# Decimals

## 1. Addition and Subtraction

### INTRODUCTION

To be able to perform the usual operations (+, −, ×, and ÷) using decimals, we need to remember what decimals are. To review this, please refer to *Fractions – 4. Fractions, Decimals, and Percentages*. It is vitally important to remember that each of the digits after (to the right of) a decimal point represents a value, just as those digits that are before (to the left of) the decimal point do. This is especially true when adding and subtracting decimals. We call the digits of a number after the decimal point *decimal places*. The value they represent (along with the values before a decimal point) can be found in the following table.

| Thousands | Hundreds | Tens | Ones/Units | . | Tenths | Hundredths | Thousandths |
|---|---|---|---|---|---|---|---|

### ADDITION

When adding and subtracting decimals we need to line up the numbers at the decimal point. This ensures that all the numbers in a column represent the same value in our decimal system (which uses the columns in the above table). So, for example, if we are asked to add the following numbers: 17.4, 5.86, and 0.107, our first task is to line them up at the decimal point like this:

$$\begin{array}{r} 17.4 \\ 5.86 \\ +\ 0.107 \\ \hline \end{array}$$

Notice that it is only the last number that has three decimal places, that is, it has a 7 in the thousandths column. In other words, both 17.4 and 5.86 do not have any thousandths. Another way to say this is that they both have 0 thousandths. 17.4 also has 0 hundredths. So we could also write our problem like this:

$$\begin{array}{r} 17.400 \\ 5.860 \\ +\ 0.107 \\ \hline \end{array}$$

Now that we have columns, the addition is just like any other addition, without a decimal point. We really just ignore the point, but insert it in the answer under the others. So, our solution would start like this:

$$\begin{array}{r} 17.400 \\ 5.860 \\ +\ 0.107 \\ \hline \quad . \end{array}$$

Now we can add the digits column by column, starting from the right as usual. So the answer is:

$$\begin{array}{r} 17.400 \\ 5.860 \\ +\ 0.107 \\ \hline 23.367 \end{array}$$

## SUBTRACTION

With addition it is often the case that we may skip the step of putting in the 0s, and just remembering they are there. This is not the case with subtraction, where putting in the zeros is particularly important.

For example, suppose we want to take away 5.98 from 12.1. Firstly we must ensure we get the order correct – remember we are taking the bottom number from the top one. So:

$$\begin{array}{r} 12.1 \\ -\ 5.98 \\ \hline \end{array}$$

Again, we need to put in the 0 hundredths in the number 12.1, and start the solution with a decimal points, so:

$$\begin{array}{r} 12.10 \\ -\ 5.98 \\ \hline \quad . \end{array}$$

Now, subtract as if the decimal point was not there.

$$\begin{array}{r} 12.10 \\ -\ 5.98 \\ \hline \quad 6.12 \end{array}$$

## FURTHER EXAMPLES

Let's add the numbers: 589.123, 30.8, 9.04, and 0.2

$$\begin{array}{r} 589.123 \\ 30.800 \\ 9.040 \\ +\ 0.200 \\ \hline 629.163 \end{array}$$

Now let's take 5.9 from 16:

Notice that 16 does not have a decimal point? As 16 doesn't have any decimal places we don't need to write in the decimal point. However, we can still put it there and add zeros in the decimal places, just as we did before. So:

$$\begin{array}{r} 16.0 \\ -\ 5.9 \\ \hline \quad 10.1 \end{array}$$

Now here are some for you to try. You can check your results with the solutions at the end of this resource.

### EXERCISES

1. Add the following sets of numbers
   a. 0.1, 15.23, and 7.6

   b. 123.456, 7.89, and 0.01

2. Subtract the smaller number from the larger number
    a. 15.2 and 2.15

    b. 3.08 and 0.456

*If you need help with any of the maths covered in this resource (or any other maths topic), you can make an appointment with Learning Development through reception: phone (02) 4221 3977, or Level 2 (top floor), Building 11, or through your campus.*

## SOLUTIONS TO EXERCISES

1. a. Add 0.1, 15.23, and 7.6

$$\begin{array}{r} 0.10 \\ 15.23 \\ +\ 7.60 \\ \hline 22.93 \end{array}$$

b. Add 123.456, 7.89, and 0.01

$$\begin{array}{r} 123.456 \\ 78.900 \\ +\ 0.010 \\ \hline 202.366 \end{array}$$

2. a. Subtract 2.15 from 15.2

$$\begin{array}{r} 15.20 \\ -\ 2.15 \\ \hline 13.05 \end{array}$$

b. Subtract 0.456 from 3.08

$$\begin{array}{r} 3.080 \\ -\ 0.456 \\ \hline 2.624 \end{array}$$