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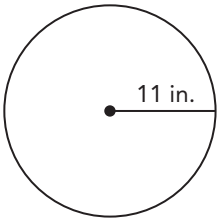
CHAPTER

Circumference and Area of a Circle

Lesson 11.1 Radius, Diameter, and Circumference of a Circle

Find the circumference of each circle. Use 3.14 as an approximation for π.

1.



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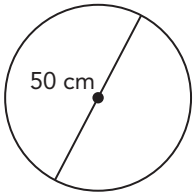
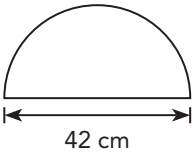


Find the distance around each semicircle. Use $\frac{22}{7}$ as an approximation for π.

3.



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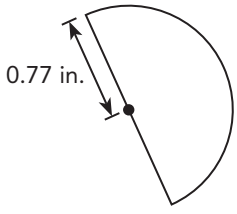
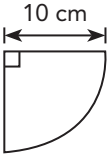


Find the distance around each quadrant. Use 3.14 as an approximation for π.

5.



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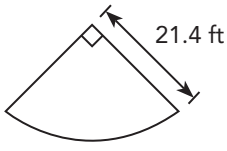

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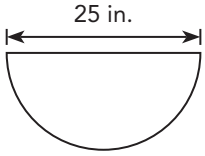
Solve. Show your work. Use $\frac{22}{7}$ as an approximation for π.

7. A circular tabletop has a radius of 1.9 feet. Find its circumference.

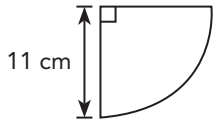
8. A circular window has a diameter of 25 inches. Find its circumference.

9. The diameter of a coin is 18 millimeters. Find its circumference.

10. A sink is in the shape of a semicircle. Find the distance around the sink.



11. A coin purse is shaped like a quadrant. Find the distance around the purse.



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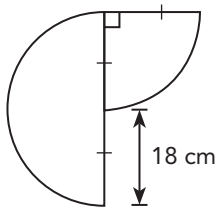
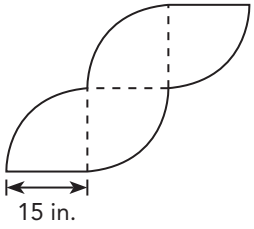
Find the distance around each figure. Use 3.14 as an approximation for π.

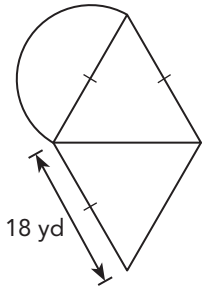
12. The figure is made up of a semicircle and a quadrant.



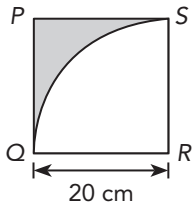
13. The figure is made up of four identical quadrants.



14. The figure is made up of a semicircle and two identical equilateral triangles.



15. The figure is made up of a quadrant within a square. Find the distance around the shaded region.



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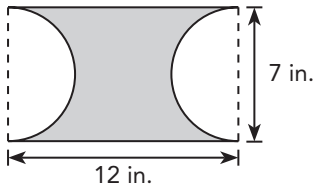
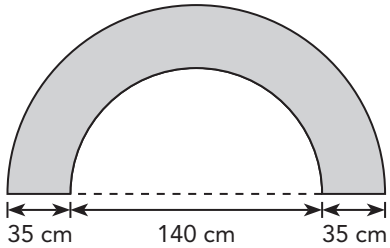
Find the distance around each figure. Use $\frac{22}{7}$ as an approximation for π.

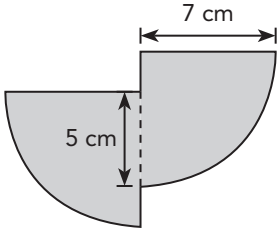
16. The figure is made up of two identical semicircles enclosed within a rectangle.



