Unit 4:
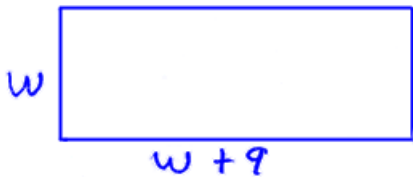**Lesson 02** **Solving perimeter and area word problems**

Perimeter is the total distance around a closed figure.

Perimeter of a rectangle: $P = 2W + 2L$

Perimeter (circumference) of a circle: $C = 2\pi r$

Perimeter of a triangle: $P = a + b + c$

Example 1: The length of a rectangle is 9 ft more than its width. Find the length if the perimeter of the rectangle is 54.

$$2w + 2(w+9) = 54$$
$$2w + 2w + 18 = 54$$
$$4w + 18 - 18 = 54 - 18$$
$$4w = 36$$
$$\frac{4w}{4} = \frac{36}{4} \quad ; \quad w = 9$$
$$L = w+9 = 9+9 = \boxed{18}$$

Example 2: The circumference of a circle is 10 inches more than its radius. What is its radius?

$$2\pi r = r + 10$$
$$2\pi r - r = r + 10 - r$$
$$2(3.14)r - r = 10$$
$$6.28r - 1r = 10$$
$$5.28r = 10$$
$$\frac{5.28r}{5.28} = \frac{10}{5.28} \quad ; \quad r = \boxed{1.8939 \text{ in}}$$

Example 3: The three sides of a triangle are x + 2, x + 4, and x + 7. If the perimeter of the triangle is 49, what is *x*?

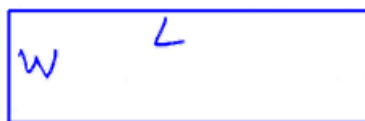$$x + 7 + x + 4 + x + 2 = 49$$
$$3x + 13 = 49$$
$$3x + 13 - 13 = 49 - 13$$
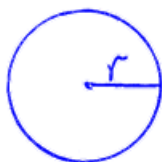$$3x = 36$$
$$\frac{3x}{3} = \frac{36}{3}$$
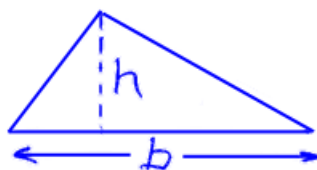$$x = \boxed{12}$$

Area of a rectangle:

$$A = L \cdot W$$

Area of a circle:

$$A = \pi r^2$$

Area of a triangle:

$$A = \frac{1}{2} b \cdot h$$

Example 4: Find the radius of a circle if its area is 32π.
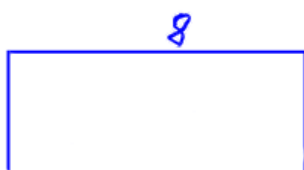
$$\pi r^2 = 32\pi$$
$$\frac{\pi r^2}{\pi} = \frac{32\pi}{\pi}$$
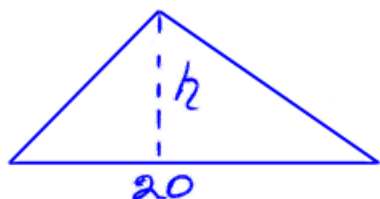$$r^2 = 32$$

To find, take √

$$r = \sqrt{32} = \boxed{5.656854}$$

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*Example 5: A rectangle's length is 8 and its width is 2 less than its area. What is its width?

$$L \cdot w = area \qquad a = area$$

$a - 2 = w \qquad 8(a - 2) = a$

$$8a - 16 = a$$

$$8a - 16 + 16 = a + 16$$

$$8a - a = a + 16 - a$$

$$7a = 16$$

$$\frac{7a}{7} = \frac{16}{7}; a = \frac{16}{7}$$

$$w = a - 2$$

$$w = \frac{16}{7} - 2; \frac{2 \cdot 7}{7}$$

$$w = \boxed{\frac{2}{7}}$$

Example 6: What is the height of a triangle if its base is 20 and its area is 100?

$$\frac{1}{2} b \cdot h = area$$

$$\frac{1}{2} 20 h = 100$$

$$10 h = 100$$

$$\frac{10 h}{10} = \frac{100}{10}$$

$$h = \boxed{10}$$

Assignment:

1. The width of a certain rectangle is 2 less than its length. If its perimeter is 96, what is its length?

2. The circumference of a circle is 2 more than three times its radius. What is the radius?

3. The length of one side of a triangle is x. Another side is two more than x while the third side is one less than x. If the perimeter is 13, what is x?

4. A rectangle's width is 4 less than its area while its length is 19. What is its width?

5. What is the base of a triangle whose height is 10 and whose area is 160?

6. If a circle's area is 180π, what is its radius?

7. If one side of a rectangle is 4x + 1 and an adjacent side is 3x + 4. What is the value of *x* if the perimeter of the rectangle is 38?

8. If all three sides of a triangle are equal (it's an equilateral triangle) and the perimeter of the triangle is 180, what is the length of each side?

*9. The perimeter of a particular circle is equal to its area. Write the equation that expresses this equality and then solve for *r*.