Find the area and perimeter of each figure. Round to the nearest tenth if necessary.

1. **SOLUTION:**
   Use the Pythagorean Theorem to find the height $h$, of the parallelogram.
   \[
   \begin{align*}
   a^2 + b^2 &= c^2 \\
   7^2 + h^2 &= 13^2 \\
   h^2 &= 13^2 - 7^2 \\
   h^2 &= 169 - 49 \\
   h &= \sqrt{120} \\
   h &\approx 11.0
   \end{align*}
   \]
   \[
   A = bh
   = 15\sqrt{120}
   \approx 164.3
   \]
   Each pair of opposite sides of a parallelogram is congruent to each other. So the perimeter is $2(13 + 15) = 56$.

   **ANSWER:**
   $P = 56$ cm, $A = 164.3$ cm$^2$

2. **SOLUTION:**
   Use the Pythagorean Theorem to find the lengths of sides.
   \[
   \begin{align*}
   \text{left side:} & \quad a^2 + b^2 = c^2 \\
   & \quad 2^2 + 20^2 = c^2 \\
   & \quad 4 + 400 = c^2 \\
   & \quad \sqrt{404} = c \\
   & \quad 20.10 \approx c
   \end{align*}
   \]
   \[
   \begin{align*}
   \text{right side:} & \quad a^2 + b^2 = c^2 \\
   & \quad 10^2 + 20^2 = c^2 \\
   & \quad 100 + 400 = c^2 \\
   & \quad \sqrt{500} = c \\
   & \quad 22.36 \approx c
   \end{align*}
   \]
   Find the perimeter and area.
   \[
   \begin{align*}
   P &= 19 + 31 + \sqrt{500} + \sqrt{404} \\
   &\approx 92.5 \\
   A &= \frac{1}{2}(b_1 + b_2)h \\
   &= \frac{1}{2}(19 + 31)(20) \\
   &= 25(20) \\
   &= 500
   \end{align*}
   \]
   **ANSWER:**
   $P = 92.5$ in., $A = 500$ in.$^2$
Find the area and perimeter of each figure. Round to the nearest tenth if necessary.

1. SOLUTION: Use the area of a square to determine which square pan Todd will use. The area of a square of side $a$ units is $a^2$ square units. Therefore, the area of a 9-inch square pan will be the closest to the round pan in area.

ANSWER: 8 in.

18. SOLUTION: The area of a square of side $a$ units is $a^2$ square units. Therefore, the area of a 9-inch square pan will be the closest to the round pan in area.

ANSWER: 8 in.

17. SOLUTION: The area of a square of side $a$ units is $a^2$ square units. Therefore, the area of a 9-inch square pan will be the closest to the round pan in area.

ANSWER: 8 in.

15. SOLUTION: The area of a square of side $a$ units is $a^2$ square units. Therefore, the area of a 9-inch square pan will be the closest to the round pan in area.

ANSWER: 8 in.

13. SOLUTION: The area of a square of side $a$ units is $a^2$ square units. Therefore, the area of a 9-inch square pan will be the closest to the round pan in area.

ANSWER: 8 in.

11. SOLUTION: The area of a square of side $a$ units is $a^2$ square units. Therefore, the area of a 9-inch square pan will be the closest to the round pan in area.

ANSWER: 8 in.

The area of a triangle is $A = \frac{1}{2}bh$.

$$A = \frac{1}{2}(a\sqrt{3})(2a)$$

$$= a^2 \sqrt{3}$$

The perimeter is $3(2a) = 6a$ mm.

ANSWER: $P = 6a$ mm, $A = a^2 \sqrt{3}$ mm$^2$

4. SOLUTION: $A = \frac{1}{2}bh$

$$\frac{1}{2}(16)(10) = 80$$

So, the area of the figure is 80 yd$^2$.

Use the Pythagorean Theorem to find the length of the third side of the triangle.

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

$$10^2 + 8^2 = c^2$$

$$100 + 64 = c^2$$

$$\sqrt{164} = c$$

$$12.8 \approx c$$

The perimeter is about $26 + 16 + 12.8 = 54.8$ yd.

ANSWER: $P = 54.8$ yd, $A = 80$ yd$^2$
5. **ARCHAEOLOGY** The tile pattern shown was used in Pompeii for paving. If the diagonals of each rhombus are 2 and 3 inches, what area makes up each “cube” in the pattern?

