

Chapter 8 Word Problems

Solving by Factoring

Example 1

Let $x =$ the #

The product of twice a number and three less than the number is 0. Find the number.

$$2x \cdot (x-3) = 0$$

$$\frac{2x}{2} = \frac{0}{2}$$

$$x = 0$$

$$\begin{array}{r} x-3=0 \\ +3 \quad +3 \\ \hline \end{array}$$

$$x = 3$$

number
is 0
or 3

Example 2

Let $x =$ 1st int.

$x+1 =$ 2nd int

When one integer is added to the square of the next consecutive integer, the sum is 1. Find the integers.

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

$$x + \begin{array}{l} \text{perf.} \\ \text{sq. tri.} \end{array} \downarrow \begin{array}{l} \text{FOIL} \\ \text{dist. prop} \end{array} x^2 + 2x + 1 = 1$$

$$\begin{array}{r} x + x^2 + 2x + 1 \\ \hline x^2 + 3x = 0 \end{array}$$

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

$$x = 0$$

$$\begin{array}{r} x+3=0 \\ -3 \quad -3 \\ \hline \end{array}$$

$$x = -3$$

If $x = 0$,
then $x+1 = 1$.

0 & 1

If $x = -3$,
then $x+1 = -2$.

-3 & -2

Example 3

$$h = -16t^2 + vt + s$$

A flare is launched from a life raft with an initial upward velocity of 192 feet per second. How many seconds will it take for the flare to return to the sea? Use the vertical motion model to write an equation and solve.

$$0 = -16t^2 + 192t$$

$$0 = 16t(-t + 12)$$

$$\frac{16t}{16} = \frac{0}{16}$$

~~t = 0~~
start of problem

$$\frac{-t + 12}{-12} = \frac{0}{-12}$$

$$\frac{-t}{-1} = \frac{-12}{-1}$$

$$t = 12$$

12 sec.

Example 4



A rectangular photograph is 8 centimeters wide and 12 centimeters long. The photograph is enlarged by increasing the length and width by an equal amount. If the area of the new photograph is 69 square centimeters greater than the area of the original photograph, what are the dimensions of the new photograph?

$$\begin{array}{l} \text{l} \cdot \text{w} \\ \text{original} \\ 8 \cdot 12 \\ 96 \end{array} + 69 = \begin{array}{l} \text{l} \cdot \text{w} \\ \text{new} \\ (12+x)(8+x) \end{array}$$

if x = 3...
12+x = 15
8+x = 11

$$165 = 96 + 12x + 8x + x^2$$

$$0 = x^2 + 20x - 69$$

$$0 = (x-3)(x+23)$$

$$x-3=0$$

$$x=3$$

~~$$x+23=0$$~~
~~$$x=-23$$~~

no neg. length

$$\begin{array}{r} 320 \quad p-69 \\ -3 \quad 23 \\ \hline 1 \quad 1 \end{array}$$

15 cm by 11 cm

Example 6

$$h = -16t^2 + vt + s$$

A missile is fired with an initial upward velocity of 2320 feet per second. When will it reach an altitude of 40,000 feet? Use the vertical motion model to write an equation and solve.

$$40,000 = -16t^2 + 2320t$$

$$\begin{array}{r} 40,000 \\ -40,000 \\ \hline 0 = -16t^2 + 2320t - 40,000 \end{array}$$

$$0 = -16(t^2 - 145t + 2500)$$

$$0 = -16(t - 125)(t - 20)$$

$$\begin{array}{l} t - 125 = 0 \\ t = 125 \end{array} \quad \begin{array}{l} t - 20 = 0 \\ t = 20 \end{array}$$

125 sec & 20 sec

Example 7

Let $x = 1^{\text{st}}$ int Let $x+1 = 2^{\text{nd}}$ int.

Find two consecutive integers whose product is 240.

$$x(x+1) = 240$$

$$\begin{array}{r} x^2 + x = 240 \\ -240 \quad -240 \\ \hline x^2 + x - 240 = 0 \end{array}$$

$$(x+16)(x-15) = 0$$

$$\begin{array}{l} x+16=0 \\ x=-16 \end{array} \quad \begin{array}{l} x-15=0 \\ x=15 \end{array}$$

if $x = -16$,
then $x+1 = -15$.

-16 & -15

if $x = 15$,
then $x+1 = 16$.

15 & 16