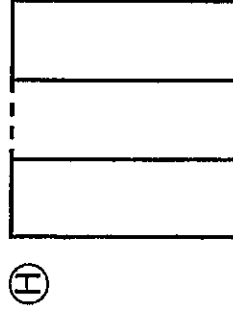
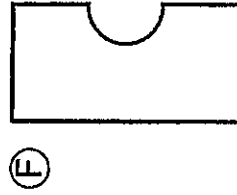


(2)

A cube with a cylinder cut from its center is cut along the plane shown below.

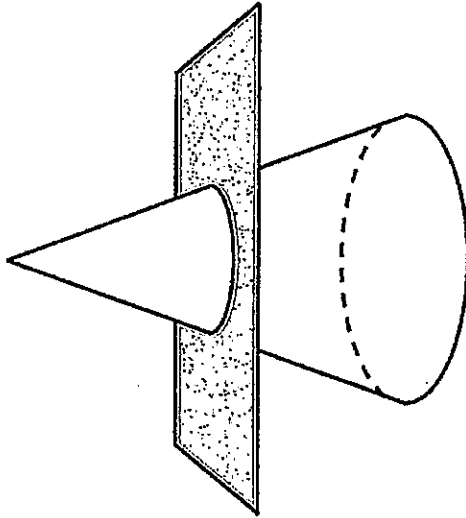


Which of the following is the cross-section of this solid?



(3)

A cross-section is cut from the circular cone below.



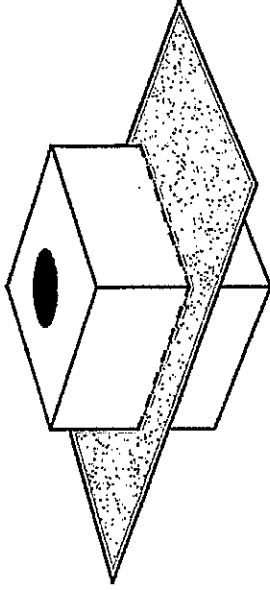
What is the shape of the cross-section?

- (A) Square
- (B) Semicircle
- (C) Triangle
- (D) Circle



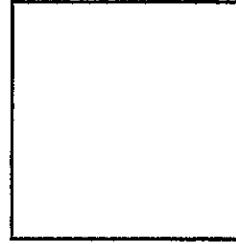
(4)

A cube with a cylinder cut from its center is cut along the plane shown below.

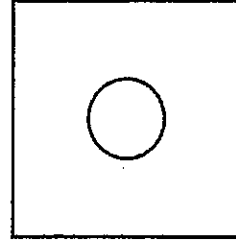


Which of the following is the cross-section of this solid?

(F)



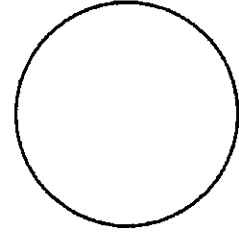
(H)



(G)

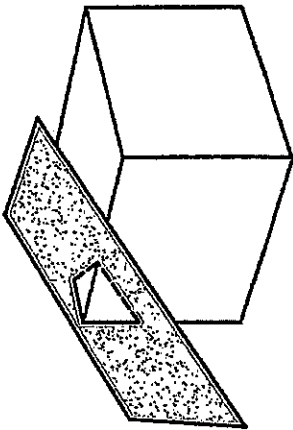


(J)



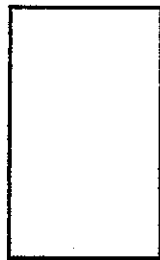
(5)

A rectangular prism is cut along the shaded plane shown below.



Which of the following is the cross-section of this solid?

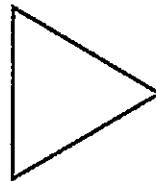
(F)



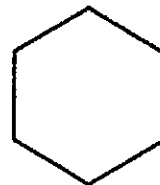
(G)



(H)

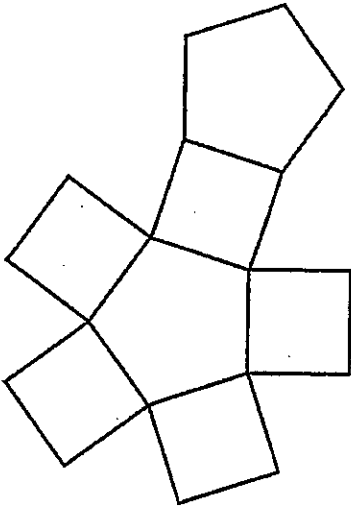


(J)



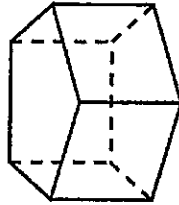
(6)

The net of a specific polyhedron is shown below.

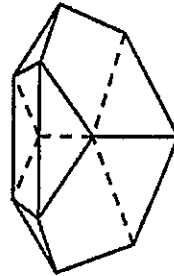


Which polyhedron is represented by this net?

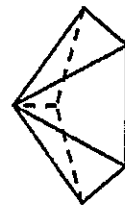
(F)



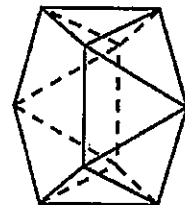
(G)



(H)

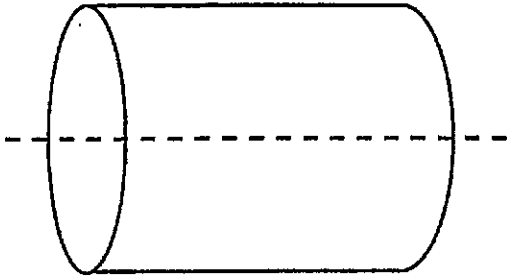


(J)



8 (7)

A cross-section is cut from the cylinder below.

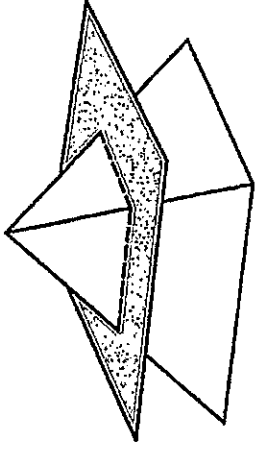


What is the shape of the cross-section?

- (A) Rectangle
- (B) Circle
- (C) Semicircle
- (D) Oval

(8)

A square pyramid is cut along the shaded plane shown below.



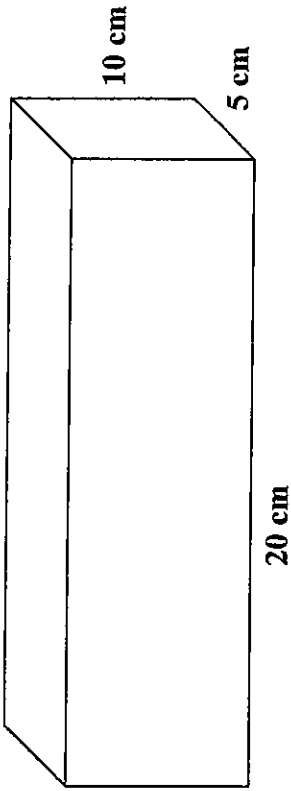
Which of the following is the cross-section of this solid?

- (F)
- (G)
- (H)
- (J)



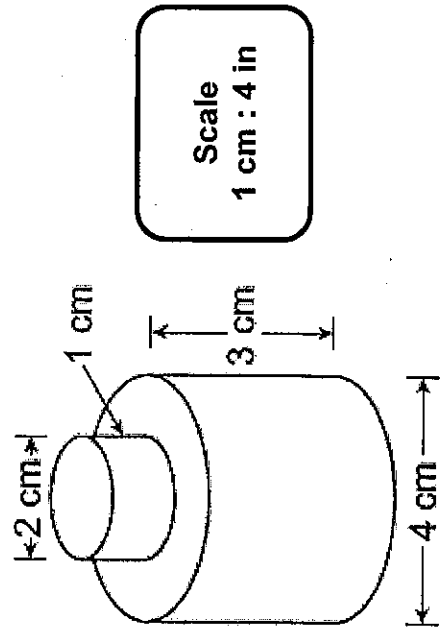
(9)

A carpenter will make a single, straight cut through the rectangular prism shown below by randomly choosing a face and cutting parallel to that face. The cut will be a whole number of centimeters from the chosen face.



What is the probability that the area, in square centimeters, of the cross section created by the cut will not be a multiple of 100?

(10) A machine part consists of two cylinders aligned along the same vertical axis. A scale drawing of the part is represented below. The part is cut in half through the vertical axis. What is the total area, in square inches, of the actual two-dimensional cross-section that is the result of the cut?







**Objective:**

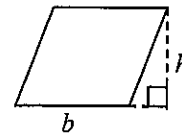
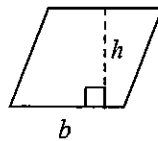
**Vocabulary**

|                 | Definition |
|-----------------|------------|
| <b>Area</b>     |            |
| <b>Altitude</b> |            |

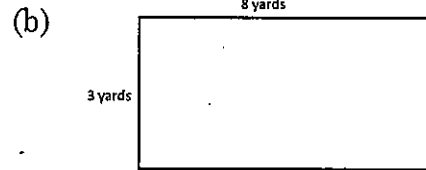
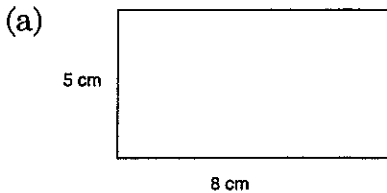
**Key Concepts - Area of a Parallelogram**

The area of a parallelogram is the product of any base length  $b$  and the corresponding *perpendicular* height  $h$ .

