Currency, Conversions, Rates

1. Changing From One to the Other

MONEY! FINANCES! $ £ € ¥…

We want to be able to calculate how much we are going to get for our Australian dollars (AUD) when we go overseas, and how much we are going to get for the "foreign currency" (whatever it may be) when we return. Hence, the need for *conversions*.

Let's say we are going to New Zealand. We have $100 (AUD) to spend. How much is that in New Zealand currency (NZD)? There are many conversion sites on the internet but we are determined to calculate this by ourselves! What we do need from the internet, though, is the *conversion rate*. (Sometimes we will know a conversion rate, for example later we will talk about measurement where we will know some of the appropriate conversion rates). With money, however, we can't know the rate because the rates change all the time depending on the financial markets.

At the time of writing, 1 AUD is worth 1.10577 NZD[*]. Right, we know what we need to know! Now, we just have to work it out. If 1 AUD is worth 1.10577 NZD, then 2 AUD will be worth 2×1.10577 NZD and 3 AUD will be worth 3×1.10577 NZD and so on.

In fact, to convert any amount of AUD to NZD, we multiply the number of AUD by the conversion rate (1.10577) to find the equivalent NZD. 100 AUD is therefore (today) worth 100×1.10577 NZD, and so it is worth 110.577 NZD. However, we cannot receive this exact amount in cash since it involves a fraction of a cent. In fact, we have to round to the nearest 10 cents because New Zealand does not have 1, 2, or 5 cent coins. Therefore we would actually receive 110.60 New Zealand Dollars for our $100 Australian.

Suppose we now wish to change $355.60 (AUD) to New Zealand dollars. We would need to multiply 355.60 by 1.10577 and would certainly have to use a calculator (then round to the nearest 10c).

$$355.60 \times 1.10577 = 393.211812$$

This would be rounded to 393.20, so we would get $393.20 NZD for our $355.60 AUD.

By using a table we can make this look nicer, and possibly easier to follow:

AUD	Calculation	NZD
1		1.10577(≈ 1.10)
2	2×1.10577	2.21154 (≈ 2.20)
3	3×1.10577	3.31731 (≈ 3.30)
…	…	…
100	100×1.10577	110.577 (≈ 110.60)
…	…	…
355.60	355.60×1.10577	393.211812 (≈ 393.20)

(≈ means is approximately equal to)

[*] All currency conversion rates were sourced on 12/09/2017 from the website: http://www.xe.com/currencyconverter/convert/?Amount=1&From=AUD&To=NZD

As long as we know what 1 unit is worth, we can change any amount.

But what if we want to come back to Australia from New Zealand? We would like to change our NZD back to our familiar AUD. We brought back 53.70 NZD. How much should we get in AUD?

This time we do NOT know the conversion rate because we only know it going from AUD to NZD, not vice versa.

So, we know

AUD	NZD
1	1.10577

We need to know

AUD	NZD
???	1

If you look at the two tables, you can see that to get from 1.10577 to 1 in the NZD column, we would divide by 1.10577. To retain the equivalence for the AUD, we do the same – that is we divide 1 AUD by 1.10577 to get what goes in the ??? slot:

AUD	Calculation	NZD
1		1.10577
0.904347197	1 ÷ 1.10577	1 (= 1.10577 ÷ 1.10577)

$1 \div 1.10577 = 0.904347197$, which becomes our new *conversion rate*. So, \$53.70 NZD is worth 53.70×0.904347197 AUD, which means we would get \$48.55 AUD (rounded to the nearest five cents) for our \$53.70 NZD. This will be clearer in a new table, with the NZD first this time, and with the new conversion rate.

NZD	Calculation	AUD
1		0.904347197
53.70	53.7×0.904347197	48.56344448 (≈ 48.55)

If you know a conversion rate, then you can multiply the quantity you need to change by the conversion rate to get to the new currency. If you want to come backwards from the currency, divide 1 by the conversion rate, then multiply that new figure by the amount you want to change.

