

1. Solve for a.

$$4\left(\frac{1}{2}a+1\right)^2 - 5 = 31$$

$$4\left(\frac{1}{2}a+1\right)^2 = 36$$

$$\left(\frac{1}{2}a+1\right)^2 = 9$$

$$\frac{1}{2}a+1 = \pm 3$$

$$\frac{1}{2}a+1 = 3 \quad \frac{1}{2}a+1 = -3$$

$$\frac{1}{2}a = 2 \quad \frac{1}{2}a = -4$$

$$\boxed{a=4} \quad \boxed{a=-8}$$

3. Solve for x  $3(x+4)^2 = 15$

$$(x+4)^2 = 5$$

$$x+4 = \pm\sqrt{5}$$

$$\boxed{x = -4 \pm \sqrt{5}}$$

2. Solve for x

$$2(x-7)^2 = 8$$

$$(x-7)^2 = 4$$

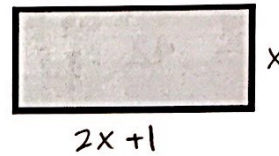
$$x-7 = \pm 2$$

$$x-7 = 2 \quad x-7 = -2$$

$$\boxed{x=9} \quad \boxed{x=5}$$

4.

The length of a rectangle is 1 cm more than twice its width. If the area of the rectangle is  $21\text{cm}^2$  then what are the dimensions?



width = 3  
length = 7

$$x(2x+1) = 21$$

$$2x^2 + x = 21$$

$$2x^2 + x - 21 = 0$$

$$(2x+7)(x-3) = 0$$

$$2x+7=0$$

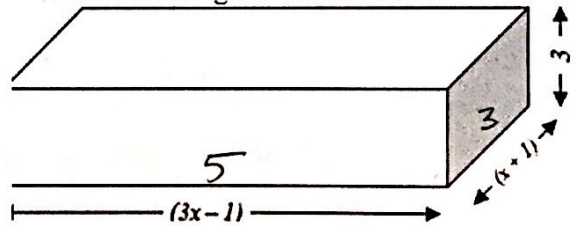
$$x = -\frac{7}{2}$$

$$x-3=0$$

$$\boxed{x=3}$$

6.

The volume of the prism is 45 cubic inches. What is the length of each side?



$$(3x-1)(x+1)(3) = 45$$

$$3x^2 + 2x - 1 = 15$$

$$3x^2 + 2x - 16 = 0$$

$$3x^2 + 8x - 6x - 16 = 0$$

$$x(3x+8) - 2(3x+8) = 0$$

$$(x-2)(3x+8) = 0$$

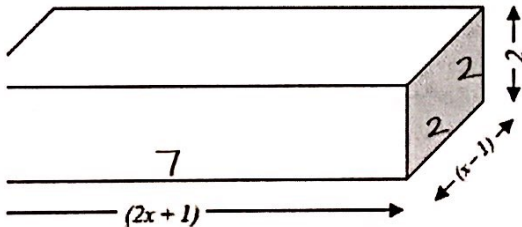
$$x-2=0$$

$$\boxed{x=2}$$

$$3x+8=0$$

$$x = -\frac{8}{3}$$

5. The volume of the prism is 28 cubic inches. What is the length of each side?



$$(2x+1)(x-1)(2) = 28$$

$$(2x^2 - x - 1) = 14$$

$$2x^2 - x - 15 = 0$$

$$(2x^2 - 6x) + (5x - 15) = 0$$

$$2x(x-3) + 5(x-3) = 0$$

$$(2x+5)(x-3) = 0$$

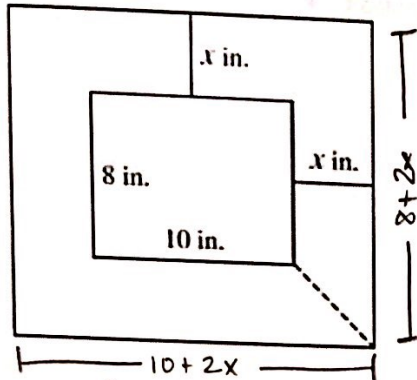
$$2x+5=0$$

$$x = -\frac{5}{2}$$

$$x-3=0$$

$$\boxed{x=3}$$

7. A picture frame is shown at the right. If the entire area of the frame and the picture totals 120 square inches find the width of the frame.