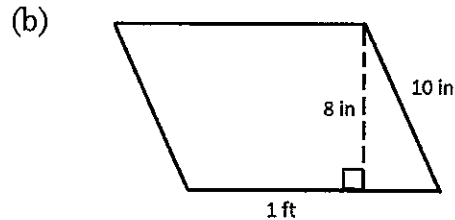
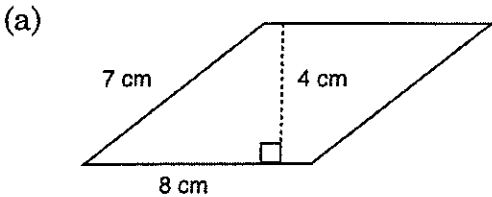
$$A = bh$$



**Example 1:** Find the area of each rectangle.



**Example 2:** Find the area of each parallelogram.



**Wrap It Up:**

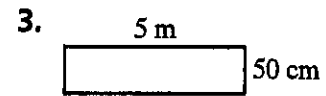
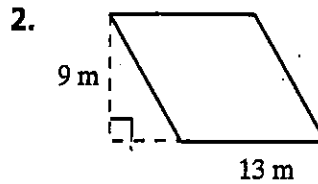
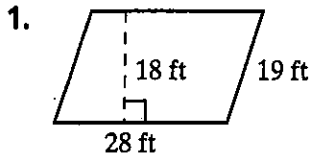
How do the areas of two parallelograms compare when the dimensions of one are twice the dimensions of the other?



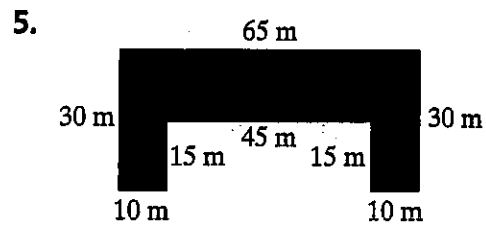
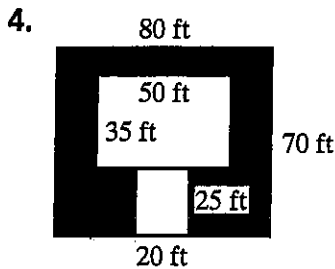
# Practice 10-1

Area: Parallelograms

Find the area of each parallelogram.



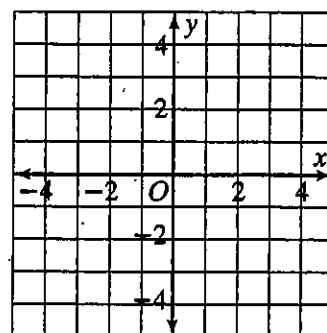
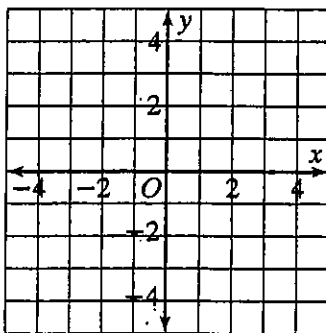
Find the area of each shaded region. Assume that all angles that appear to be right angles are right angles.



The vertices of a parallelogram are given. Draw each parallelogram. Find its area.

6.  $P(1, 1), Q(3, 1), R(2, 4), S(4, 4)$

7.  $J(-3, 2), K(1, 2), M(-1, -3), L(3, -3)$



8. The perimeter of a square is 72 in. What is its area?

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# Reteaching 10-1

## Area: Parallelograms

Draw the parallelogram with vertices  $A(-2, 4)$ ,  $B(1, 4)$ ,  $C(0, -2)$ , and  $D(-3, -2)$ . Find its area.

Plot the four points and connect them to form the parallelogram. To find the area, find the length of a base and the height to that base. Any one of the four sides could be used as the base. The easiest side to use is  $\overline{DC}$ .

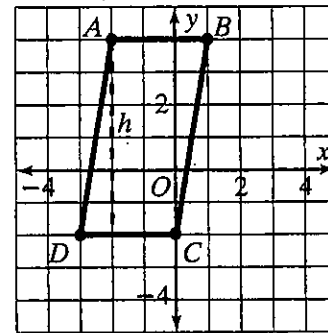
Count in the figure.

$DC = 3$  units, so  $b = 3$ .

Draw the height as a dashed line from  $A$ , perpendicular to  $\overline{DC}$ .

Count in the figure,  $h = 6$ .

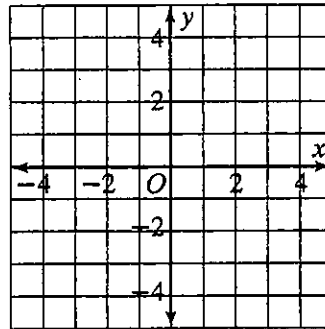
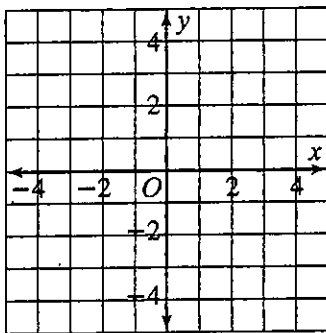
So  $A = bh = 3(6) = 18$  units<sup>2</sup>.



The vertices of a parallelogram are given. Draw each parallelogram. Find its area.

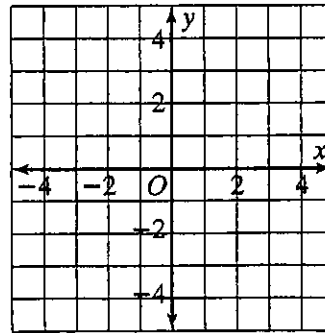
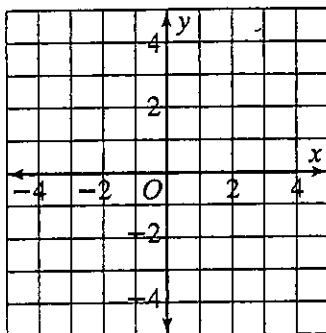
1.  $E(-1, 2)$ ,  $F(3, 2)$ ,  $G(1, 1)$ ,  $H(-3, 1)$

2.  $M(-2, 1)$ ,  $N(2, 1)$ ,  $Q(-3, -2)$ ,  $P(1, -2)$



3.  $R(1, 3)$ ,  $S(3, 3)$ ,  $U(-1, -4)$ ,  $T(1, -4)$

4.  $V(-3, -1)$ ,  $W(5, -1)$ ,  $Y(-4, -3)$ ,  $X(4, -3)$



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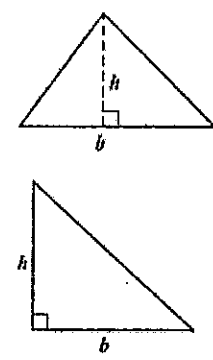
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**Objective:**

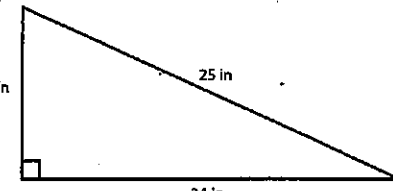
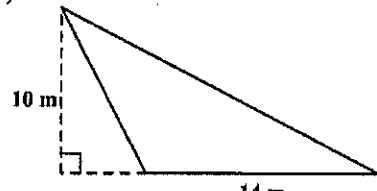
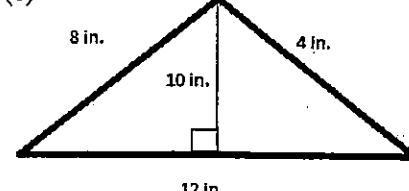
| Vocabulary             | Definition |
|------------------------|------------|
| Altitude of a triangle |            |

**Key Concepts - Area of a Triangle**

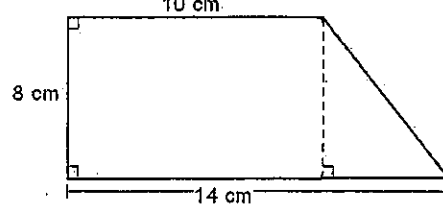
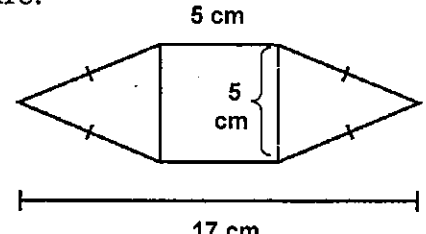
The area of a triangle equals half the product of any base length  $b$  and the corresponding height  $h$ .

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


**Example 1:** Find the area of each triangle.

(a)  (b)  (c) 

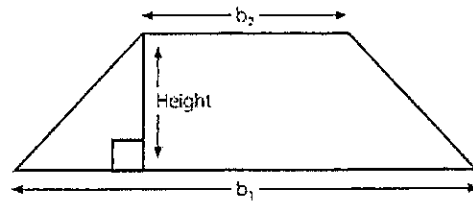
**Example 2:** Find the area of each composite figure.

