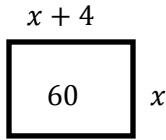


9.7

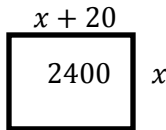
- 1) In a landscape plan, a rectangular flowerbed is designed to be 4 meters longer than it is wide. If 60 square meters are needed for the plants in the bed, what should the dimensions of the rectangular bed be?



$$\begin{aligned}
 x(x + 4) &= 60 \\
 x^2 + 4x &= 60 \\
 &\quad -60 \quad -60 \\
 x^2 + 4x - 60 &= 0 \\
 (x - 6)(x + 10) &= 0 \\
 x - 6 = 0 \quad x + 10 = 0 \\
 \frac{+6 \quad +6}{x = 6} \quad \frac{-10 \quad -10}{x = -10}
 \end{aligned}$$

6m by 10m

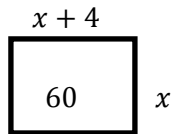
- 3) A rectangular lot is 20 yards longer than it is wide and its area is 2400 square yards. Find the dimensions of the lot



$$\begin{aligned}
 x(x + 20) &= 2400 \\
 x^2 + 20x &= 2400 \\
 \left(20 \cdot \frac{1}{2}\right)^2 &= 10^2 = 100 \\
 x^2 + 20x + 100 &= 2400 + 100 \\
 \sqrt{(x + 10)^2} &= \sqrt{2500} \\
 x + 10 &= \pm 50 \\
 \frac{-10 \quad -10}{x = -10 \pm 50} \\
 x &= 40, \quad \cancel{-60}
 \end{aligned}$$

40yds x 60 yds

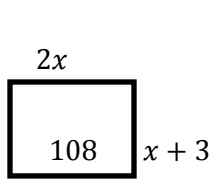
- 5) The length of a rectangular lot is 4 rods greater than its width, and its area is 60 square rods. Find the dimensions of the lot.



$$\begin{aligned}
 x(x + 4) &= 60 \\
 x^2 + 4x &= 60 \\
 &\quad -60 \quad -60 \\
 x^2 + 4x - 60 &= 0 \\
 (x + 10)(x - 6) &= 0 \\
 x + 10 = 0 \quad x - 6 = 0 \\
 \frac{-10 \quad -10 \quad +6 \quad +6}{x = -10 \quad x = 6}
 \end{aligned}$$

6 rods x 10 rods

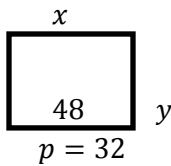
- 7) A rectangular piece of paper is twice as long as a square piece and 3 inches wider. The area of the rectangular piece is 108 in^2 . Find the dimensions of the square piece.



$$\begin{aligned}
 2x(x + 3) &= 108 \\
 2x^2 + 6x &= 108 \\
 -108 - 108 & \\
 \frac{2x^2}{2} + \frac{6x}{2} - \frac{108}{2} &= \frac{0}{2} \\
 x^2 + 3x - 54 &= 0 \\
 (x + 9)(x - 6) &= 0 \\
 x + 9 = 0 \quad x - 6 = 0 & \\
 \frac{-9 - 9}{x - 9} \quad \frac{+6 + 6}{x + 6} & \\
 \cancel{x - 9} & \quad x = 6
 \end{aligned}$$

$6 \text{ in} \times 6 \text{ in}$

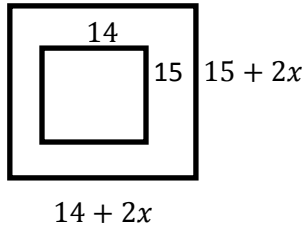
- 9) The area of a rectangle is 48 ft^2 and its perimeter is 32 ft. Find its length and width.



$$\begin{aligned}
 2x + 2y &= 32 \\
 -2x \quad - 2y & \\
 \frac{2y}{2} = \frac{32}{2} - \frac{2x}{2} & \\
 y = 16 - x & \\
 xy = 48 & \\
 x(16 - x) = 48 & \\
 16x - x^2 = 48 & \\
 \frac{-16x + x^2 - 16x + x^2}{0 = x^2 - 16x + 48} & \\
 0 = (x - 12)(x - 4) & \\
 x - 12 = 0 \quad x - 4 = 0 & \\
 \frac{+12}{x = 12} \quad \frac{+4}{x = 4} & \\
 y = 16 - 12 = 4 \quad y = 16 - 4 = 12 &
 \end{aligned}$$

$12 \text{ ft} \times 4 \text{ ft}$

- 11) A mirror 14 inches by 15 inches has a frame of uniform width. If the area of the frame equals that of the mirror, what is the width of the frame?