An alternate method to converting back to AUD is: instead of finding the new conversion rate by dividing 1 by the conversion rate, immediately divide your amount by the AUD to NZD conversion rate. E.g. $53.7 \div 1.10577 = 48.56344448$. You can choose whatever method you prefer.

More examples

Today, 1 AUD is worth 0.800805 USD. How many US Dollars would we receive for \$248.25 AUD?

We are given the conversion rate of 0.800805. So, we multiply 248.25 by 0.800805 and get \$198.80 USD (rounded to two decimal places).

At today's rate, how many AUD would we receive for \$350 USD?

Here, we need to work out the conversion rate, so $1 \div 0.800805$ gives 1.248743452, which becomes our NEW conversion rate (our "vice versa" one). So, \$350 USD $= 350 \times 1.248743452 =$ \$437.05 AUD (rounded to the nearest five cents).

EXERCISES

Using 1 AUD is worth 0.669769 EUR (Euros, €) and 0.607890 GBP (British Pounds, £), calculate what you would receive for the following conversions:

1. You want to convert \$1200 AUD to EUR

2. Convert \$350 AUD to GBP

3. Convert £89.50 GBP to AUD

4. Change 520 EUR to AUD

Answers to these problems are at the end of the resource.

MEASUREMENT

There are quite a few different types of conversions between measurements. One that we don't need so much these days but was very important in Australia a few years ago (when the metric system was introduced) is to convert between one system of measurement and another. For example, you might find your grandmother's recipe book which contains measurements such as ounces and pounds (*imperial*) – but your scales are in grams and kilograms (*metric*).

Another kind of conversion is to express measurements in the metric system as different units within that system. You might need to convert millimetres to metres, or grams to kilograms because your measuring device is not in the right units for what you want.

A further kind of conversion concerns how the units, particularly in the metric system, are equivalent, so that length, mass (weight) and volume (capacity) can all be linked together. This is really helpful especially for calculating water usage.

We also need to convert between Fahrenheit (°F) and Celsius (°C) temperatures as some countries still use the Fahrenheit scale. This uses a different conversion method.

Let's start with converting between systems. This is very similar to converting currencies (see the "money" section above). If we know the conversion factor, the method is very simple. The problem is to know all the conversion factors, but this is where the internet is very useful!

Grandma's recipe calls for 8 ounces of mixed fruit. We need to convert this to grams. First, look for the conversion rate: 1 ounce = 28.3495 grams[†]. So 8 ounces would be $8 \times 28.3495 \approx 226.796$ g. Your scales are probably not that accurate so you would round this to 227 g, or even 225 or 230 g, depending on taste (or the amount of fruit you have available).

Ounces	Calculation	Grams
1		28.3495
8	8×28.3495	226.796 (≈ 227)

[†] Source: http://www.metric-conversions.org/weight/ounces-to-grams.htm on 12/09/17

Another example: You may have been sewing for quite a long time, using a machine that has markings in inches, such as $5/8$" for a seam allowance. Now you've bought a new machine and need to work out what the seam allowance is in centimetres. (This calculation looks a bit tricky because it has fractions in it, but we can cope with that!)

Firstly, what is the conversion rate? $1" = 2.54$ cm. So, we multiply $\frac{5}{8}$ by 2.54. If your calculator has fraction keys, this is not a problem; however, if it doesn't, multiply 2.54 by 5 and divide the result by 8. Whichever way you calculate you should get 1.5875. When sewing we would generally round this down to 1.5 cm (a little easier to work with than 1.6 cm).

Here's one for you to try: A small seam allowance is $1/4$". Convert this to cm.

Answer: 0.635 cm (usually given as 0.6 cm in sewing)

Another example: You've been watching the cricket and know that the length of the pitch is 22 yards (or 1 chain) but wonder what this is in metres! Conversion factor: 1 yard $= 0.9144$ m. So, what is the length of the pitch?

