

Sum and Product of the Roots

Name: _____

We've seen how we can come up with a possible quadratic equation given its roots or solutions. For example, if I know that a quadratic equation has roots 5 and -2, I could follow the process below:

$$x = 5, \quad x = -2$$

$$x - 5 = 0, \quad x + 2 = 0$$

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

$$x^2 + 2x - 5x - 10 = 0$$

$$x^2 - 3x - 10 = 0$$

This is one possible quadratic equation with these roots.

Question: What's another possible quadratic equation with these roots? _____

Question: How many different quadratic equations have these roots? _____

There is another way to find a quadratic equation given its roots that many people find useful. Look below at the roots and the equations that have those roots. Can you discover the shortcut?

Roots

possible quadratic equation with those roots

5 and -2

$$x^2 - 3x - 10 = 0$$

6 and 5

$$x^2 - 11x + 30 = 0$$

-1 and -7

$$x^2 + 8x + 7 = 0$$

-20 and 3

$$x^2 + 17x - 60 = 0$$

5 and 4

$$x^2 - 9x + 20 = 0$$

5 and -5

$$x^2 - 25 = 0$$

What pattern do you see?

Does the pattern or shortcut you discovered above work for these examples?

$\frac{3}{2}$ and $-\frac{3}{2}$

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

$\frac{1}{5}$ and -2

$$5x^2 + 9x - 2 = 0$$

$\frac{2}{3}$ and $\frac{1}{3}$

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

Let's write down this shortcut.

Remember: We can find any quadratic equation that has these roots. So to make things a bit easier, let's find the quadratic equation with $a = 1$.

When $a = 1$, then $b =$ _____, and $c =$ _____.

1) Given the roots below, write a quadratic equation with those roots.

a) $5 \text{ and } -2$

b) $-5 \text{ and } -2$

c) $6 \text{ and } 3$

d) $\frac{2}{3} \text{ and } \frac{-1}{3}$

2) Given the sum of the roots and the product of the roots, write a quadratic equation.

a) $\text{sum} = 8, \text{product} = 12$

b) $\text{sum} = -8, \text{product} = 12$

c) $\text{sum} = -7, \text{product} = -10$

d) $\text{sum} = \frac{4}{7}, \text{product} = \frac{3}{49}$

3) Given the quadratic equations below, find the sum of the roots and the product of the roots.

a) $x^2 - 9x + 8 = 0$

b) $x^2 + x - 7 = 0$

c) $2x^2 - 6x - 10 = 0$

d) $3x^2 - 3x + 11 = 0$