**SOLUTION:**
There are 3 rhombi in each “cube” in the pattern. So, the total area is three times the area of each rhombus.

$$A = 3 \left[ \frac{1}{2}d_1d_2 \right]$$

$$= 3 \left[ \frac{1}{2}(2)(3) \right]$$

$$= 9$$

**ANSWER:**
9 in$^2$

---

Find the area of each figure. Round to the nearest tenth if necessary.

6. 

**SOLUTION:**

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

$$= \frac{1}{2}(41 + 53)(48)$$

$$= 2256$$

**ANSWER:**
2256 ft$^2$

---

7. 

**SOLUTION:**

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

$$= \frac{1}{2}(11 + 19)(11)$$

$$= 165$$

**ANSWER:**
165 ft$^2$

---

8. 

**SOLUTION:**

$$A = \frac{1}{2}d_1d_2$$

$$= \frac{1}{2}(22)(26)$$

$$= 286$$

**ANSWER:**
286 cm$^2$

---

9. 

**SOLUTION:**

$$A = \frac{1}{2}d_1d_2$$

$$= \frac{1}{2}(42)(148)$$

$$= 3108$$

**ANSWER:**
3108 m$^2$
10. **GEMOLOGY** A gem is cut in a kite shape. It is 6.2 millimeters wide at its widest point and 5 millimeters long. What is the area?

**SOLUTION:**
\[ A = \frac{1}{2}d_1d_2 \]
\[ = \frac{1}{2}(5)(6.2) \]
\[ = 15.5 \text{ mm}^2 \]

**ANSWER:**
15.5 mm²

11. **ALGEBRA** The area of a triangle is 16 square units. The base of the triangle is \( x + 4 \) and the height is \( x \). Find \( x \).

**SOLUTION:**
The area \( A \) of a triangle is one half the product of a base \( b \) and its corresponding height \( h \).

\[ A = 16, \quad b = x + 4, \quad h = x \]

area \( = \frac{1}{2} \cdot bh \)
\[ 16 = \frac{1}{2} \cdot (x + 4)(x) \]
\[ 16 = \frac{1}{2} \cdot (x^2 + 4x) \]
\[ 32 = x^2 + 4x \]
\[ 0 = x^2 + 4x - 32 \]
\[ 0 = (x + 8)(x - 4) \]
\[ x = 4 \text{ or } -8 \]

Since length cannot be negative, \( x = 4 \).

**ANSWER:**
4

12. **ASTRONOMY** A large planetarium in the shape of a dome is being built. When it is complete, the base of the dome will have a circumference of 870 meters. How many square meters of land were required for this planetarium?

**SOLUTION:**
The area required for the dome is equal to the area of the circular base of the dome. To find the area, first find determine the radius from the circumference.

\[ C' = 2\pi r \]
\[ r = \frac{C'}{2\pi} \]
\[ r = \frac{870}{2\pi} \approx 67.6 \text{ ft} \]

\[ A = \pi r^2 \]
\[ = \pi \left( \frac{870}{2\pi} \right)^2 \]
\[ \approx 60,232 \text{ ft}^2 \]

Therefore, about 60,232 m² of land was required for the planetarium.

**ANSWER:**
60,232 m²

Find the area of each circle or sector. Round to the nearest tenth.

13. **SOLUTION:**
\[ A = \pi r^2 \]
\[ = \pi (6)^2 \]
\[ = 36\pi \]
\[ \approx 113.1 \text{ cm}^2 \]

**ANSWER:**
113.1 cm²
Practice Test - Chapter 11

14. SOLUTION:
\[ A = \frac{x}{360} \cdot \pi r^2 \]
\[ = \frac{121}{360} \pi (8)^2 \]
\[ = \frac{121}{360} \pi (64) \]
\[ \approx 67.6 \]

ANSWER:
67.6 ft²

15. MURALS An artisan is creating a circular street mural for an art festival. The mural is going to be 50 feet wide. One sector of the mural spans 38°. What is the area of this sector to the nearest square foot?

SOLUTION:
The ratio of the area A of a sector to the area of the whole circle is equal to the ratio of the degree measure of the intercepted arc to 360.

\[ A = \frac{38}{360} \cdot \pi r^2 \]
\[ = \frac{19}{180} \pi (25)^2 \]
\[ = 207 \]

The area of the sector is 207 ft²

ANSWER:
207 ft²

Find the perimeter and the area of each figure. Round to the nearest tenth if necessary.

