Decimal arithmetic

We can add, subtract, multiply and divide decimal numbers.

Addition and subtraction of decimal numbers works the same way as whole number addition and subtraction, we just need to make sure that we line up the decimal.

Multiplication and division of decimal numbers will have us ignore the decimal place until the end of the problem.

Let's try an example with addition and subtraction of decimal numbers.

Example

Find the sum and difference.

$$13.16 + 8.74$$

$$13.16 - 8.74$$

To find the sum, we'll line up the decimals, making sure that they're stacked directly on top of one another.

$$\begin{array}{r} 13.16 \\ +\ 8.74 \end{array}$$

Then we'll bring the decimal straight down, adding the numbers as usual, starting with the 1's place, carrying any extra to the 10's place, adding the 10's place, carrying any extra to the 100's place, etc.

$$\begin{array}{r} 13.16 \\ +\ 8.74 \\ \hline 21.90 \end{array}$$

We can say that the sum is $13.16 + 8.74 = 21.90$.

To find the difference, we'll line up the decimals, making sure that they're stacked directly on top of one another.

$$\begin{array}{r} 13.16 \\ -\ 8.74 \end{array}$$

Then we'll bring the decimal straight down, subtracting the numbers as usual, starting with the 1's place, borrowing from the 10's place if necessary, subtracting the 10's place, borrowing from the 100's place if necessary, etc.

$$\begin{array}{r} 13.16 \\ -\ 8.74 \\ \hline 4.42 \end{array}$$

We can say that the sum is $13.16 - 8.74 = 4.42$.

Let's try an example with multiplication and division of decimal numbers.

Example

Find the product and quotient.

$$13.1 \times 8.74$$

$$13.1 \div 8.74$$

To find the product, we'll right-align the decimal numbers, making sure that they're stacked directly on top of one another.

$$\begin{array}{r} 13.1 \\ \times\ 8.74 \end{array}$$

We'll ignore the decimals for now, multiplying the numbers as usual.

$$\begin{array}{r} 13.1 \\ \times\ 8.74 \\ \hline 524 \\ 9{,}170 \\ +\ 104{,}800 \\ \hline 114{,}494 \end{array}$$

Now we'll count the number of digits to the right of the decimal points in both numbers. There is one number, a 1, after the decimal point in 13.1. There are two numbers, a 7 and a 4, after the decimal point in 8.74. That's a total of three numbers after the decimal points, which means we have to move the decimal point in from the right three places in our final answer. Therefore, instead of $114{,}494$, we get 114.494.

To find the quotient, we'll do long division, bringing the decimal in the dividend directly up into the quotient.

$$\begin{array}{r} 1.4988\ldots \\ 8.74\ \overline{)\ 13.1000000} \\ -\ 8\ 74 \\ \hline 4\ 360 \\ -\ 3\ 496 \\ \hline 8640 \\ -\ 7866 \\ \hline 7740 \\ -\ 6992 \\ \hline 7480 \\ -\ 6992 \\ \hline 4880 \\ \ldots \end{array}$$

As you can see, 8.74 doesn't divide evenly into 13.1, so we can stop after a few decimal places and just give the estimation as $13.1 \div 8.74 \approx 1.4988$.

Notice also that we completely ignored the decimals, other than bringing the decimal from the dividend straight up into the quotient. For the rest of the problem, we treated the dividend and divisor as whole numbers.