17. The figure is made up of two semicircles.



18. The figure is made up of two identical quadrants.

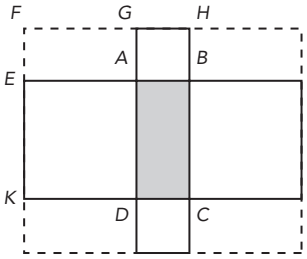


14. Area of trapezoid *CDEG*
$= \frac{1}{2} \cdot 20(36 + 20) = 560$ in.^{2}
Area of triangle *BCG*
$= \frac{1}{2} \cdot 36 \cdot 36 = 648$ in.^{2}
Area of triangle *BDE*
$= \frac{1}{2} \cdot 20(36 + 20) = 560$ in.^{2}
Area of the shaded region
$= 560 + 648 - 560$
$= 648$ square inches

15. a) *PS* = 7 units, *PQ* = 4.5 units
Perimeter of *PQRS*
$= 7 \cdot 2 + 4.5 \cdot 2 = 23$ units
23 units → 138 in.
1 unit → 138 ÷ 23 = 6 in.
Length of each small rectangle
= 3.5 units
$3.5 \cdot 6 = 21$ in.
Area of each small rectangle
$= 21 \cdot 6$
= 126 square inches

b) $126 \cdot 9 = 1{,}134$ in.^{2}
The area of rectangle *PQRS* is 1,134 square inches.

16.



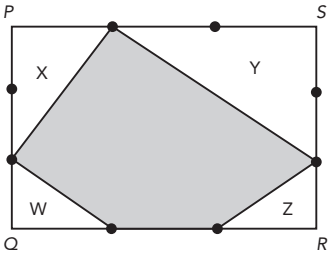
By observation:
Area of *EFGA* = area of *ABCD*
Length of square *FHCK*
= perimeter of *ABCD* ÷ 2
= 30 ÷ 2 = 15 in.
Area of square *FHCK*
$= 15 \cdot 15 = 225$ in.^{2}
Total area of square *ADKE* and square *ABHG*
$= 234 \div 2 = 117$ in.^{2}
Area of rectangle *ABCD*
$= (225 - 117) \div 2$
$= 54$ in.^{2}
The area of rectangle *ABCD* is 54 square inches.

Brain @ Work

1. a) Each equilateral triangle can be divided into 9 smaller equilateral triangles.
Area of each smaller triangle
$= 18 \div 9 = 2$ cm^2
Area of the shaded region is formed by six smaller equilateral triangles
$= 6 \cdot 2 = 12$ square centimeters

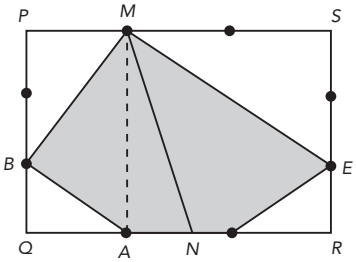
b) Area of composite figure
$= 18 \cdot 2 - 12$
= 24 square centimeters

2. a)



Area of *PQRS*
$= 18 \cdot 12 = 216$ in.^{2}
Area of triangle X
$= \frac{1}{2} \cdot 6 \cdot 8 = 24$ in.^{2}
Area of triangle Y
$= \frac{1}{2} \cdot 12 \cdot 8 = 48$ in.^{2}
Area of triangle W
= area of triangle Z
$= \frac{1}{2} \cdot 6 \cdot 4 = 12$ in.^{2}
Shaded region
$= 216 - (24 + 48 + 12 + 12)$
$= 120$ square inches

b) Equal parts
$= 120 \div 2 = 60$ in.^{2}



Area of triangle *MBA*
$= \frac{1}{2} \cdot 12 \cdot 6 = 36$ in.^{2}
Area of triangle *AMN*
$= 60 - 36 = 24$ in.^{2}
Length of base $\overline{AN}$
$= \frac{24 \cdot 2}{12} = 4$ in.
Length of $\overline{QN}$
$= 6 + 4 = 10$ inches

Chapter 11

Lesson 11.1

1. $2 \cdot 3.14 \cdot 11 = 69.08$ inches
2. $3.14 \cdot 50 = 157$ centimeters
3. Length of the semicircular arc
$\approx \frac{1}{2} \cdot \frac{22}{7} \cdot 42 = 66$ cm
Distance around the semicircle
$= 66 + 42 = 108$ centimeters