$$A = 2(14 \cdot 15) = 420$$

3 in

$$\begin{aligned} (15 + 2x)(14 + 2x) &= 420 \\ 210 + 30x + 28 + 4x^2 &= 420 \\ 4x^2 + 58x + 210 &= 420 \\ &\quad \underline{-420 \quad -420} \end{aligned}$$

$$\begin{aligned} \frac{4x^2}{2} + \frac{58x}{2} - \frac{210}{2} &= \frac{0}{2} \\ 2x^2 + 29x - 105 &= 0 \end{aligned}$$

$$(2x + 35)(x - 3) = 0$$

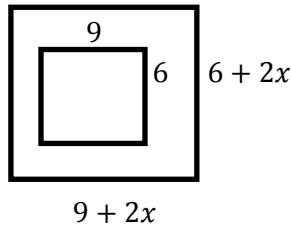
$$2x + 35 = 0 \quad x - 3 = 0$$

$$\underline{\quad -35 \quad -35 \quad +3 \quad +3}$$

$$\frac{2x}{2} = \frac{-35}{2} \quad x = 3$$

~~$$x = \frac{35}{2}$$~~

- 13) A grass plot 9 yards long and 6 yards wide has a path of uniform width around it. If the area of the path is equal to the area of the plot, determine the width of the path.



$$A = 2(9 \cdot 6) = 108$$

1.5 yds

$$\begin{aligned} (6 + 2x)(9 + 2x) &= 108 \\ 54 + 12x + 18x + 4x^2 &= 108 \\ 4x^2 + 30x + 54 &= 108 \\ &\quad \underline{-108 \quad -108} \end{aligned}$$

$$\frac{4x^2}{2} + \frac{30x}{2} - \frac{54}{2} = \frac{0}{2}$$

$$2x^2 + 15x - 27 = 0$$

$$(2x - 3)(x + 9) = 0$$

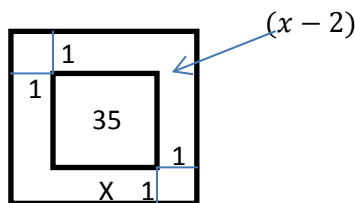
$$2x - 3 = 0 \quad x + 9 = 0$$

$$\underline{\quad +3 \quad +3 \quad -9 \quad -9}$$

$$\frac{2x}{2} = \frac{3}{2} \quad \del{x = -9}$$

$$x = \frac{3}{2} = 1.5$$

- 15) A page is to have a margin of 1 inch, and is to contain 35 in² of painting. How large must the page be if the length is to exceed the width by 2 inches?



7in x 9in

$$x(x - 2) = 35$$

$$x^2 - 2x = 35$$

$$\underline{\quad -35 \quad -35}$$

$$x^2 - 2x - 35 = 0$$

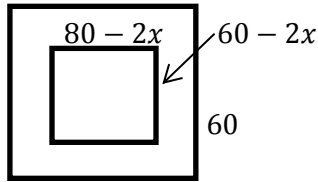
$$(x - 7)(x + 5) = 0$$

$$x - 7 = 0 \quad x + 5 = 0$$

$$\underline{\quad +7 \quad +7 \quad -5 \quad -5}$$

$$x = 7 \quad \del{x = -5}$$

- 17) A rectangular wheat field is 80 rods long by 60 rods wide. A strip of uniform width is cut around the field, so that half the grain is left standing in the form of a rectangular plot. How wide is the strip that is cut?



80

$$A = \frac{1}{2}(60 \cdot 80) = 2400$$

10 rods

$$\begin{aligned}(80 - 2x)(60 - 2x) &= 2400 \\ 48000 - 160x - 120x + 4x^2 &= 2400 \\ 4x^2 - 280x + 4800 &= 2400 \\ &\quad \underline{-2400 \quad -2400}\end{aligned}$$

$$\frac{4x^2}{4} - \frac{280x}{4} + \frac{2400}{4} = \frac{0}{4}$$

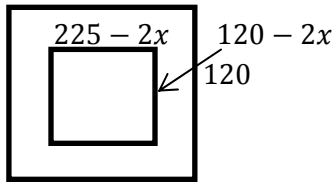
$$x^2 - 70x + 600 = 0$$

$$(x - 10)(x - 60) = 0$$

$$x - 10 = 0 \quad x - 60 = 0$$

$$\begin{array}{l} \underline{+10 \quad +10 \quad +60 \quad +60} \\ x = 10 \quad \cancel{x = 60} \end{array}$$

- 19) A rectangular field 225 ft by 120 ft has a ring of uniform width cut around the outside edge. The ring leaves 65% of the field uncut in the center. What is the width of the ring?



