11.4 Circumference and Arc Length

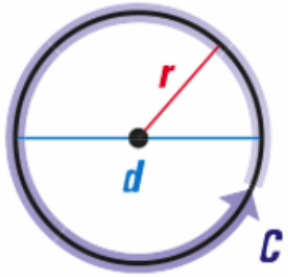
The **circumference** of a circle is the distance around the circle. For all circles, the ratio of the circumference to the diameter is the same. This ratio is known as π, or *pi*. In Chapter 1, you used 3.14 to approximate the value of π. Throughout this chapter, you should use the π key on a calculator, then round to the hundredths place unless instructed otherwise.

THEOREM — For Your Notebook

THEOREM 11.8 Circumference of a Circle

The circumference C of a circle is $C = \pi d$ or $C = 2\pi r$, where d is the diameter of the circle and r is the radius of the circle.

Justification: Ex. 2, p. 769



$C = \pi d = 2\pi r$

EXAMPLE 1 Use the formula for circumference

Find the indicated measure.

a. Circumference of a circle with radius 9 centimeters

b. Radius of a circle with circumference 26 meters

EXAMPLE 2 Use circumference to find distance traveled

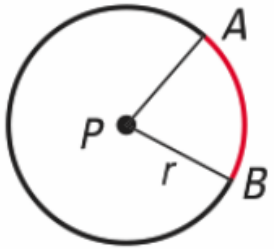
TIRE REVOLUTIONS The dimensions of a car tire are shown at the right. To the nearest foot, how far does the tire travel when it makes 15 revolutions?

ARC LENGTH An **arc length** is a portion of the circumference of a circle. You can use the measure of the arc (in degrees) to find its length (in linear units).

COROLLARY — For Your Notebook

ARC LENGTH COROLLARY

In a circle, the ratio of the length of a given arc to the circumference is equal to the ratio of the measure of the arc to 360°.

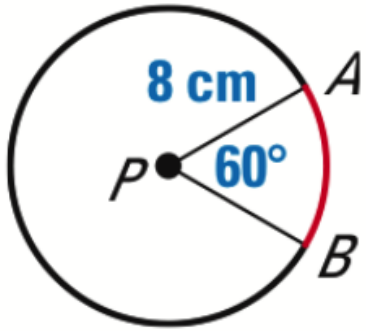


$$\frac{\text{Arc length of } \overset{\frown}{AB}}{2\pi r} = \frac{m\overset{\frown}{AB}}{360^\circ}, \text{ or Arc length of } \overset{\frown}{AB} = \frac{m\overset{\frown}{AB}}{360^\circ} \cdot 2\pi r$$

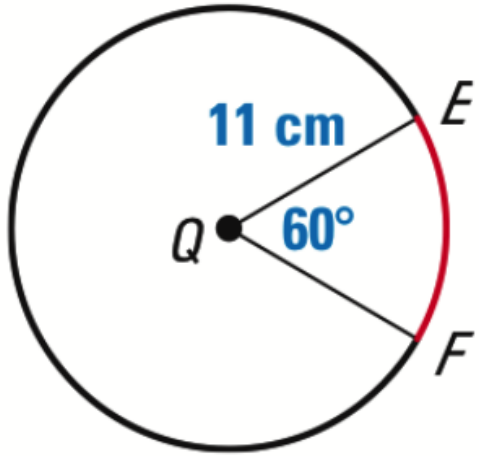
EXAMPLE 3 Find arc lengths

Find the length of each red arc.

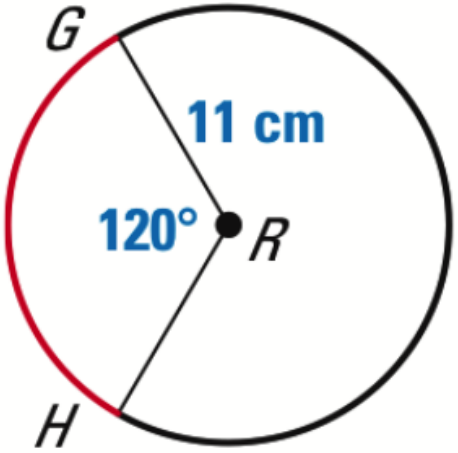
a.



b.