4. Length of the semicircular arc
$\approx \frac{1}{2} \cdot \frac{22}{7} \cdot 1.54 = 2.42$ in.
Distance around the semicircle
$= 2.42 + 0.77 + 0.77 = 3.96$ inches

5. Length of the arc
$\approx \frac{1}{4} \cdot 2 \cdot 3.14 \cdot 10$
$= 15.7$ cm
Distance around the quadrant
$= 15.7 + 10 + 10$
$= 35.7$ centimeters

6. Length of the arc
$\approx \frac{1}{4} \cdot 2 \cdot 3.14 \cdot 21.4$
$= 33.598$ ft
Distance around the quadrant
$= 33.598 + 21.4 + 21.4$
$= 76.398$ feet

7. $2 \cdot \frac{22}{7} \cdot 1.9 = 11.94$ feet

8. $\frac{22}{7} \cdot 25 = 78.57$ inches

9. $\frac{22}{7} \cdot 18 = 56.57$ millimeters

10. $\frac{1}{2} \cdot \frac{22}{7} \cdot 25 = 39.29$ in.
Distance around the semicircle
$= 39.29 + 25$
$= 64.29$ inches

11. $\frac{1}{4} \cdot 2 \cdot \frac{22}{7} \cdot 11 = 17.29$ cm
Distance around the quadrant
$= 17.29 + 11 + 11$
$= 39.29$ centimeters

12. $\frac{3}{4}$ of the circle
$\approx \frac{3}{4} \cdot 2 \cdot 3.14 \cdot 18$
$= 84.78$ cm
Distance around the figure
$= 84.78 + 18 + 18$
$= 120.78$ centimeters

13. Length of the arcs of the 4 quadrants
$\approx 2 \cdot 3.14 \cdot 15$
$= 94.2$ in.
Distance around the figure
$= 94.2 + 15 + 15$
$= 124.2$ inches

14. Length of semicircular arc
$\approx \frac{1}{2} \cdot 3.14 \cdot 18 = 28.26$ yd
Distance around the shaded region
$= 28.26 + 18 \cdot 3$
$= 82.26$ yards

15. Length of the arc of the quadrant
$\approx \frac{1}{4} \cdot 2 \cdot 3.14 \cdot 20 = 31.4$ cm
Distance around the shaded region
$= 31.4 + 20 + 20$
$= 71.4$ centimeters

16. Length of the 2 semicircular arcs
$\approx \frac{22}{7} \cdot 7 = 22$ in.
Distance around the shaded region
$= 22 + 12 + 12 = 46$ inches

17. Length of the small semicircular arc
$\approx \frac{1}{2} \cdot \frac{22}{7} \cdot 140 = 220$ cm
Length of the big semicircular arc
$\approx \frac{1}{2} \cdot \frac{22}{7} \cdot (140 + 35 + 35) = 330$ cm
Distance around the shaded region
$= 220 + 330 + 35 + 35$
$= 620$ centimeters

18. Length of the arc of the 2 quadrants
$\approx \frac{1}{2} \cdot 2 \cdot \frac{22}{7} \cdot 7 = 22$ cm
Distance around the figure
$= 22 + 7 + 7 + 2 + 2$
$= 40$ centimeters

Lesson 11.2

1. $3.14 \cdot 20 \cdot 20$
$= 1{,}256$ square centimeters

2. $3.14 \cdot 4 \cdot 4$
$= 50.24$ square miles

3. $\frac{1}{2} \cdot \frac{22}{7} \cdot 17.5 \cdot 17.5$
$= 481.25$ square feet

4. $\frac{1}{2} \cdot \frac{22}{7} \cdot 56 \cdot 56$
$= 4{,}928$ square meters

5. $\frac{1}{4} \cdot 3.14 \cdot 3.5 \cdot 3.5$
≈ 9.6 square inches

6. $\frac{1}{4} \cdot 3.14 \cdot 14 \cdot 14$
≈ 153.9 square yards

7. $\frac{1}{2} \cdot \frac{22}{7} \cdot 20 \cdot 20$
≈ 628.57 square meters

8. $\frac{1}{2} \cdot \frac{22}{7} \cdot 7 \cdot 7 = 77$ square centimeters