(a)  (b) 

**Key Concepts – Area of a Trapezoid**

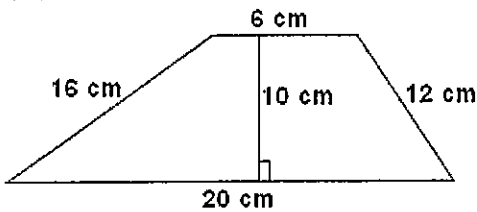
The area of a trapezoid is half the product of the height and the sum of the lengths of the bases.

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

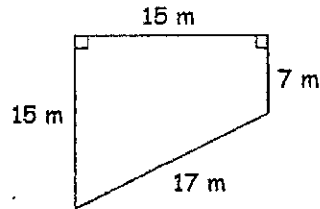


**Example 3:** Find the area of each trapezoid.

(a)



(b)



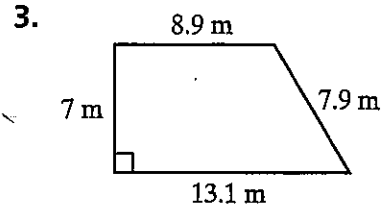
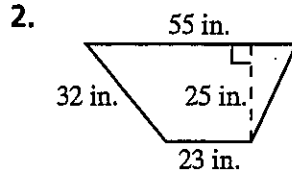
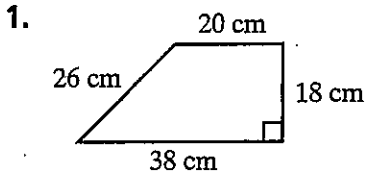
**Wrap It Up:**

What is the difference between the area of a triangle and the area of a trapezoid?

# Practice 10-2

Area: Triangles and Trapezoids

Find the area of each trapezoid.

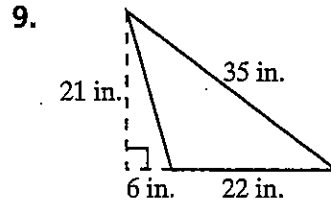
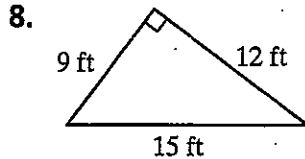
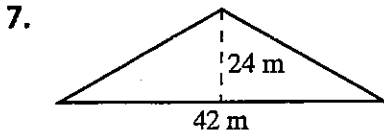


4. base<sub>1</sub> = 13 in.  
base<sub>2</sub> = 8 in.  
height = 5 in.

5. base<sub>1</sub> = 24.6 cm  
base<sub>2</sub> = 9.4 cm  
height = 15 cm

6. base<sub>1</sub> = 2.25 ft  
base<sub>2</sub> = 4.75 ft  
height = 3.5 ft

Find the area of each triangle.

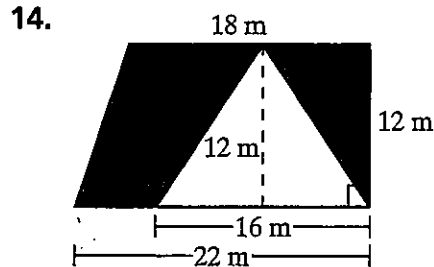
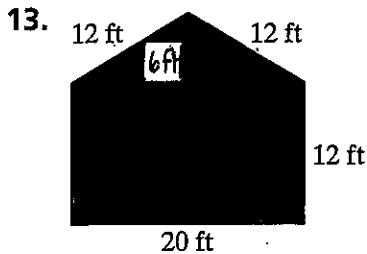


10. base = 24 in.  
height = 9 in.  
area = \_\_\_\_\_

11. height = 27 cm  
base = 34 cm  
area = \_\_\_\_\_

12. base = 40 ft  
height = 8.25 ft  
area = \_\_\_\_\_

Find the area of each shaded region.



15. A triangle has an area of  $36 \text{ cm}^2$  and a base of 6 cm. What is the height of the triangle?

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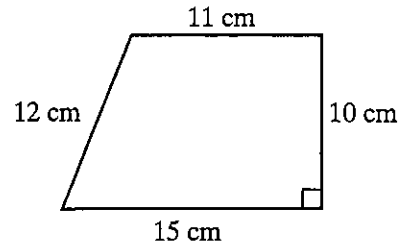
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# Reteaching 10-2

## Area: Triangles and Trapezoids

Find the area of the trapezoid.

The formula for the area  $A$  of a trapezoid is  $A = \frac{1}{2}h(b_1 + b_2)$ , where  $h$  is the height and  $b_1$  and  $b_2$  are the lengths of the bases. The bases are the two sides that are parallel. So, the bases of the trapezoid in the figure have lengths 15 cm and 11 cm. Let  $b_1 = 15$  and  $b_2 = 11$ . The height is the perpendicular distance between the bases. Since the trapezoid has right angles, the height is the side with length 10 cm. So,  $h = 10$ .



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

$$A = \frac{1}{2} \cdot 10(15 + 11)$$

$$A = \frac{1}{2} \cdot 10(26)$$

$$A = 130$$

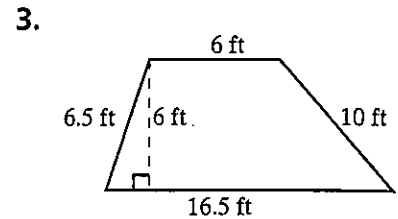
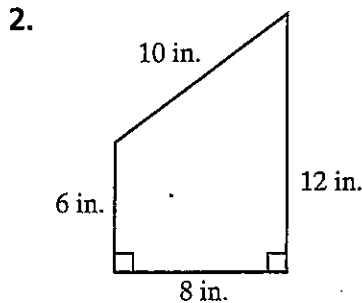
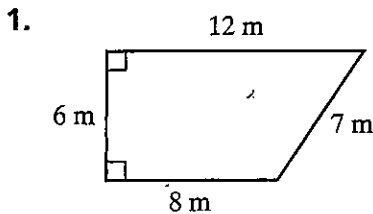
Substitute 10 for  $h$ , 15 for  $b_1$ , and 11 for  $b_2$ .

Simplify, using the order of operations.

Multiply.

So, the area of the trapezoid is 130  $\text{cm}^2$ .

Find the area of each trapezoid.



4.  $b_1 = 25 \text{ cm}$   
 $b_2 = 18 \text{ cm}$   
 $h = 12 \text{ cm}$

5.  $b_1 = 4 \text{ ft}$   
 $b_2 = 7 \text{ ft}$   
 $h = 5 \text{ ft}$

6.  $b_1 = 85 \text{ mm}$   
 $b_2 = 73 \text{ mm}$   
 $h = 48 \text{ mm}$

7.  $b_1 = 1.5 \text{ in.}$   
 $b_2 = 3.5 \text{ in.}$   
 $h = 4.5 \text{ in.}$

8.  $b_1 = 50 \text{ m}$   
 $b_2 = 60 \text{ m}$   
 $h = 40 \text{ m}$

9.  $b_1 = 12.4 \text{ km}$   
 $b_2 = 8.8 \text{ km}$   
 $h = 9 \text{ km}$

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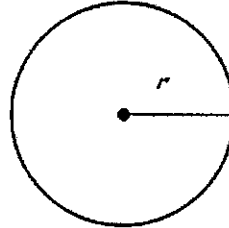
Objective:

Key Concepts – Circumference of a Circle

$$C = 2\pi r$$

Key Concepts – Area of a Circle

$$A = \pi r^2$$



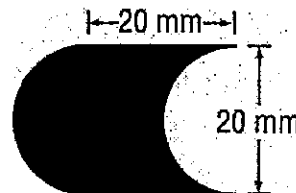
For #1-3, give EXACT & APPROXIMATE answers using 3.14 for  $\pi$ .

**Example 1:** Find the circumference AND area of a circular table with diameter 20 in.

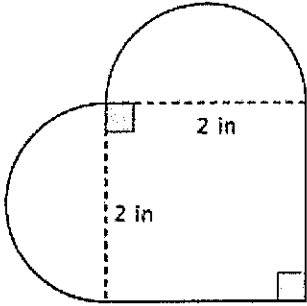
**Example 2:** A circular lampshade with a diameter of 18 inches has a length of wire that goes around it exactly one time. How many inches of wire are needed to go around the lampshade exactly one time?

**Example 3:** A TV station's weather radar can detect precipitation in a circular region having a diameter of 100 miles. Find the area of the region.

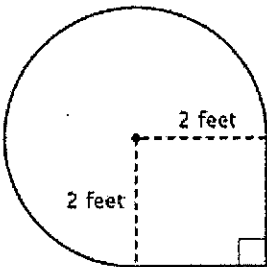
**Example 4:** Find the area of the composite figure.



**Example 5:** Find the area of the figure to the nearest tenth. Use 3.14 for  $\pi$ .



**Example 6:** Find the area of the figure to the nearest tenth. Use 3.14 for  $\pi$ .



**Wrap It Up:**

What is the difference between the area of a circle and the circumference of a circle?

# Practice 10-3

Area: Circles

Find the area of each circle. Give an exact area and an approximate area to the nearest tenth.

