Decimal equations

In this lesson we'll learn to solve equations with decimals by multiplying by powers of 10.

Remember from Pre-Algebra that we can identify the **place value** of any digit.

0.1 has a 1 in the tenths place

0.02 has a 2 in the hundredths place

0.003 has a 3 in the thousandths place

0.0004 has a 4 in the ten-thousandths place

When we multiply by...

10 move the decimal point one place to the right

100 move the decimal point two places to the right

$1,000$ move the decimal point three places to the right

$10,000$ move the decimal point four places to the right

Notice that we move the decimal point to the right one place for each 0 in the multiple of 10.

One method of solving an equation with decimals is to multiply both sides of the equation by a power of 10. In order to solve an equation involving

decimals, the first thing we'll do is get rid of the decimals by changing them to whole numbers.

Let's do a couple of examples.

Example

Solve the decimal equation.

$$0.3x + 5 = 11$$

In order to solve this equation, the first thing we'll do is get rid of the decimal by changing it to a whole number. Since the decimal in our equation ends in the tenths place, we'll need to multiply both sides of the equation by 10 in order to change the decimal to a whole number.

$$0.3x + 5 = 11$$

$$(0.3x + 5)(10) = 11(10)$$

$$0.3x(10) + 5(10) = 11(10)$$

$$3x + 50 = 110$$

$$3x + 50 - 50 = 110 - 50$$

$$3x = 60$$

$$\frac{3x}{3} = \frac{60}{3}$$

$$x = 20$$

Let's do another one.

Example

Solve for the variable.

$$6a + 5a = -1.1$$

In order to solve this equation, the first thing we'll do is get rid of the decimal by changing it to an integer. Since the decimal in our equation ends in the tenths place, we'll need to multiply both sides of the equation by 10 in order to change the decimal to a whole number.

$$6a + 5a = -1.1$$

$$(6a + 5a)(10) = -1.1(10)$$

$$6a(10) + 5a(10) = -1.1(10)$$

$$60a + 50a = -11$$

$$110a = -11$$

$$\frac{110a}{110} = \frac{-11}{110}$$

$$a = \frac{-1}{10}$$

$$a = -0.1$$

Let's look at another example.

Example

Solve for the variable.

$$0.4n + 3.9 = 5.78$$

In order to solve this equation, the first thing we'll do is get rid of the decimals by changing them to whole numbers. Since the longest decimal in our equation ends in the hundredths place, we'll need to multiply both sides of the equation by 100 in order to change all the decimals to whole numbers. This means we'll move each decimal point two places to the right.

$$0.4n + 3.9 = 5.78$$

$$(0.4n + 3.9)(100) = 5.78(100)$$

$$0.4n(100) + 3.9(100) = 5.78(100)$$

$$40n + 390 = 578$$

$$40n + 390 - 390 = 578 - 390$$

$$40n = 188$$

$$\frac{40n}{40} = \frac{188}{40}$$

$$n = \frac{47}{10}$$

$$n = 4.7$$