

## 1.22 - Worksheet

## Math 20-2: Solving Quadratic Equations by Factoring

Pg411 #4ab: Solve each equation.

$$12 - 5x = 2x^2$$

$$\begin{array}{r} -12 \quad +5x \quad +5x \quad -12 \\ 0 = 2x^2 + 5x - 12 \end{array}$$

$$\begin{array}{r} +8 \quad -3 \\ \square + \square = 5 \\ \square \times \square = -24 \end{array}$$

$$0 = 2x^2 + 8x - 3x - 12$$

$$0 = (2x^2 + 8x) + (-3x - 12)$$

$$0 = 2x(x+4) - 3(x+4)$$

$$0 = (x+4)(2x-3)$$

$$\begin{array}{l} \swarrow \quad \searrow \\ x+4=0 \quad 2x-3=0 \\ \boxed{x=-4} \quad \boxed{x=\frac{3}{2}} \end{array}$$

$$4x^2 = 9 - 9x$$

$$4x^2 + 9x - 9 = 0$$

$$\begin{array}{r} -3 \quad +12 \\ \square + \square = 9 \\ \square \times \square = -36 \end{array}$$

$$\begin{array}{r} 1136 \\ 218 \\ \hline 3, 12 \\ \hline 6, 6 \end{array}$$

$$4x^2 - 3x + 12x - 9 = 0$$

$$(4x^2 - 3x) + (12x - 9) = 0$$

$$x(4x-3) + 3(4x-3) = 0$$

$$(4x-3)(x+3) = 0$$

$$\begin{array}{l} \swarrow \quad \searrow \\ 4x-3=0 \quad x+3=0 \\ \boxed{x=\frac{3}{4}} \quad \boxed{x=-3} \end{array}$$

**Pg413 #14:** Samuel is hiking along the top of First Canyon on the South Nahanni River in the Northwest Territories. When he knocks a rock over the edge, it falls into the river, 1260m below. The height of the rock,  $h(t)$ , at  $t$  seconds can be modelled by the following function:

$$h(t) = -25t^2 - 5t + 1260$$

**Bayer's Note:** This planet (definitely not Earth) has an acceleration due to gravity of  $50 \text{ m/s}^2$ , and Samuel threw the rock downward at  $5 \text{ m/s}$  from the top of a  $1260 \text{ m}$  tall ledge. This is a very poor question, but I included it anyways because I think it is hilarious. All the math will work out regardless of the ridiculous value.

- How long will it take the rock to reach the water?
- What is the domain of the function? Explain your answer.

$$\textcircled{A} \quad 0 = -25t^2 - 5t + 1260$$

$$0 = -5(5t^2 + t - 252)$$

$$\begin{array}{r} -35 \quad +36 \\ \square + \square = 1 \\ \square \times \square = 1260 \end{array}$$

$$0 = -5[5t^2 - 35t + 36t - 252]$$

$$0 = -5[5t(t-7) + 36(t-7)]$$

$$0 = -5(t-7)(5t+36)$$

$$\begin{array}{l} \swarrow \quad \searrow \\ t-7=0 \quad 5t+36=0 \\ \boxed{t=7} \quad \boxed{t=-7.2} \end{array}$$

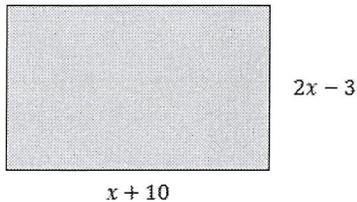
Takes 7sec to hit the water

$$\textcircled{B} \quad \text{Domain is } [0, 7]$$

Starts at  $t=0 \text{ sec}$   
Ends at  $t=7 \text{ sec}$  when it hits the water.

## Math 20-1: Solving Quadratic Equations by Graphing

**Pg 230 #11:** A rectangle has dimension  $x + 10$  and  $2x - 3$ , where  $x$  is in centimeters. The area of the rectangle is  $54 \text{ cm}^2$ .



- What equation could you use to determine the value of  $x$ ?
- What is the value of  $x$ ?

(A) Area =  $(L)(w)$   
 $54 = (x+10)(2x-3)$   
 $54 = 2x^2 - 3x + 20x - 30$   
 $54 = 2x^2 + 17x - 30$   
 $0 = 2x^2 + 17x - 84$

(B)  $\square + \square = +17$   
 $\square \times \square = 168$

1, 168
2, 84
4, 42
6, 28
3, 56
<span style="border: 1px solid black; padding: 2px;">7, 24</span>
8, 21

$2x^2 + 17x - 84 = 0$   
 $2x^2 - 7x + 24x - 84 = 0$   
 $(2x^2 - 7x) + (24x - 84) = 0$   
 $x(2x-7) + 12(2x-7) = 0$   
 $(2x-7)(x+12) = 0$

$\downarrow$   $2x-7=0$   $\rightarrow$   $x+12=0$   
 $x = 7/2$   $x = -12$

$x = -12$  doesn't give positive length or width.

So  $x = 7/2 \text{ cm}$   
 or  $x = 3.5 \text{ cm}$

**Pg 230 #13:** A flare is launched from a boat. The height,  $h$ , in meters, of the flare above the water is approximately modelled by the function  $h(t) = 150t - 5t^2$ , where  $t$  is the number of seconds after the flare is launched.

- What equation could you use to determine the time it takes for the flare to return to the water?
- How many seconds will it take for the flare to return to the water?

(A)  $0 = 150t - 5t^2$   
 $5t^2 - 150t + 0 = 0$

So at water level when  $t=0$  (launched) and  $t=30$  (landed).

(B)  $5t(t-30) = 0$

$\downarrow$   $5t=0$   $\downarrow$   $t-30=0$   
 $t=0$   $t=30$

So lands after 30 sec.