225

$$A = 0.65(120 \cdot 225) = 17500$$

$$\begin{aligned}(225 - 2x)(120 - 2x) &= 17500 \\ 27000 - 450x - 240x + 4x^2 &= 17500 \\ 4x^2 - 690x + 27000 &= 17500 \\ &\quad \underline{-17500 \quad -17500}\end{aligned}$$

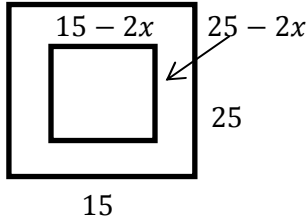
$$\frac{4x^2}{2} - \frac{690x}{2} + \frac{9450}{2} = \frac{0}{2}$$

$$2x^2 - 345x + 4725 = 0$$

$$\frac{345 \pm \sqrt{345^2 - 4(2)(4725)}}{2(2)} = \frac{345 \pm \sqrt{81225}}{4} = \frac{345 \pm 285}{4} = \frac{315}{2} \text{ \& } 15$$

15 ft

- 21) A frame is 15 in by 25 in and is of uniform width. The inside of the frame leaves 75% of the total area available for the picture. What is the width of the frame?



$$A = .75(25 \cdot 15) = 281.25$$

1.25 in

$$(15 - 2x)(25 - 2x) = 281.25$$

$$375 - 30x - 50x + 4x^2 = 281.25$$

$$4x^2 - 80x + 375 = 281.25$$

$$\frac{-281.25 - 281.25}{-163800} = \frac{0}{-163800}$$

$$\frac{4x^2}{4} - \frac{80x}{4} + \frac{93.75}{4} = \frac{0}{4}$$

$$x^2 - 20x + 23.4375 = 0$$

$$\frac{-23.4375 \pm \sqrt{23.4375^2 - 4(1)(23.4375)}}{2(1)}$$

$$x^2 - 20x = -23.4375$$

$$\left(-20 \cdot \frac{1}{2}\right)^2 = (-10)^2 = 100$$

$$x^2 - 20x + 100 = -23.4375 + 100$$

$$\sqrt{(x - 10)^2} = \sqrt{(76.5625)}$$

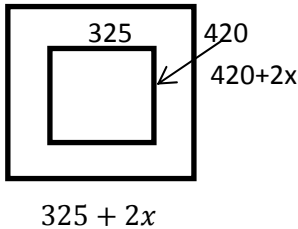
$$x - 10 = \pm 8.75$$

$$\frac{+10 \quad +10}{\quad \quad \quad}$$

$$x = 10 \pm 8.75$$

$$x = 18.75, 1.25$$

- 23) The farmer in the previous problem has a neighbor who has a field 325 ft by 420 ft. His neighbor wants to increase the size of his field by 20% by cultivating a band of uniform width around the outside of his lot. How wide a band should his neighbor cultivate?



$$A = 1.2(325)(420) = 163800$$

$$(420 + 2x)(325 + 2x) = 163800$$

$$136500 + 840x + 650x + 4x^2 = 163800$$

$$4x^2 + 1490x + 136500 = 163800$$

$$\frac{-163800 - 163800}{-327600} = \frac{0}{-327600}$$

$$\frac{4x^2}{4} + \frac{1490x}{4} - \frac{27300}{4} = \frac{0}{4}$$

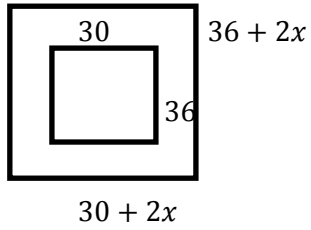
$$x^2 + 745x - 13650 = 0$$

$$\frac{-745 \pm \sqrt{(745)^2 - 4(1)(-13650)}}{2(1)} = \frac{-745 \pm \sqrt{664225}}{2}$$

$$\frac{-745 \pm 815}{2} = 17.5, -390$$

17.5 ft

- 25) Donna has a garden that is 30 ft by 36 ft. She wants to increase the size of the garden by 40%. How wide a ring around the outside should she cultivate?



$$A = 1.4(30 \cdot 36) = 1512$$

$$(36 + 2x)(30 + 2x) = 1512$$

$$1080 + 72x + 60x + 4x^2 = 1512$$

$$4x^2 + 132x + 1080 = 1512$$

$$\frac{-132x - 1080}{4} = \frac{-1512}{4}$$

$$\frac{4x^2}{4} + \frac{132x}{4} - \frac{432}{4} = \frac{0}{4}$$

$$x^2 + 33x - 108 = 0$$

$$\frac{-33 \pm \sqrt{33^2 - 4(1)(-108)}}{2(1)} = \frac{-33 \pm \sqrt{1521}}{2} = \frac{-33 \pm 39}{2} = 3, -36$$

3 ft.