## 11.7 Start Thinking

You are making cone-shaped hats for a drama production. The pattern calls for circles with a 20-inch diameter. You are to cut out a sector created by a 60° angle, as shown in the figure. What is the circumference of the circular base of the cone? Use this circumference and the formula $C = 2\pi r$ to find the radius of the circular base of the cone. You want to cover the top of the hat with fabric. What is the surface area that you will cover?

60°

⊢—20 in.—⊣

conical hat
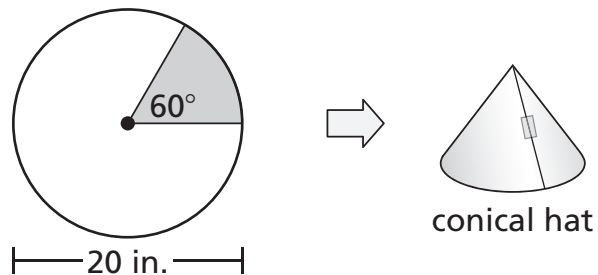
11.7 Warm Up

Find the area of the shaded region.

1.

6 cm

2.

15 in.

22 in.

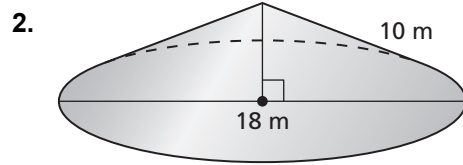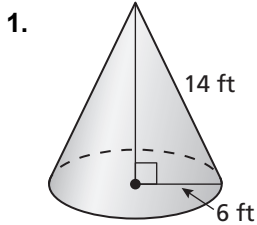**3.**

16 m
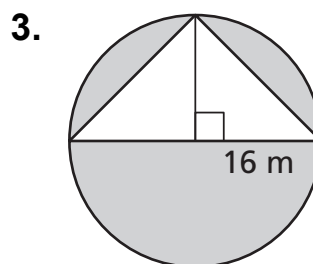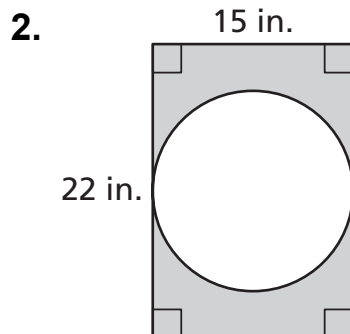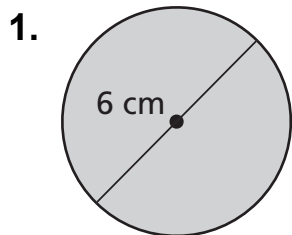
11.7 Cumulative Review Warm Up

Find an equation of the line.

1. parallel to the line $y = 2x + 3$, passes through the point $(0, -8)$

2. parallel to the line $y = x$, passes through the point $(-2, 7)$

3. perpendicular to the line $y = -5x - 7$, passes through the point $(-1, -3)$
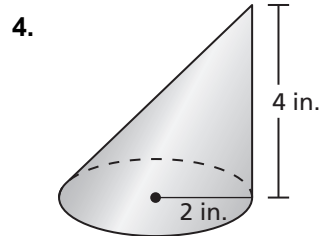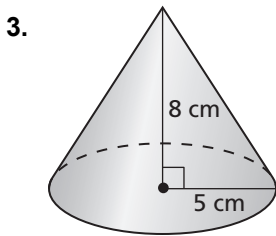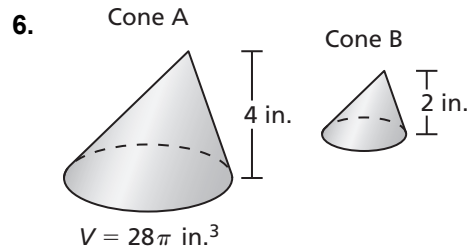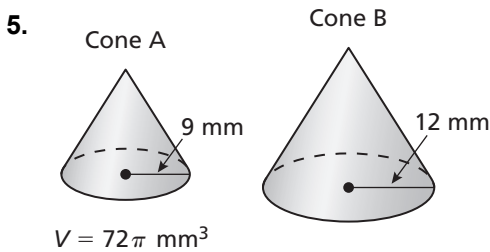
11.7 Practice A

In Exercises 1 and 2, find the surface area of the right cone.

1.

14 ft

6 ft

2.

10 m

18 m

In Exercises 3 and 4, find the volume of the cone.

3.

8 cm

5 cm

4.

4 in.

2 in.

In Exercises 5 and 6, the cones are similar. Find the volume of Cone B.

5.

Cone A   Cone B

9 mm   12 mm

$V = 72\pi$ mm^3

6.