Answer: 20.1168 m (roughly 20 m)

Here are some more for you to try. You will need the following information:

1 inch = 2.54 cm 1 kg = 2.2 pounds 1 mile = 1.6 km 1 L = 0.22 gallons (UK)

EXERCISES

Convert each of the following. You can check your answers at the end of the resource.

5. 5.7 inches to cm

6. 78 kg to pounds

7. 20 miles to km

8. 30 L to gallons (UK)

9. 10 cm to inches

10. 150 pounds to kg

11. 25 km to miles

12. 50 gallons (UK) to L

CONVERTING WITHIN THE METRIC SYSTEM

In the metric system we use a number of prefixes to easily talk about measurements at different scales. The table below highlights the main prefixes:

Name	mega	kilo	hecto	deca	-	deci	centi	milli	micro
Symbol	M	k	h	da	-	d	c	m	μ‡
Factor	1000000	1000	100	10	1	0.1	0.01	0.001	0.000001

You might notice that in the metric system each prefix stands for a power of 10. For example, a kilometre is 1000 metres, because the prefix kilo always means $1000 = 10^3$. In the same way, a centigram is 0.01 grams because centi always means 0.01 (or $\frac{1}{100} = 10^{-2}$). This is the way that we can know the conversion factors.

There are many different ways of calculating when we need to convert between metric measurements. For example, we know that there are 10 millimetres in 1 centimetre. So, there must be 2×10 millimetres in 2 centimetres. Our conversion factor is 10. Except for the mega and micro columns, the conversion factor between two columns is 10 and if we go between two of those columns, the conversion factor must be $100 = 10 \times 10$. Be careful with using micro and mega, which have a conversion factor of 1000 to their neighbouring column.

As an alternative to counting columns you can remember to multiply by the factor you currently are and divide by the factor you want to convert to. That is to convert 312.4 decametres to megametres, we multiply by 10 ($312.4 \times 10 = 3124$) and divide by 1000000 ($3124 \div 1000000 = 0.003124$). So 312.4 decametres is the same as 0.003124 megametres.

Example:

Litre (L)	Calculation	Millilitre (mL)
1		1000
5.7	5.7×1000	5700

This works for converting large measures to smaller ones, but how about going back the other way! You can work out the new conversion factor by dividing 1 by the old conversion factor (in this case, if we want to convert millilitres to litres, the new conversion factor would be $1 \div 1000 = 0.001$) then multiplying the amount we wish to change. This is actually the same as just dividing the amount we wish to change by the old conversion factor.

Example: Change 495 millilitres to litres.

There are three columns from millilitres to litres, so the conversion factor, going from left to right would be 1000. We need to go right to left, so we either multiply by $1 \div 1000$, or we divide by 1000, which gives the same result. You need to choose which way works best for you!

Changing 495 millilitres to litres:

$$\begin{aligned} 495 \text{ mL} &= 495 \times 0.001 \text{ L} \\ &= 0.495 \text{ L} \end{aligned}$$

Or:

$$\begin{aligned} 495 \text{ mL} &= 495 \div 1000 \text{ L} \\ &= 0.495 \text{ L} \end{aligned}$$

Check your answer by asking yourself if it makes sense.

Example: Change 5000 km to m.

The first thing to ask is: should we get more or less than 5000 for our answer?

‡ The symbol μ is the Greek letter pronounced *mu*

$$5000 \text{ km} = 5000 \times 1000 \text{ m}$$
$$= 5000000 \text{ m}$$

This does make sense because there are already 1000 metres in 1 kilometre so there are going to be many more than that in 5000 km! (You can also make the numbers simpler – for example, how would you calculate the number of metres in 2 kilometres?)

Example: Change 65 320 kg to Mg.

This time we will get a smaller answer. This is where you either multiply by $1 \div 1000$, or you just divide by 1000. Whichever way you calculate, you should end up with 65.32 Mg.

Here are some for you to try. You can check your answers at the back.