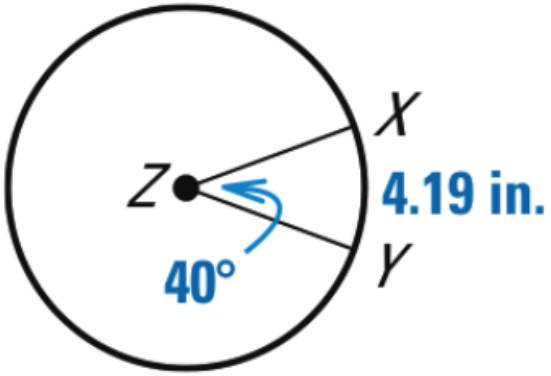
c.



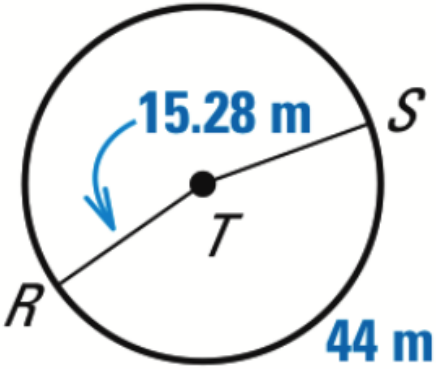
EXAMPLE 4 Use arc lengths to find measures

Find the indicated measure.

a. Circumference C of $\odot Z$



b. $m\overset{\frown}{RS}$



Assignment:

11.4 ws

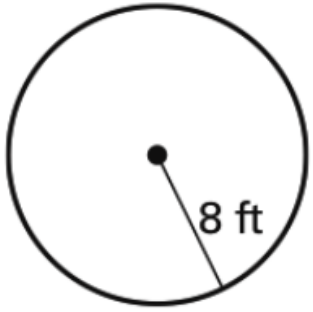
LESSON 11.4

Practice B

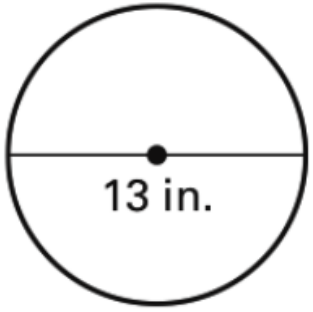
For use with pages 746–752

Use the diagram to find the indicated measure.

1. Find the circumference.



2. Find the circumference.



3. Find the radius.

$C = 65.98$ cm

Find the indicated measure.

4. The exact radius of a circle with circumference 42 meters

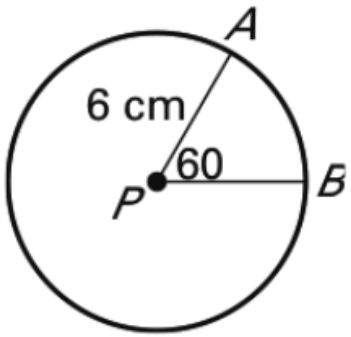
5. The exact diameter of a circle with circumference 39 centimeters

6. The exact circumference of a circle with diameter 15 inches

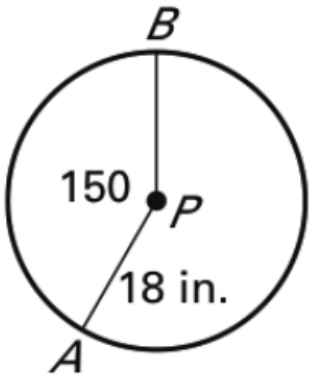
7. The exact circumference of a circle with radius 27 feet

Find the length of $\overset{\frown}{AB}$.

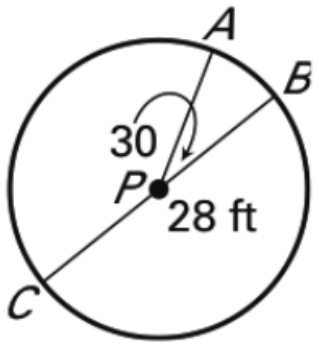
8.