Cone A

Cone B

4 in.   2 in.

$V = 28\pi$ in.^{3}

In Exercises 7 and 8, find the volume of the composite solid.

7.

7 in.

4 in.

15 in.

8.

4 cm

4 cm

4 cm
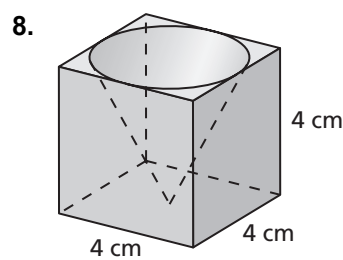
9. A cone has height h and a base with radius r. You want to change the cone so its volume is tripled. What is the new height if you only change the height? What is the new radius if you only change the radius? Explain.

10. A snack stand serves shaved ice in cone-shaped containers and cylindrical containers. Which container gives you more shaved ice for your money? Explain.

4 in.

6 in.

$3.25

4 in.

6 in.

$4.75
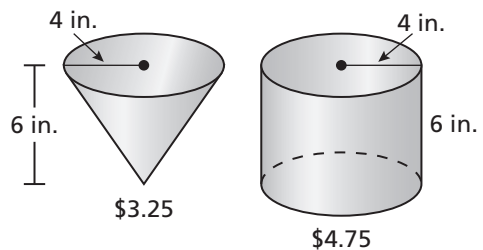
11.7 Practice B
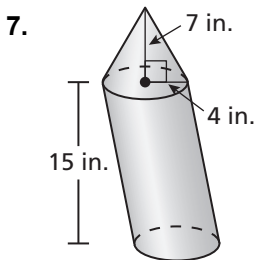
In Exercises 1 and 2, find the surface area of the right cone.

1.

20 yd

7 yd

2.

8.6 mm

15 mm
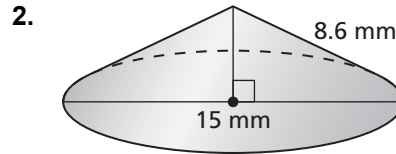
In Exercises 3 and 4, find the volume of the cone.

3.

14 in.

11 in.

4.

4 cm

6 cm

In Exercises 5 and 6, the cones are similar. Find the volume of Cone B.

5.

Cone A

Cone B

10 ft

6 ft

$V = 700\pi$ ft^3

6.

Cone A

Cone B

6 m

$V = 24\pi$ m^3

14 m

In Exercises 7 and 8, find the volume of the composite solid.

7.

6 in.

8 in.

10 in.

6 in.

8 in.
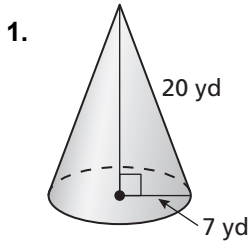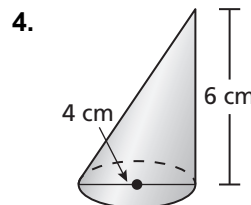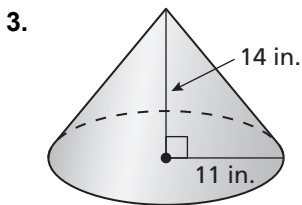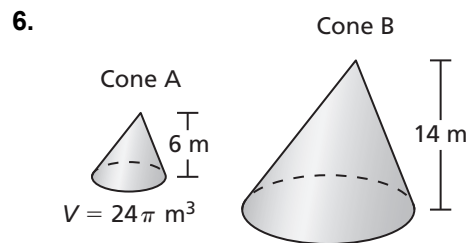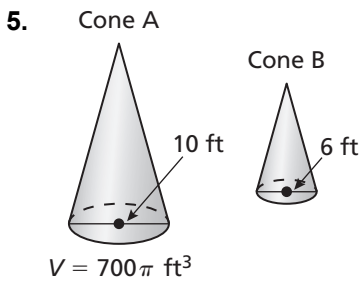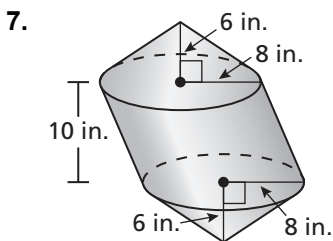
8.

2.8 cm

2.8 cm

2.8 cm
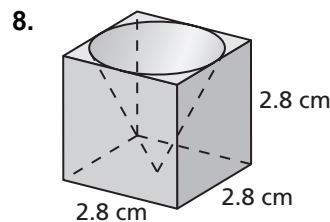
9. A cone has height h and a base with radius r. You want to change the cone so its volume is halved. What is the new height if you only change the height? What is the new radius if you only change the radius? Explain.