EXERCISES

13. Change 5.3 m to cm

14. Change 6.82 kg to g

15. Change 180 mm to cm

16. Change 9567 mg to g

17. Change 3.5 L to mL

18. Change 1483 g to kg

19. Change 18000 kL to ML

20. Change 9 ML to L

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. Convert $1200 AUD to EUR

We know 1 AUD = 0.669769 EUR, so

$$1200 \text{ AUD} = 1200 \times 0.669769 \text{ EUR}$$
$$= 803.72 \text{ EUR}$$

2. Convert $350 AUD to GBP

1 AUD = 0.607890 GBP, so

$$350 \text{ AUD} = 350 \times 0.60789 \text{ GBP}$$
$$= 212.76 \text{ GBP}$$

3. Convert £89.50 GBP to AUD

1 AUD = 0.607890 GBP, which means that:

$$1 \text{ GBP} = 1 \div 0.60789 \text{ AUD}$$
$$= 1.645034463 \text{ AUD}$$

is our new conversion rate. So,

$$89.50 \text{ GBP} = 89.50 \times 1.645034463 \text{ AUD}$$
$$= 147.23 \text{ AUD}$$

4. Convert 520 EUR to AUD

1 AUD = 0.669769 EUR, so

$$1 \text{ EUR} = 1 \div 0.669769 \text{ AUD}$$
$$= 1.493052082 \text{ AUD}$$

is our new conversion rate. So,

$$520 \text{ EUR} = 520 \times 1.493052082 \text{ AUD}$$
$$= 776.39 \text{ AUD}$$

5. 5.7 inches to cm

1 inch = 2.54 cm, so

$$5.7 \text{ inches} = 5.7 \times 2.54 \text{ cm}$$
$$= 14.478 \text{ cm}$$

6. 78 kg to pounds

1 kg = 2.2 pounds, so

$$78 \text{ kg} = 78 \times 2.2 \text{ pounds}$$
$$= 171.6 \text{ pounds}$$

7. 20 miles to km

1 mile = 1.6 km, so

$$20 \text{ miles} = 20 \times 1.6 \text{ km}$$
$$= 32 \text{ km}$$

8. 30 L to gallons (UK)

1 L = 0.22 gallons (UK), so

$$30 \text{ L} = 30 \times 0.22 \text{ gallons (UK)}$$
$$= 6.6 \text{ gallons (UK)}$$

9. 10 cm to inches

1 inch = 2.54 cm, so

10. 150 pounds to kg

1 kg = 2.2 pounds, so

1 cm = 1 ÷ 2.54 inches

= 0.3937 inches

And

10 cm = 10 × 0.3937 inches

= 3.937 inches

1 pound = 1 ÷ 2.2 kg

= 0.45 kg

And

150 pounds = 150 × 0.45 kg

= 68.18 kg

11. 25 km to miles

1 mile = 1.6 km, so

1 km = 1 ÷ 1.6 miles

= 0.625 miles

And

25 km = 25 × 0.625 miles

= 15.625 miles

12. 50 gallons (UK) to L

1 L = 0.22 gallons (UK), so

1 gallon = 1 ÷ 0.22 L

= 4.55 L

And

50 gallon = 50 × 4.55 L

= 227.27 L

13. Change 5.3 m to cm

5.3 m = 5.3 × 1 ÷ 0.01 cm

= 530 cm

14. Change 6.82 kg to g

6.82 kg = 6.82 × 1000 ÷ 1 g

= 6820 g

15. Change 180 mm to cm

180 mm = 180 × 0.001 ÷ 0.01 cm

= 18 cm

16. Change 9567 mg to g

9567 mg = 9567 × 0.001 ÷ 1 g

= 9.567 g

17. Change 3.5 L to mL

3.5 L = 3.5 × 1 ÷ 0.001 mL

= 3500 mL

18. Change 1483 g to kg

1483 g = 1483 × 1 ÷ 1000 kg

= 1.483 kg

19. Change 18000 kL to ML

18000 kL = 18000 × 1000 ÷ 1000000 ML

= 18 ML

20. Change 9 ML to L

9 ML = 9 × 1000000 ÷ 1 L

= 9000000 L