1.  $r = 7$  m

$A =$  \_\_\_\_\_

$A \approx$  \_\_\_\_\_

2.  $d = 18$  cm

$A =$  \_\_\_\_\_

$A \approx$  \_\_\_\_\_

3.  $d = 42$  m

$A =$  \_\_\_\_\_

$A \approx$  \_\_\_\_\_

4.  $r = 35$  km

$A =$  \_\_\_\_\_

$A \approx$  \_\_\_\_\_

5.  $d = 22$  cm

$A =$  \_\_\_\_\_

$A \approx$  \_\_\_\_\_

6.  $r = 25$  ft

$A =$  \_\_\_\_\_

$A \approx$  \_\_\_\_\_

7.  $r = 3\frac{1}{2}$  mi

$A =$  \_\_\_\_\_

$A \approx$  \_\_\_\_\_

8.  $d = 5$  in.

$A =$  \_\_\_\_\_

$A \approx$  \_\_\_\_\_

9.  $d = 9.8$  mm

$A =$  \_\_\_\_\_

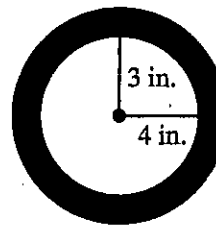
$A \approx$  \_\_\_\_\_

Find the area of each shaded region to the nearest tenth.

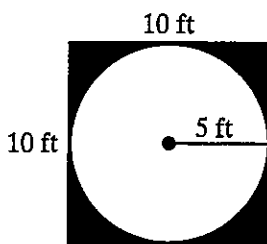
10.



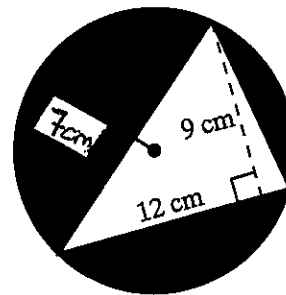
11.



12.



13.



14. A goat is tethered to a stake in the ground with a 5-m rope. The goat can graze to the full length of the rope a full  $360^\circ$  around the stake. How much area does the goat have in which to graze?

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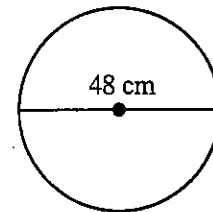
# Reteaching 10-3

Area: Circles

Find the area of the circle. Give an exact area and an approximate area.

The formula for the area  $A$  of a circle is  $A = \pi r^2$ , where  $r$  is the radius of the circle and  $\pi$  is a number that is close to 3.14, but not exactly 3.14.

In the circle shown, the diameter is 48 cm. The radius of any circle is half its diameter.



$$\frac{1}{2} \cdot 48 = 24$$

So,  $r = 24$  cm.

$$A = \pi r^2$$

$A = \pi(24)^2$  Substitute 24 for  $r$  in the formula.

$$A = 576\pi \quad \text{Simplify.}$$

The exact area of the circle is  $576\pi$  cm<sup>2</sup>.

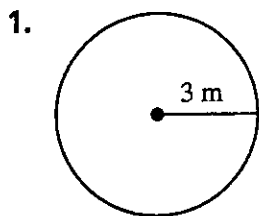
To find the approximate area, substitute 3.14 for  $\pi$ .

$$A = 576\pi \approx 576(3.14) = 1,808.64$$

Note: The symbol  $\approx$  is read "is approximately equal to."

The approximate area is 1,808.64 cm<sup>2</sup>.

Find the area of each circle. Give an exact area and an approximate area to the nearest tenth.



$$A = \underline{\hspace{2cm}}$$

$$A \approx \underline{\hspace{2cm}}$$

4.  $r = 15$  cm

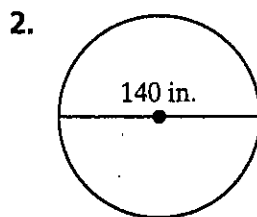
$$A = \underline{\hspace{2cm}}$$

$$A \approx \underline{\hspace{2cm}}$$

7.  $r = 3.4$  ft

$$A = \underline{\hspace{2cm}}$$

$$A \approx \underline{\hspace{2cm}}$$



$$A = \underline{\hspace{2cm}}$$

$$A \approx \underline{\hspace{2cm}}$$

5.  $d = 16$  in.

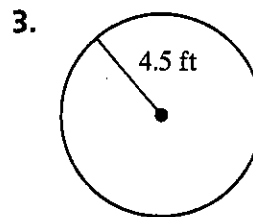
$$A = \underline{\hspace{2cm}}$$

$$A \approx \underline{\hspace{2cm}}$$

8.  $d = 29$  cm

$$A = \underline{\hspace{2cm}}$$

$$A \approx \underline{\hspace{2cm}}$$



$$A = \underline{\hspace{2cm}}$$

$$A \approx \underline{\hspace{2cm}}$$

6.  $d = 7$  m

$$A = \underline{\hspace{2cm}}$$

$$A \approx \underline{\hspace{2cm}}$$

9.  $d = 284$  mi

$$A = \underline{\hspace{2cm}}$$

$$A \approx \underline{\hspace{2cm}}$$

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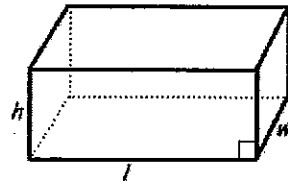
Objective:

Vocabulary

|              | Definition |
|--------------|------------|
| Surface Area |            |

Key Concepts - Surface Area of a Prism

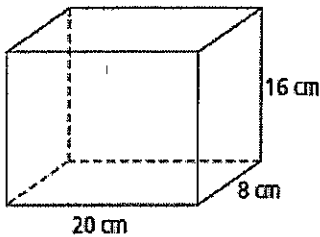
Rectangular Prism:  $SA = 2lw + 2lh + 2wh$



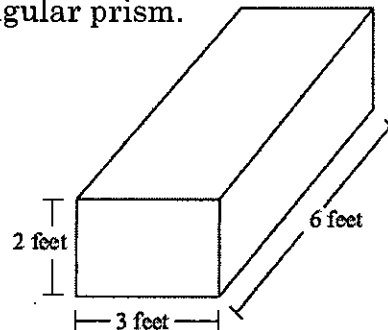
Triangular Prism:  $SA = 2\left(\frac{1}{2}bh_t\right) + bh + bh + bh$  OR  $SA = 2B + ph$

Example 1: Find the surface area of each rectangular prism.

(a)

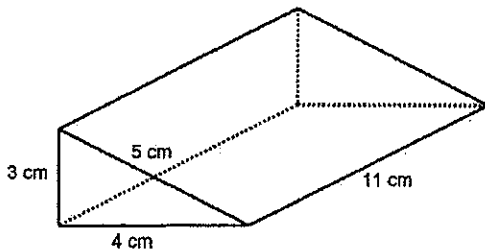


(b)

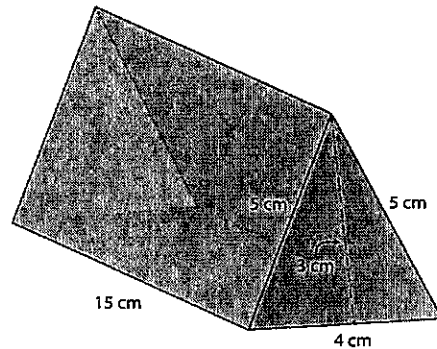


Example 2: Find the surface area of the prisms.

(a)

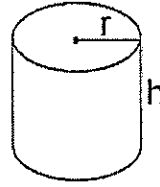


(b)



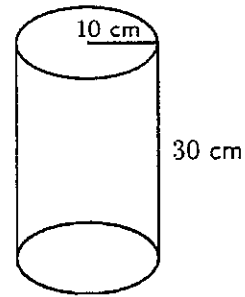
**Key Concepts - Surface Area of a Cylinder**

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

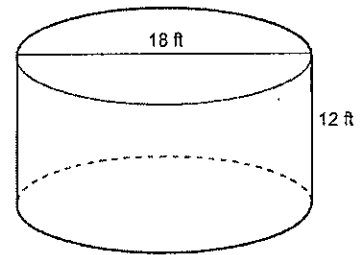


For #3-4, give **EXACT & APPROXIMATE** answers using 3.14 for  $\pi$ .

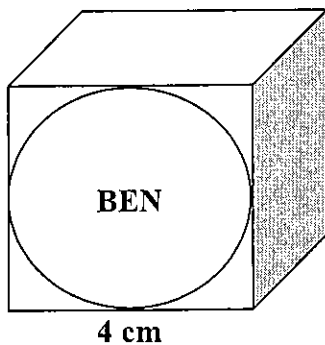
**Example 3:** Find the surface area of the cylinder.



**Example 4:** Find the surface area of the cylindrical water tank.



**Example 5:** Ben wants to decorate his entire box that is a cube with blue paper, except the circle with his name on it. Rounded to the nearest square centimeter, how much blue paper is needed to cover Ben's box?