16. SOLUTION:
The total area is the sum of the areas of the triangle and the square.

The base and height of the triangle is 6. The area of the triangle is

\[ A = \frac{1}{2} bh \]
\[ = \frac{1}{2} (6)(6) \]
\[ = 18 \]

The area of the square is

\[ A = lw \]
\[ = 6 \cdot 6 \]
\[ = 36 \]

The total area is therefore 18 + 36 = 54.

Use the Pythagorean Theorem to find the length of the diagonals of the triangle.

\[ c^2 = a^2 + b^2 \]
\[ c^2 = 3^2 + 6^2 \]
\[ c = \sqrt{3^2 + 6^2} \]
\[ c = \sqrt{45} \]
\[ c \approx 6.7 \]

Therefore, the perimeter of the figure is about 3(6) + 2(6.7) = 31.4.

ANSWER:
31.4; 54
17. **SOLUTION:**

The area of the figure is the difference between the areas of the large square with sides of 5, and the small square with sides of 2.

\[
A = A_{\text{large}} - A_{\text{small}} \\
= 5^2 - 2^2 \\
= 25 - 4 \\
= 21
\]

The perimeter of the figure is the sum of the lengths of the sides.

\[
P = 5 + 5 + 5 + 2 + 2 + 2 + (5 - 2) \\
= 24
\]

**ANSWER:**

24; 21

**FLOORING** Brian’s service project is to build tree houses in the city park. Find the shaded area in each treehouse. Round to the nearest tenth.

18. **SOLUTION:**

Break up the composite figure into smaller polygons to determine each of their shaded areas:

Half the measure of the central angle of the regular hexagon is \(\frac{360}{6} = 60\). Therefore, use this information to find the apothem of the hexagon:

\[
\tan(36) = \frac{2.5}{x} \\
x = \frac{2.5}{\tan(36)} \\
x \approx 3.44 \text{ ft}
\]

Now, use the Area of a Regular Polygon Formula to find the area of the hexagon:

\[
A = \frac{1}{2} aP \\
A = \frac{1}{2}(3.44)(25) \approx 43 \text{ ft}^2
\]

Next, find the area of the isosceles triangle. We know the legs are 5 ft each and the height bisects the vertex angle. The vertex angle will be equal to the interior angle of the hexagon \(\left(\frac{(5-2)180}{5} = 108\right)\), since they are vertical angles. Therefore, we can use trigonometry to determine the height and base of the isosceles triangle.

\[
\cos(54) = \frac{1}{5} \\
h = 5 \cdot \cos(54) \\
h \approx 2.93 \text{ ft}
\]

\[
\sin(54) = \frac{x}{5} \\
x = 5 \cdot \sin(54) \\
x \approx 4.05 \text{ ft}
\]
Practice Test - Chapter 11

The area of the triangle is:
\[ A = \frac{1}{2} bh = \frac{1}{2} (8.1)(2.93) \approx 11.9 \text{ ft}^2. \]

Combine these individual areas to get the total shade area of the composite figure:
\[ A = \text{hexagon} + \text{isosceles triangle} \]
\[ A = 43 + 11.9 \]
\[ A = 54.9 \text{ ft}^2 \]
ANSWER: 54.9 ft²

19.

SOLUTION:
Find the area of the shaded parts of this composite shape by breaking it into polygons—namely one circle and two congruent isosceles trapezoids.

The area of the circle is
\[ A = \pi r^2 = \pi (2.5)^2 \approx 19.6 \text{ ft}^2. \]

The area of one isosceles trapezoid is
\[ A = \frac{1}{2} (8)(7+10) = 68 \text{ ft}^2. \]

The total shaded area of the composite figure is
\[ A = 19.6 + 2(68) = 155.6 \text{ ft}^2. \]
ANSWER: 155.6 ft²

20. BAKING Todd wants to make a cheesecake for a birthday party. The recipe calls for a 9-inch diameter round pan. Todd only has square pans. He has an 8-inch square pan, a 9-inch square pan, and a 10-inch square pan. Which pan comes closest in area to the one that the recipe suggests?

SOLUTION:
The area of a square of side s units is \( s^2 \) square units and that of a circle of radius \( r \) is given by the formula \( A = \pi r^2 \) sq. units.
The area of the round pan is
\[ \pi (4.5)^2 \approx 63.6 \text{ in}^2. \]
Therefore, the 8-inch square pan whose area is 64 sq. in. will be the closest to the round pan in area.
ANSWER: 8 in.