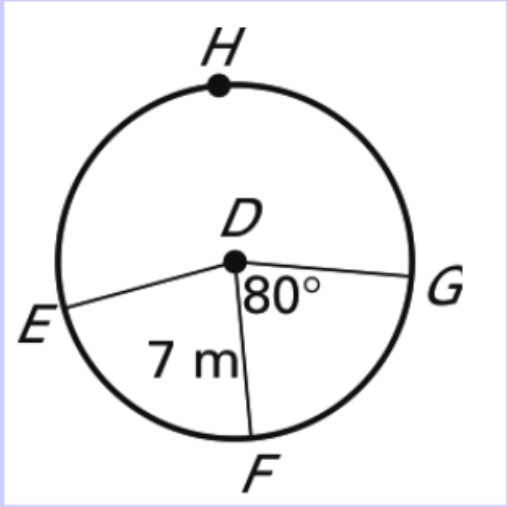
9.



10.



In ⊙*D* shown below, ∠*EDF* ≅ ∠*FDG*. Find the indicated measure.



11. $m\overset{\frown}{EFG}$

12. $m\overset{\frown}{EHG}$

13. Length of $\overset{\frown}{EFG}$

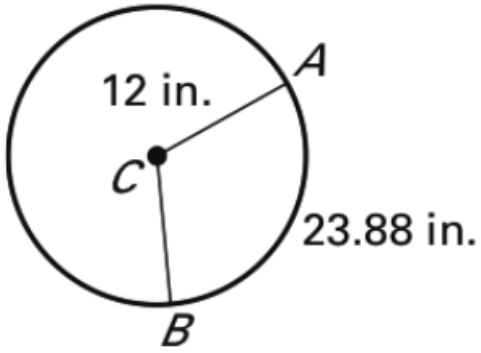
14. Length of $\overset{\frown}{EHG}$

15. $m\overset{\frown}{EHF}$

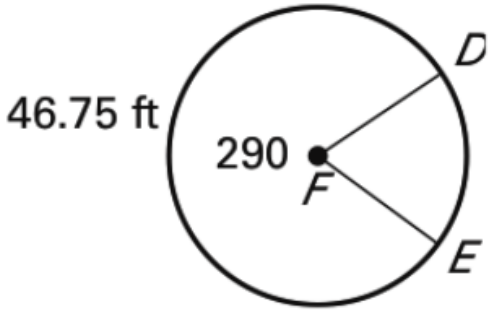
16. Length of $\overset{\frown}{FEG}$

d the indicated measure.