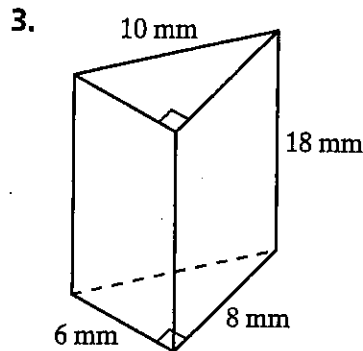
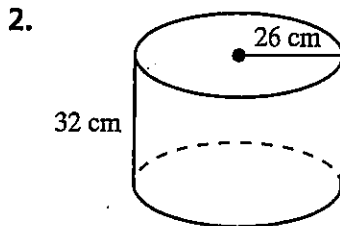
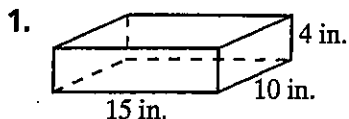
**Wrap It Up:**

How do you find the surface areas of both a prism and a cylinder?

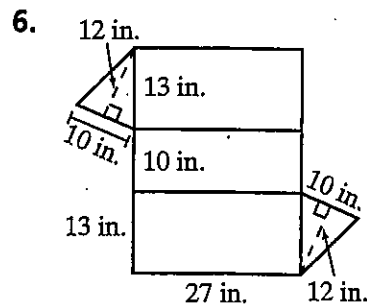
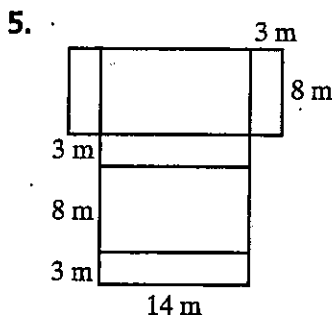
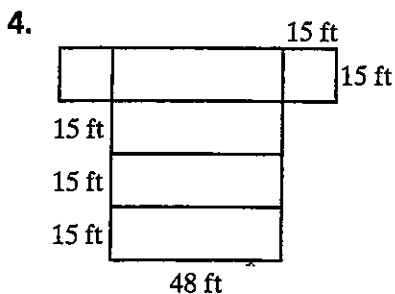
# Practice 10-5

## Surface Area: Prisms and Cylinders

Find the surface area of each space figure. If the answer is not a whole number, round to the nearest tenth.



Find the surface area of the space figure represented by each net to the nearest square unit.



7. A room is 18 ft long, 14 ft wide, and 8 ft high.

a. Find the cost of painting the four walls with two coats of paint costing \$9.50 per gallon. Each gallon covers  $256 \text{ ft}^2$  with one coat.

\_\_\_\_\_

b. Find the cost of carpeting the floor with carpet costing  $\$5/\text{ft}^2$ .

\_\_\_\_\_

c. Find the cost of covering the ceiling with acoustic tile costing  $\$7.50/\text{ft}^2$ .

\_\_\_\_\_

d. Find the total cost of renovating the walls, floor, and ceiling.

\_\_\_\_\_

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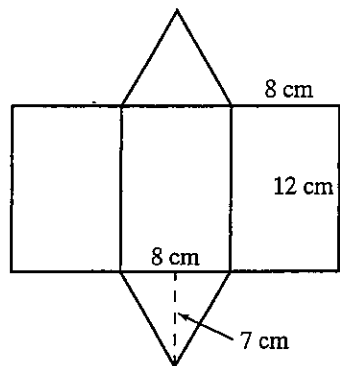
# Reteaching 10-5

## Surface Area: Prisms and Cylinders

Find the surface area of the triangular prism.  
Two methods can be used to find the surface area.

### Method 1

Draw a net for the prism, find the area of each polygon in the net, and then add them together.



The triangles have area:

$$A = \frac{1}{2}bh = \frac{1}{2}(8)(7) = 28 \text{ cm}^2$$

Each rectangle has area:

$$A = bh = 8(12) = 96 \text{ cm}^2$$

The total area of the 2 triangles and 3 rectangles is:

$$28 + 28 + 96 + 96 + 96 = 344 \text{ cm}^2$$

### Method 2

Use the formula

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

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

$$p = 3(8) = 24$$

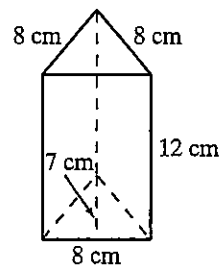
$$\text{L.A.} = 24(12) = 288 \text{ cm}^2$$

$$B = \frac{1}{2}bh = \frac{1}{2}(8)(7) = 28 \text{ cm}^2$$

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

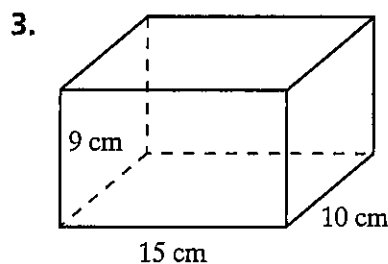
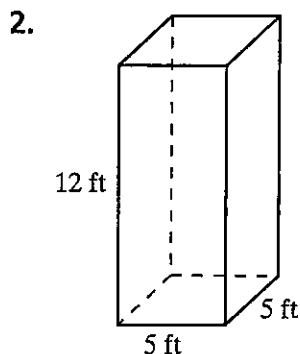
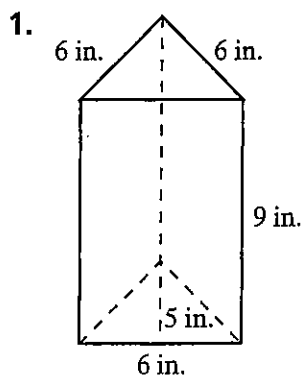
$$= 288 + 2(28)$$

$$= 344 \text{ cm}^2$$



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Find the surface area of each prism using the method you prefer.



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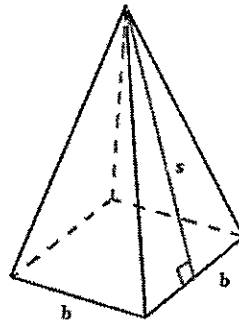
**Objective:**

**Vocabulary**

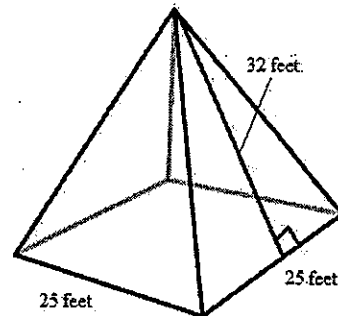
|                     | Definition |
|---------------------|------------|
| <b>Slant Height</b> |            |

**Key Concepts - Surface Area of a Square Pyramid**

$$S.A. = b^2 + 4\left(\frac{1}{2}bs\right)$$

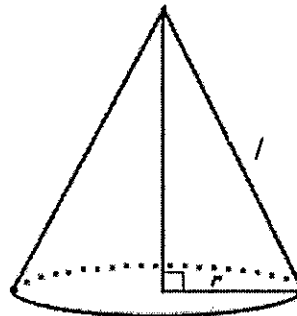


**Example 1:** Find the surface area of the square pyramid.

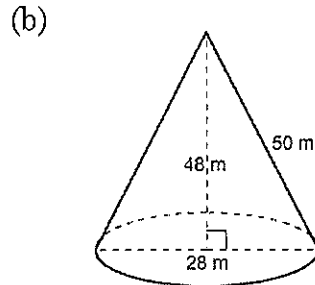
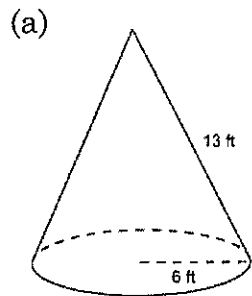


**Key Concepts - Surface Area of a Cone**

$$S.A. = \pi r^2 + \pi rl$$

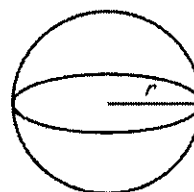


**Example 2:** Find the surface area of the cone. Use 3.14 for  $\pi$ .

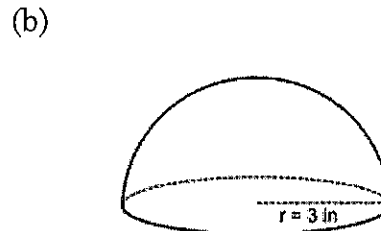
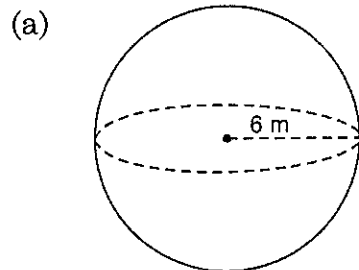


**Key Concepts - Surface Area of a Sphere**

$$S.A. = 4\pi r^2$$



**Example 3:** Find the surface area of the sphere. Use 3.14 for  $\pi$ .



**Wrap It Up:**

How do you find the surface areas of a square pyramid, a cone, and a sphere?