$$(10 + 2x)(8 + 2x) = 120$$

$$4x^2 + 36x + 80 = 120$$

$$4x^2 + 36x - 40 = 0$$

$$x^2 + 9x - 10 = 0$$

$$(x + 10)(x - 1) = 0$$

$$x = -10 \quad \boxed{x = 1}$$

9. The product of two consecutive positive integers is 132. Write an equation to model the situation and find the two integers

$$x(x+1) = 132$$

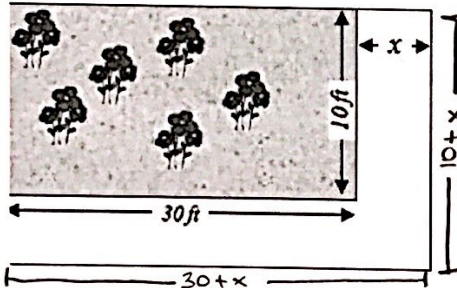
$$x^2 + x - 132 = 0$$

$$(x+12)(x-11) = 0$$

$$x = -12 \quad \boxed{x = 11}$$

11 and 12

11. A park is putting in a sidewalk of uniform width to go around two sides of a rectangular garden that is 10 feet by 30 feet. The contractor has enough concrete for 176 ft<sup>2</sup>. What is the maximum width of such a sidewalk?



$$(30 + x)(10 + x) - 300 = 176$$

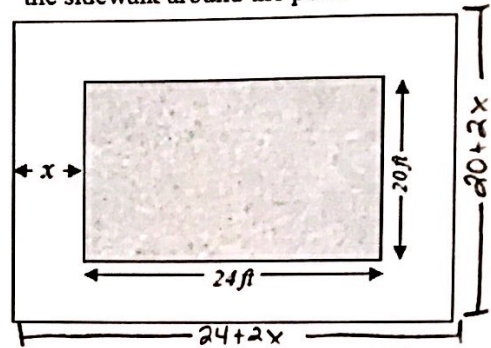
$$x^2 + 40x + 300 - 300 = 176$$

$$x^2 + 40x - 176 = 0$$

$$(x + 44)(x - 4) = 0$$

$$x = -44 \quad \boxed{x = 4}$$

8. A below ground swimming pool is to be constructed in the park. The pool is in the shape of a rectangle with the dimensions of 20' by 24'. A uniform width sidewalk is to be made around the pool. If the contractor says that he has enough concrete to create 300 ft<sup>2</sup> of sidewalk. What is the maximum width of the sidewalk around the pool?



$$(24 + 2x)(20 + 2x) - 480 = 300$$

$$4x^2 + 88x + 480 - 480 = 300$$

$$4x^2 + 88x - 300 = 0$$

$$x^2 + 22x - 75 = 0$$

$$(x + 25)(x - 3) = 0$$

$$x = -25 \quad \boxed{x = 3}$$

10. The perimeter of a rectangle is 42 cm and the area is 80 cm<sup>2</sup>. Write an equation to model the situation and find the dimensions of the rectangle.

$$2x + 2y = 42$$

$$x \cdot y = 80$$

$$y = \frac{80}{x}$$

$$2x + 2\left(\frac{80}{x}\right) = 42$$

$$2x + \frac{160}{x} = 42$$

$$2x^2 + 160 = 42x$$

$$2x^2 - 42x + 160 = 0$$

$$x^2 - 21x + 80 = 0$$

$$(x - 16)(x - 5) = 0$$

$$x = 16$$

$$x = 5$$

Substitute into  $x \cdot y = 80$

x = 16  
y = 5

12. A right triangle is shown below. Use the Pythagorean Theorem to determine the lengths of each side.

$$(x+3)^2 + (2x+5)^2 = (2x+7)^2$$

$$x^2 + 6x + 9 + 4x^2 + 20x + 25 = 4x^2 + 28x + 49$$

$$x^2 - 2x - 15 = 0$$

$$(x - 5)(x + 3) = 0$$

$$x = 5 \quad x = -3$$