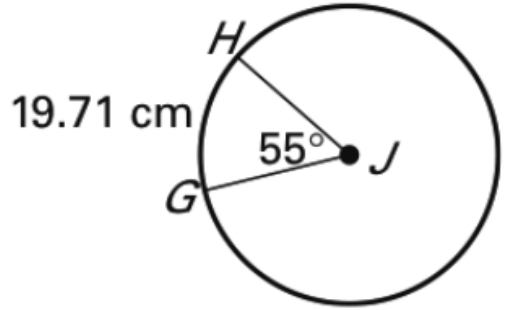
$m\overset{\frown}{AB}$



18. Circumference of $\odot F$

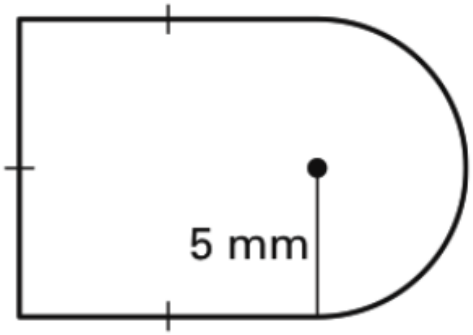


19. Radius of $\odot J$

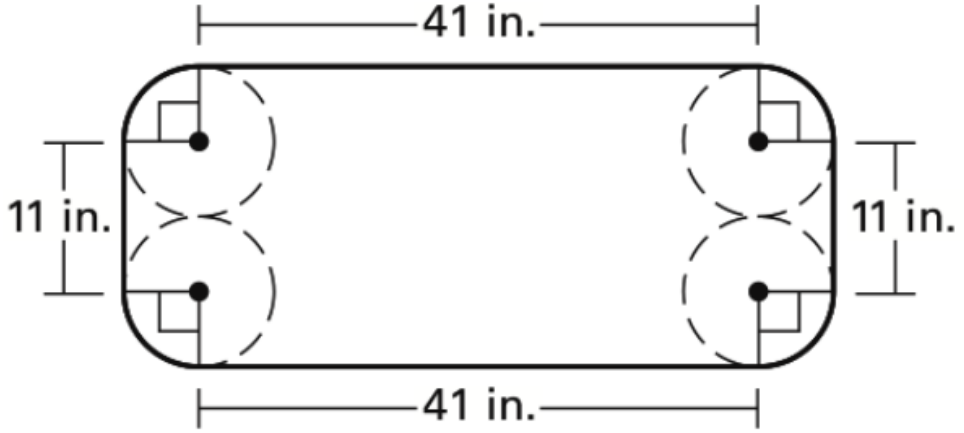


Find the perimeter of the region.

20.



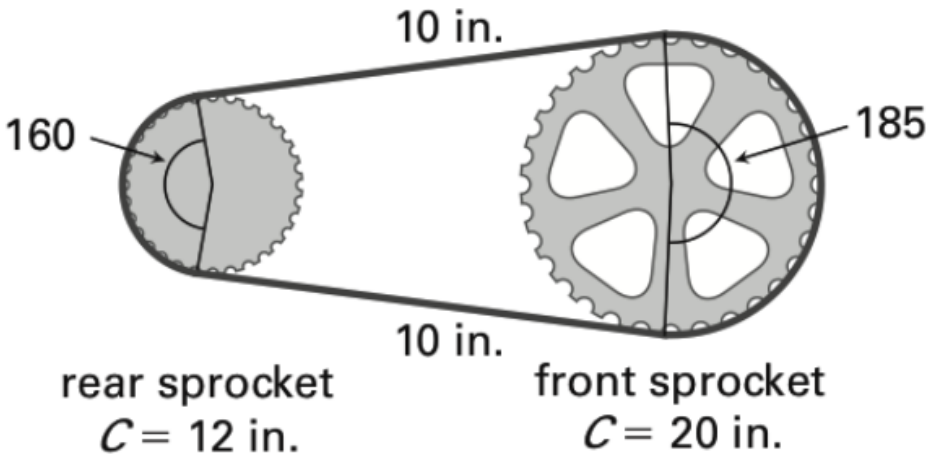
21.



22. In the table below, $\overset{\frown}{AB}$ refers to the arc of a circle. Complete the table.

Radius	4	11			9.5	10.7
$m\overset{\frown}{AB}$	30°		105°	75°		270°
Length of $\overset{\frown}{AB}$		8.26	17.94	6.3	14.63	

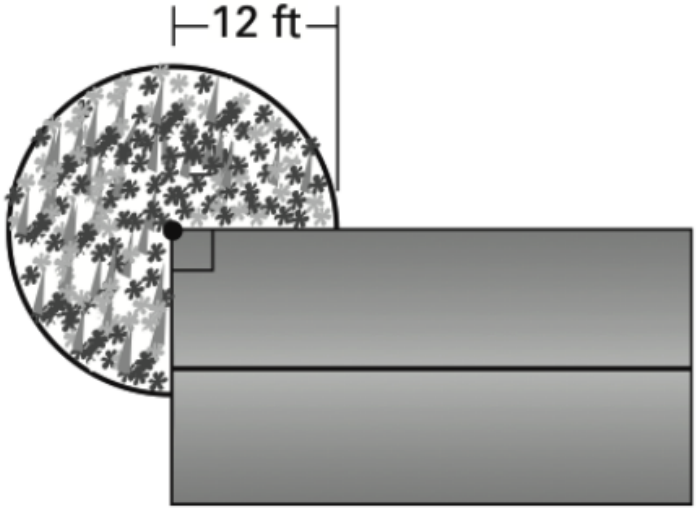
23. Bicycles The chain of a bicycle travels along the front and rear sprockets, as shown. The circumference of each sprocket is given.



a. About how long is the chain?

b. On a chain, the teeth are spaced in $\frac{1}{2}$ inch intervals. About how many teeth are there on this chain?

24. Enclosing a Garden You have planted a circular garden adjacent to one of the corners of your garage, as shown. You want to fence in your garden. About how much fencing do you need?



Assignment:

p. 749 (3-13, 15-26, 42, 46-48)