Square Pyramid:

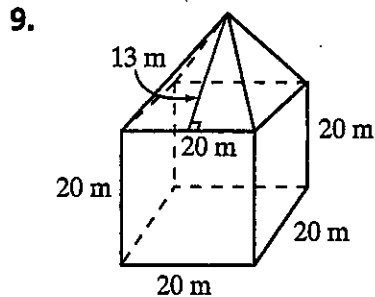
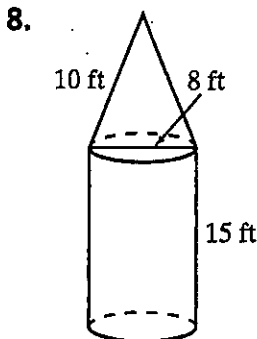
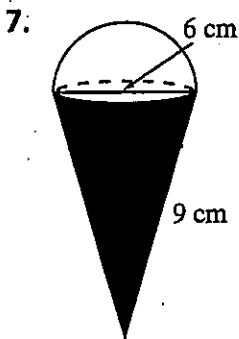
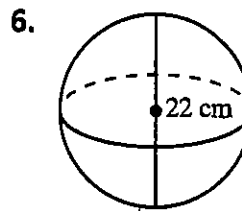
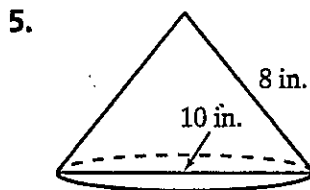
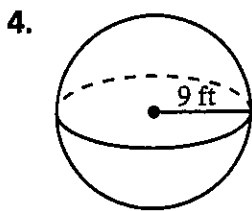
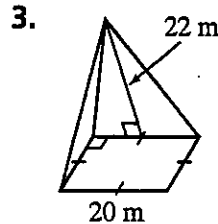
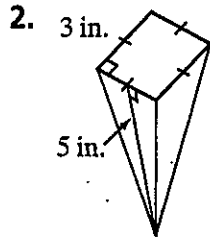
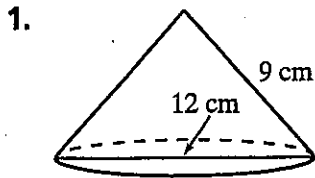
Cone:

Sphere:

# Practice 10-6

## Surface Area: Pyramids, Cones, and Spheres

Find the surface area of each space figure to the nearest square unit.



10. a hemisphere with diameter 70 cm

11. A cone and a square-based pyramid have slant heights of 6 in. The diameter for the cone and the base edge of the pyramid are both 8 in.

a. Which space figure has the greater surface area?

b. By how much does the greater surface area exceed the lesser?  
Use 3.14 for  $\pi$ .

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# Reteaching 10-6

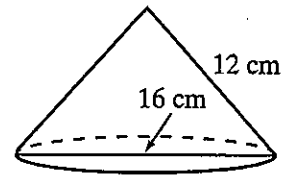
## Surface Area: Pyramids, Cones, and Spheres

Find the surface area of the cone.

The formula for the surface area (S.A.) of a cone is  $S.A. = L.A. + B$ , where  $B$  is the area of the base and L.A. is the lateral surface area.

$L.A. = \pi rl$ , where  $r$  is the radius of the cone and  $l$  is the slant height.

In the cone, given  $r = \frac{1}{2}(16) = 8$  and  $l = 12$ :



$$L.A. = \pi rl$$

$$= \pi(8)(12)$$

$$\approx 301.44$$

Substitute 8 for  $r$  and 12 for  $l$ .

Use 3.14 for  $\pi$ .

The base is a circle, so  $B = \pi r^2$ .

$$B = \pi r^2 = \pi(8)^2$$

$$\approx 200.96$$

Substitute 8 for  $r$ .

Use 3.14 for  $\pi$ .

Thus,  $S.A. = L.A. + B$

$$\approx 301.44 + 200.96$$

$$= 502.4$$

Substitute 301.44 for L.A. and 200.96 for  $B$ .

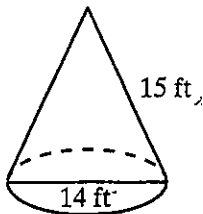
Add.

The surface area is about  $502 \text{ cm}^2$ . Don't forget to use square units.

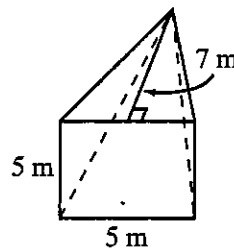
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Find the surface area of each space figure to the nearest square unit.

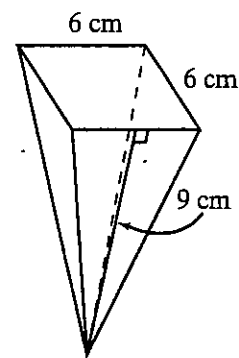
1.



2.



3.



4. cone

$$r = 10 \text{ in.}$$

$$l = 14 \text{ in.}$$

5. square pyramid

$$b = 11 \text{ cm}$$

$$l = 8 \text{ cm}$$

6. cone

$$d = 24 \text{ m}$$

$$l = 25 \text{ m}$$

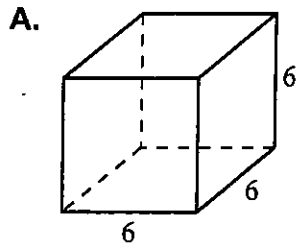
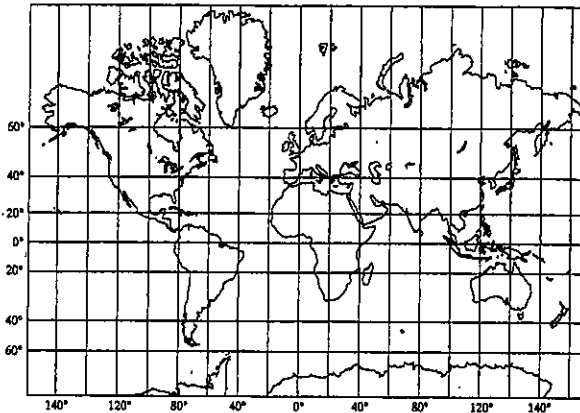
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# Enrichment 10-6

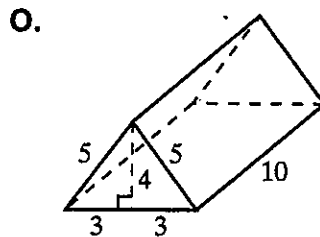
## Flattening the Earth

Unlike other space figures, a sphere cannot be drawn as a net. (Think of how an orange peel splits if you try to flatten it.) This poses a dilemma for mapmakers trying to draw the spherical earth on flat paper. No matter how they draw the map, it will suffer from distortion.

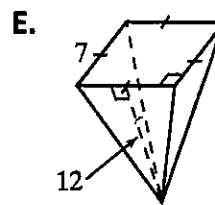
In 1569 a Flemish geographer drew a "flat" Earth map with its distortions confined to the polar regions, where they were of little consequence. His map is still widely used today. To learn his name, find each exact surface area. Write the letter of the exercise above the surface area in the grid at the bottom of the page.



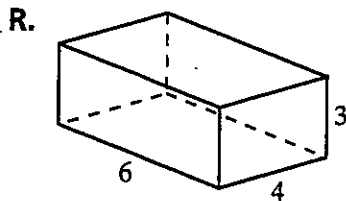
S.A. = \_\_\_\_\_



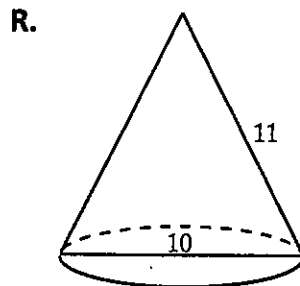
S.A. = \_\_\_\_\_



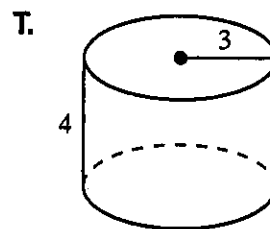
S.A. = \_\_\_\_\_



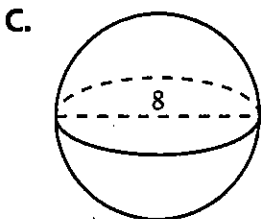
S.A. = \_\_\_\_\_



S.A. = \_\_\_\_\_



S.A. = \_\_\_\_\_



S.A. = \_\_\_\_\_



S.A. = \_\_\_\_\_

Answer: Gerhardus

50π    217    80π    64π    216    42π    184    108

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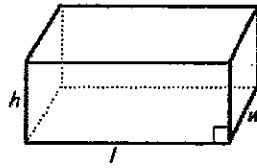
**Objective:**

**Vocabulary**

|                   | Definition |
|-------------------|------------|
| <b>Volume</b>     |            |
| <b>Cubic unit</b> |            |

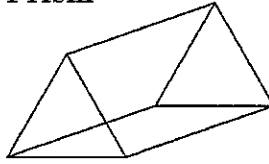
**Key Concepts - Volume of a Rectangular Prism**

$$V = lwh$$



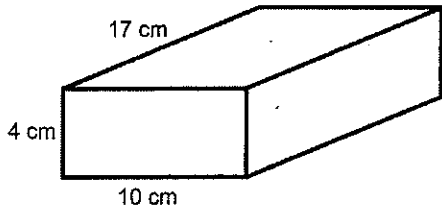
**Key Concepts - Volume of a Triangular Prism**

$$V = \left(\frac{1}{2}bh\right) \cdot h$$

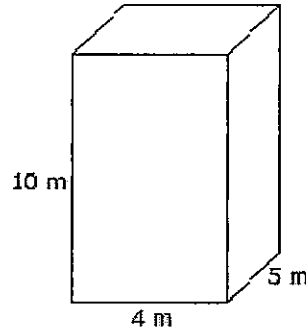


**Example 1:** Find the volume of the prism.

(a)

