

## Solving Quadratics – Word Problems

Word problems seem so much more difficult than your everyday problem. If you think of them that way, they become that much more difficult. A word problem needs to be translated from words into math. Once you've done that, it's your everyday problem again. The most important part is to pay attention not only to what the problem is telling you, but also to what it's asking you to find.

<p><b>EXAMPLE</b> The arc of James' potato, thrown during a food fight, is modeled by the equation <math>f(t) = 2t^2 + 6t - 20</math>, where <math>t</math> represents the time in seconds. If James misses his target, after how many seconds will the potato hit the ground?</p> <p><i>We're given an equation and asked for the time (<math>t</math>) before it hits the ground: <math>y = 0</math>. It's asking for the zeros!</i></p> $f(t) = 2t^2 + 6t - 20$ $0 = 2t^2 + 6t - 20$ $0 = t^2 + 3t - 10$ $0 = (t + 5)(t - 2)$ $t + 5 = 0 \text{ or } t - 2 = 0$ $t = -5 \text{ or } t = 2$ <p>It can't land after negative seconds, so the answer is <span style="border: 1px solid black; padding: 2px;">2 seconds</span>.</p>	<p>1. A bird is catapulted toward a group of pigs. The bird's trajectory can be tracked by the equation <math>f(t) = -t^2 - 2t + 24</math>, where <math>t</math> is the time in seconds. If the bird hits the ground beneath the pigs' feet, after how many seconds will he hit?</p>	<p>2. A rocket is launched from ground level with an initial vertical velocity of 1600 ft/s. The position of the rocket can be tracked using the following equation <math>f(t) = -16t^2 + 1600t</math>, where <math>t</math> is the time in seconds. After how many seconds will the rocket hit the ground?</p>
<p><b>EXAMPLE</b> Two consecutive negative integers have the property that one integer times twice the other equals 84. What is the sum of these integers?</p> <p><b><i>Consecutive</i></b> means 2 numbers in order (3 &amp; 4, 6 &amp; 7, etc.). That's like saying</p> $x \text{ and } x + 1$ <p>"one integer times twice the other equals 84"</p> $(One\ integer)(2)(the\ other) = 84$ $x(2)(x + 1) = 84$ $2x(x + 1) = 84$ $2x^2 + 2x = 84$ $2x^2 + 2x - 84 = 0$ <p><i>It's a zeros problem! Divide by <math>a = 2</math></i></p> $x^2 + x - 42 = 0 \text{ Factor!}$ $(x - 6)(x + 7) = 0$ <p><math>x</math> is either 6 or -7, but the problem wanted <b>negative, so it has to be -7!</b></p> $x = -7$ $x + 1 = -7 + 1 = -6$ <p>The "sum of these two integers" is: <math>-7 + -6 = </math><span style="border: 1px solid black; padding: 2px;">-13</span></p>	<p>3. Two consecutive positive integers have the property that one integer times 5 times the other equals 10. What is the sum of these integers?</p>	<p>4. Two consecutive negative integers have the property that one integer times thrice (three times) the other equals 60. What is the sum of these integers?</p>

**EXAMPLE**

Determine the sum of two negative consecutive integers, given that one integer multiplied by a fifth of the other will equal 6.

Consecutive:  $x$  &  $x + 1$

$$(x) \left( \frac{1}{5} \right) (x + 1) = 6$$

*I don't like the fraction. I'll get rid of it by multiplying both sides by 5.*

$$(x)(x + 1) = 30$$

$$x^2 + x = 30$$

$$x^2 + x - 30 = 0$$

$$(x - 5)(x + 6) = 0$$

$x$  is 5 or -6

*The problem asks for negatives, so:*

$$x = -6 \text{ \& } x + 1 = -6 + 1 = -5$$

*The sum of these integers will be:*

$$-6 + -5 = \boxed{-11}$$

5. Determine the sum of two consecutive positive integers, given that one integer multiplied by a fourth of the other will equal 3.

6. Determine the sum of two consecutive negative integers, given that one integer multiplied by half of the other will equal 55.