10. During a chemistry lab, you use a funnel to pour a solvent into a flask. The radius of the funnel is 4 centimeters and its height is 12 centimeters. You pour the solvent into the funnel at a rate of 60 milliliters per second and the solvent flows out of the funnel at a rate of 40 milliliters per second. How long will it be before the funnel overflows? (Remember that 1 milliliter is equal to 1 cubic centimeter.)

11.7 Enrichment and Extension
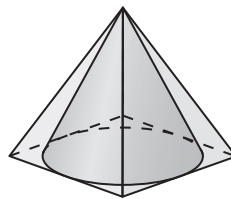
Surface Area and Volumes of Cones

1. A disk has a radius of 10 meters. A 90° sector is cut away, and a cone is formed.

   a. What is the circumference of the base of the cone?

   b. What is the area of the base of the cone?

   c. What is the volume of the cone?

A cone is inscribed in a regular pyramid with a base edge length of 2 feet and a height of 2 feet. Find the volume of the cone.
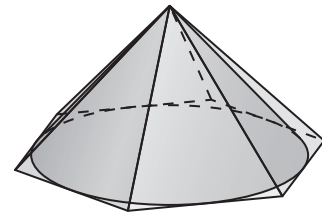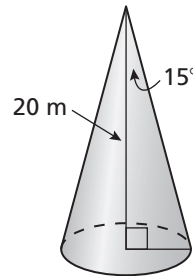
2.
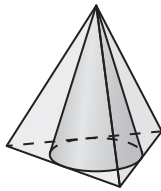
3.

4.

5. Find the volume of the cone to the right.

6. How could you change the height of a cone so that its volume would remain the same when its radius was tripled?

20 m

15°

The *frustum* of a cone is formed by removing the top of a cone with a cut parallel to the base. In the figure at the right, r is the radius of the top of the frustum, R is the radius of the bottom, h is the height, and ℓ is the slant height.

The surface area S of a frustum of a cone in terms of r, R, and ℓ can be written as $S = \pi(r + R)\ell + \pi r^2 + \pi R^2$, or in terms of r, R, and h as

$$S = \pi(r + R)\sqrt{(R - r)^2 + h^2} + \pi r^2 + \pi R^2.$$
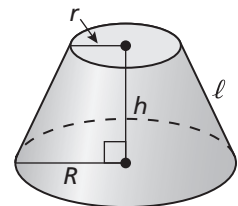
7. Find the surface area of the frustum of a cone with $r = 6$ feet, $R = 8$ feet, and $\ell = 13$ feet.

8. Find the surface area of the frustum of a cone with $r = 2.1$ meters, $R = 7.9$ meters, and $h = 12.2$ meters.

11.7 Puzzle Time

## Why Do Traffic Lights Never Go Swimming?

| A	B	C	D	E	F

G	

Complete each exercise. Use $\pi \approx 3.14$. Find the answer in the answer column. Write the word under the answer in the box containing the exercise letter.

418.7 CHANGE	
lateral BECAUSE	
side THE	
342.5 WET	
575.7 TO	
612.7 WATER	
470.5 TOO	

Complete the sentence.

A. The _____ surface of a cone consists of all segments that connect the vertex with points on the base edge.

B. A right cone has a radius of 2 feet and a slant height of 9 feet. The volume is _____ cubic feet. Round your answer to the nearest tenth.

Find the surface area (in square units) of the cone. Round your answer to the nearest tenth.

C.

14 in.
6 in.

D.

18 in.
12 in.

E.

9 m
6 m

F.

22 m
5 m

G.

4 m   25 m
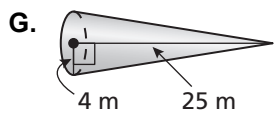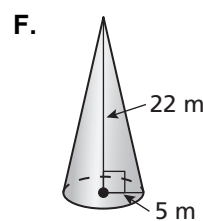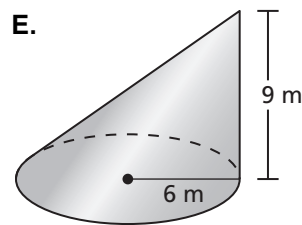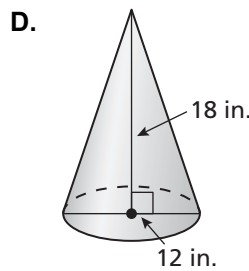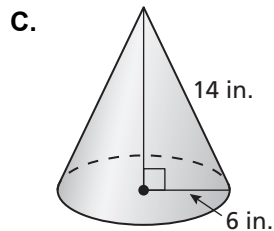
16.9 STOP	
339.1 LONG	
417.8 AND	
248.5 GREEN	
36.7 THEY	
525.7 WAIT	
376.8 TAKE	