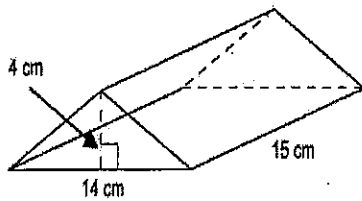


(b)

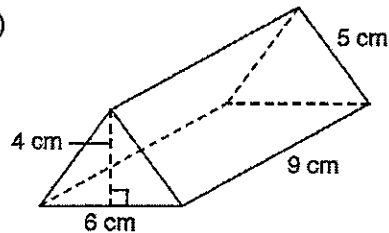


**Example 2:** Find the volume of the prism.

(a)

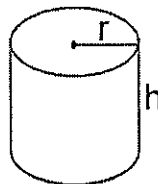


(b)



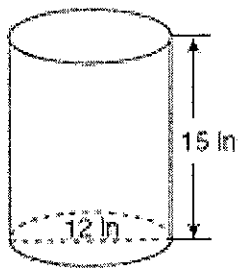
**Key Concepts – Volume of a Cylinder**

$$V = (\pi r^2) \cdot h$$

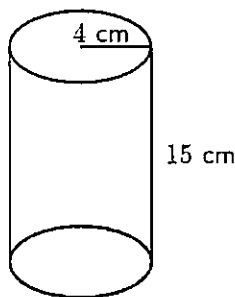


**Example 3:** Find the volume of the cylinder to the nearest cubic inch. Use 3.14 for  $\pi$ .

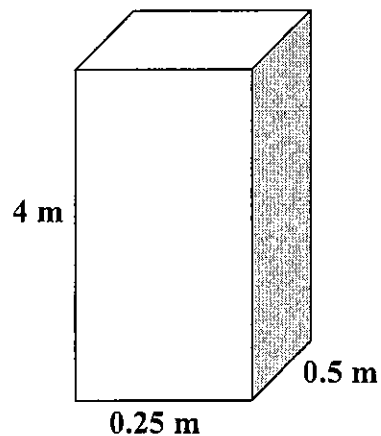
(a)



(b)



**Example 4:** Mrs. Edgar is filling the water tank below. After 5 minutes, the water tank is filled up to  $\frac{1}{3}$  of its height. What is the rate, in cubic meters per minute, at which Mrs. Edgar is filling up the water tank? Give an exact answer.



**Wrap It Up:**

How do you find the volumes of prisms and cylinders?

Rectangular Prisms:

Triangular Prisms:

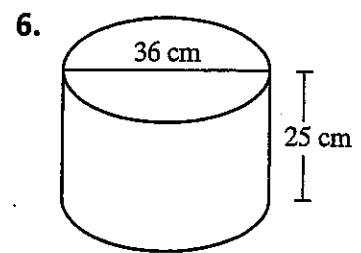
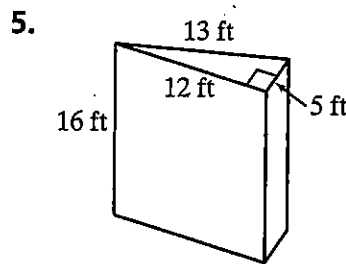
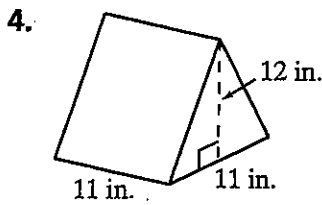
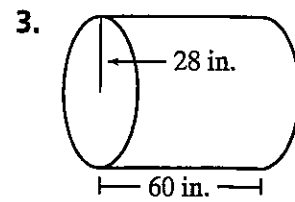
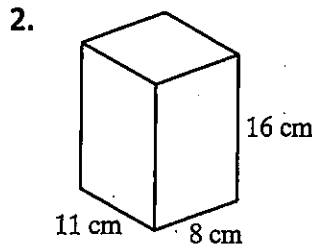
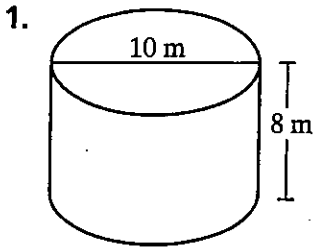
Cylinders:



# Practice 10-7

## Volume: Prisms and Cylinders

Find the volume of each prism or cylinder to the nearest cubic unit.



7. prism  
rectangular base:  
8 in. by 6 in.  
height: 7 in.

8. cylinder  
radius: 14 in.  
height: 18 in.

9. cylinder  
radius: 5 cm  
height: 11.2 cm

10. prism  
square base:  
3.5 ft on a side  
height: 6 ft

11. cube  
sides: 13 m

12. cylinder  
diameter: 5 ft  
height: 9 ft

13. A water storage tank has a cylindrical shape. The base has a diameter of 18 m and the tank is 32 m high. How much water, to the nearest cubic unit, can the tank hold?

14. A tent in the shape of a triangular prism has a square base with a side of 8 feet and a height of 6 feet. What is the volume of the tent?

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# Reteaching 10-7

## Volume: Prisms and Cylinders

Find the volume of the cylinder.

$$V = Bh$$

Use the formula for volume.

$$V = \pi r^2 h$$

$B = \pi r^2$  since the base is a circle.

$$r = \frac{1}{2}d = \frac{1}{2}(28) \\ = 14$$

Find  $r$  from  $d = 28$ .

$$V = \pi r^2 h$$

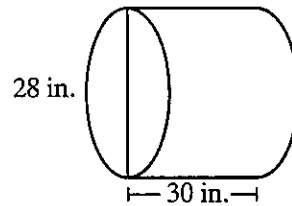
$$V = \pi(14)^2(30)$$

Substitute 14 for  $r$  and 30 for  $h$ .

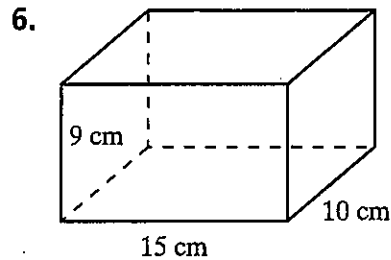
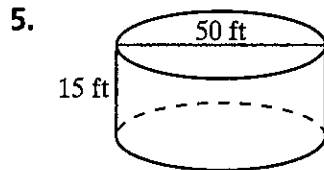
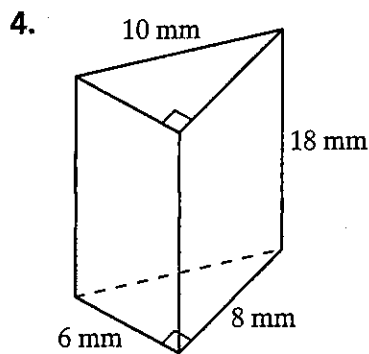
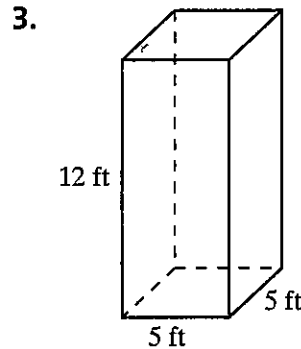
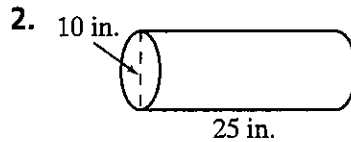
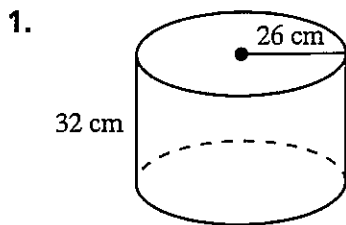
$$\approx 18,463.2$$

Multiply. Use 3.14 for  $\pi$ .

The volume is about 18,463 in.<sup>3</sup>. Don't forget to use cubic units.



Find the volume of each prism or cylinder to the nearest cubic unit.



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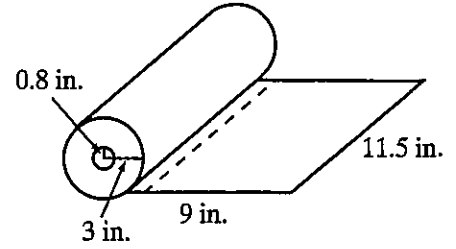
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## Enrichment 10-7

### Paper Towel Thickness

Each sheet in a roll of paper towels measures 11.5 in. by 9 in. There are 120 sheets in the roll.

Answer these questions to find the thickness of each sheet. Use 3.14 for  $\pi$ .



1. The radius of the entire paper towel cylinder is 3 in. The radius of the hollow cylinder in the middle is 0.8 in. Describe how you can find the volume of paper on the roll.

---

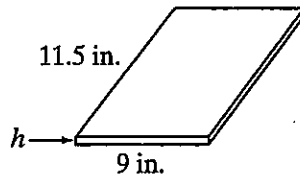


---

2. Use the method you described to find the volume of paper on the roll. Round to the nearest hundredth.

---

Each sheet of paper on the roll is a very thin rectangular prism. Let  $h$  = height of the prism.



3. Find the volume of each sheet of paper in terms of  $h$ .

---

4. Find the volume of paper on the roll in terms of  $h$ .

---

Your answers to Exercise 2 and 4 give you two different expressions for the volume of paper on the roll.

5. Write an equation using the two expressions.

---

6. Solve the equation to find  $h$ , the thickness of one sheet of paper. Round to the nearest thousandth.

---

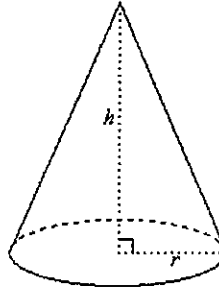
49



**Objective:**

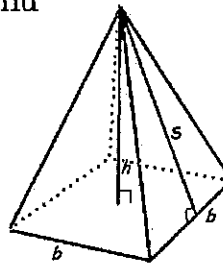
**Key Concepts - Volume of a Cone**

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



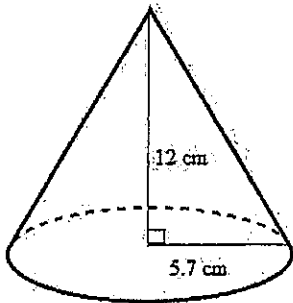
**Key Concepts - Volume of a Square Pyramid**

$$V = \frac{1}{3}(b^2) \cdot h$$

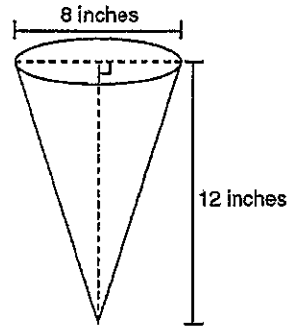


**Example 1:** Find the volume of the cone to the nearest tenth. Use 3.14 for  $\pi$ .

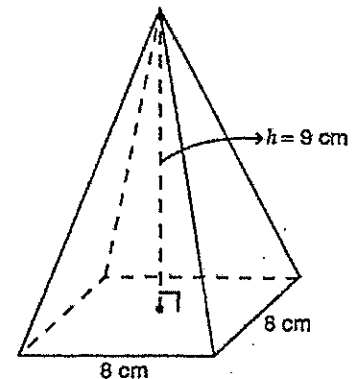
(a)



(b)

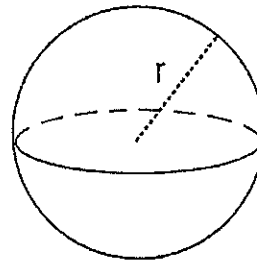


**Example 2:** Find the volume of the square pyramid.



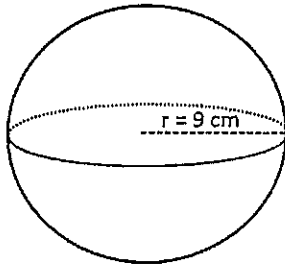
**Key Concepts - Volume of a Sphere**

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

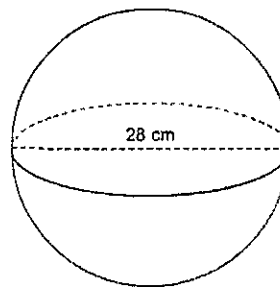


**Example 3:** Find the volume of the sphere to the nearest tenth. Use 3.14 for  $\pi$ .

(a)

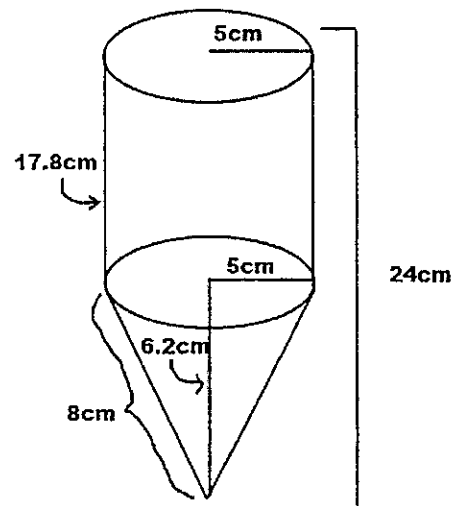


(b)



**Wrap It Up:**

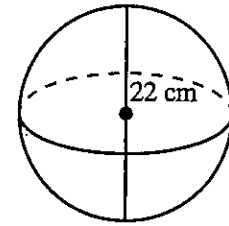
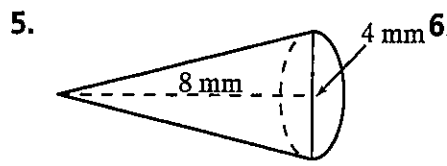
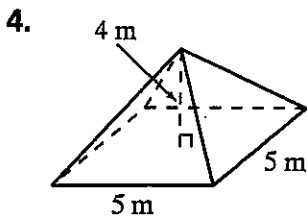
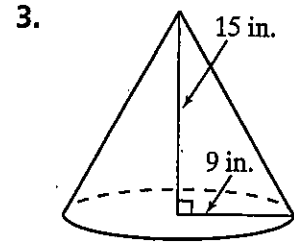
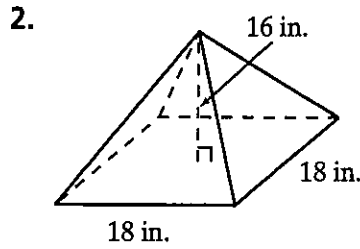
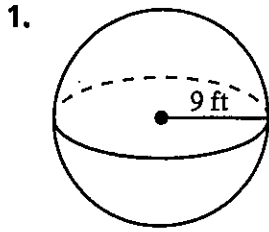
1. How are the volumes of pyramids and cones related to volumes of prisms and cylinders?
2. Find the volume of the composite figure below to the nearest tenth. Use 3.14 for  $\pi$ .



# Practice 10-9

Volume: Pyramids, Cones, and Spheres

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



7. square-based pyramid  
 $s = 9$  in.  
 $h = 12$  in.

8. cone  
 $r = 8$  cm  
 $h = 15$  cm

9. sphere  
 $r = 6$  in.

10. You make a snow figure using three spheres with radii of 12 in., 10 in., and 8 in., with the biggest on the bottom and the smallest for the head. You get snow from a rectangular area that is 6 ft by 7 ft.
- a. Find the volume of snow in your snow figure to the nearest hundredth of a cubic inch.

bottom: \_\_\_\_\_ middle: \_\_\_\_\_

head: \_\_\_\_\_ total: \_\_\_\_\_

- b. Find the area in square inches from which you get snow.

\_\_\_\_\_

- c. How deep does the snow need to be before you have enough snow to make a figure? State your answer to the nearest  $\frac{1}{4}$  in.

\_\_\_\_\_

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# Reteaching 10-9

## Volume: Pyramids, Cones, and Spheres

Find the volume of the cone.

Use the formula  $V = \frac{1}{3}Bh$ .

$r = \frac{1}{2}d = \frac{1}{2}(10) = 5$      The radius is half the diameter.

$B = \pi r^2$

$B = \pi(5)^2 \approx 78.5$      Substitute 5 for  $r$  to find the area of the base and multiply.

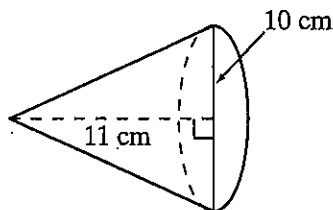
$V = \frac{1}{3}Bh$

$V = \frac{1}{3}(78.5)(11)$      Substitute 78.5 for  $B$  and 11 for  $h$ .

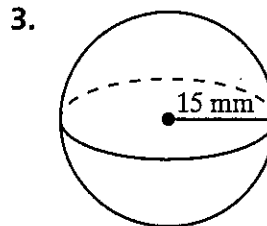
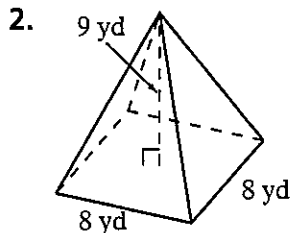
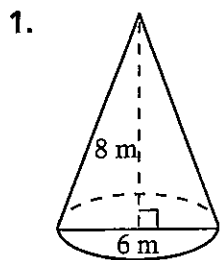
$\approx 287.83$      Multiply and round.

The volume is approximately  $287.83 \text{ cm}^3$ .

Remember to use cubic units.



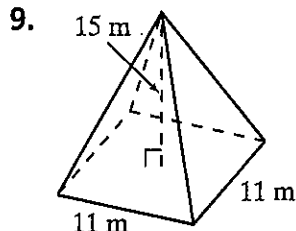
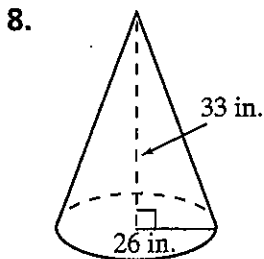
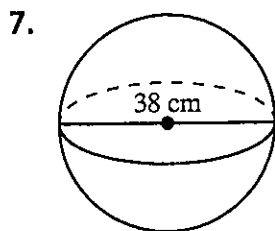
Find the volume of each figure to the nearest hundredth.



4. cone  
 $B = 93 \text{ ft}^2$   
 $h = 7 \text{ ft}$

5. sphere  
 $r = \frac{3}{4} \text{ in.}$

6. pyramid  
 $B = 774 \text{ cm}^2$   
 $h = 42 \text{ cm}$



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