



Nursing: Metric conversions

It is necessary to ensure that units of measurement are consistent when carrying out medication calculations. This may require the conversion of units.

This worksheet will teach you to understand power of ten, multiply and divide decimals by powers of ten, and convert smaller and larger units.

Powers of ten

Powers of 10 such as 10, 100, and 1 000 are special numbers in our number system. Short cuts can be taken when we are multiplying or dividing these powers of 10.


Multiplying decimals by powers of ten

Rule: to multiply, move the decimal point to the *right* the same number of places as the number of noughts in the power of ten. (You may need to add some spare noughts at the *end* of the decimal to have the places to move to.)

Examples:

a) 3.2×10


Multiply by 10: move the decimal point one place to the right.

$$3 \bullet 2 \bullet = 32$$


= 32

b) 0.585×10

Multiply by 10: move the decimal point one place to the right.

$$0 \bullet 5 \bullet 8 \bullet 5 = 5.85$$


= 5.85

c) $3.721 \times 1\,000$

Multiply by 1 000: move the decimal point three places to the right.

$$3 \bullet 7 \bullet 2 \bullet 1 \bullet = 3721$$


= 3 721

d) $2.3 \times 1\,000$

Multiply by 1 000: move the decimal point three places to the right. Write the number with three numbers after the decimal point (2.300).

$$2 \bullet 3 \bullet 0 \bullet 0 \bullet = 2300$$


= 2 300

e) $0.02 \times 1\,000$

(Write as 0.020)

Multiply by 1 000: move the decimal point three places to the right.

0.020 = 20

= 20

Dividing by powers of ten

Rule: to divide, move the decimal point to the left the same number of places as the number of noughts in the power of ten. (You may need to add some spare noughts at the front of the number to have the places to move to.)

Examples:

a) $900.3 \div 10$

Divide by 10: move the decimal point one place to the left.

90.3 = 90.3

= 90.3

b) $852 \div 1\,000$ (the decimal point sits after the 2)

Divide by 1 000: move the decimal point three places to the left.

0.852 = 0.852

= 0.852

c) $56.04 \div 1\,000$

(Write as 056.04)

Divide by 1 000: move the decimal point three places to the left.

0.05604 = 0.05604

= 0.05604

Using these rules to convert measurements

The most commonly used units of measurement in nursing are the following:

Mass: kilogram, gram, milligram and microgram

Liquid volume: litre and millilitre

Length: centimetre

The following conversions may be useful:

1 kilogram (kg)	=	1 000 grams (g)
1 gram (g)	=	1 000 milligrams (mg)
1 milligram (mg)	=	1 000 micrograms (mcg or μg)
1 litre (L)	=	1 000 millilitres (mL)

Rule: to convert from one unit to another, either divide by 1 000 or multiply by 1 000.

Converting to a smaller unit of measurement

As seen in the table above, 1 000 of each of the smaller units equates to the larger unit. For instance, 1 g is equivalent to 1 000 mg. To convert to a smaller unit you need more of them – so multiply.

Examples:

a) 5.2 g to mg

$$5.2 \times 1\,000 = 5.200 \times 1\,000 = 5\,200$$

Answer: 5 200 mg

b) 0.2 L to mL

$$0.2 \times 1\,000 = 0.200 \times 1\,000 = 200$$

Answer: 200 mL

c) 0.087 mg to mcg

$$0.087 \times 1\,000 = 87$$

Answer: 87 mcg

d) 15.3 kg to g

$$15.3 \times 1\,000 = 15.300 \times 1\,000 = 15\,300$$

Answer: 15 300 g

e) 8g to mg

$$8 \times 1\,000 = 8.000 \times 1\,000 = 8\,000$$

Answer: 8 000 mg

Working with medications

Rule: when doing drug calculations, make sure that the units of measurement are the same before you start.

Example

A patient is ordered 0.25 of digoxin. The digoxin available in tablets containing 125 micrograms. How many tablets are required?

The two measurements used here are in different units – milligrams and micrograms.

Convert 0.25 mg to micrograms:

$$0.25 \times 1\,000 = 0.250 \times 1\,000 = 250.0 = 250 \text{ micrograms}$$

Each tablet contains 125 micrograms. We want 250 micrograms so the patient requires 2 tablets.

Note: Where possible, convert to the smaller unit as this will give you the whole numbers to work with rather than decimal numbers.

Exercises

Set 1:

1. 2.5×10
2. 13.8×10
3. 6.524×10
4. 6.4×100
5. 7.026×100
6. 0.12×100
7. 56.1×100
8. $0.1234 \times 1\,000$
9. $2.256 \times 1\,000$
10. $3.61 \times 1\,000$

Set 2:

1. $3.2 \div 10$
2. $0.3 \div 10$
3. $103 \div 10$
4. $213.3 \div 100$
5. $82.5 \div 100$
6. $0.4 \div 100$
7. $800 \div 1\,000$
8. $2\,586 \div 1000$
9. $200.3 \div 1\,000$
10. $60.52 \div 1\,000$

Set 3: convert the measurement to the unit specified

1. 5 000 mg to g
2. 852 micrograms to mg
3. 2.35 kg to g
4. 0.47 mg to mcg
5. 600 mL to L
6. 200 mg to g
7. 703 mcg to mg
8. 32 mg to mcg
9. 1.7 L to mL
10. 0.05 mg to mcg
11. 12 345 mL to L
12. 6.587 g to mg
13. 0.045 L to mL
14. 92 mcg to mg

Solutions are on the next page

Solutions

Set 1:

- | | | | | |
|-------|----------|----------|----------|-----------|
| 1. 25 | 2. 138 | 3. 65.24 | 4. 640 | 5. 702.6 |
| 6. 12 | 7. 5 610 | 8. 123.4 | 9. 2 256 | 10. 3 610 |

Set 2:

- | | | | | |
|----------|---------|----------|-----------|-----------|
| 1. 0.32 | 2. 0.03 | 3. 10.3 | 4. 2.133 | 5. 0.825 |
| 6. 0.004 | 7. 0.8 | 8. 2.586 | 9. 0.2006 | 10. 3 610 |

Set 3:

- | | | | | |
|--------------|--------------|---------------|--------------|------------|
| 1. 5 g | 2. 0.852 mg | 3. 2 350 g | 4. 470 mcg | 5. 0.6 L |
| 6. 0.2 g | 7. 0.703 mg | 8. 32 000 mcg | 9. 1 700 mL | 10. 50 mcg |
| 11. 12.345 L | 12. 6 587 mg | 13. 45 mL | 14. 0.092 mg | |

For more information

Visit our [intro to maths](#) page on the Charles Sturt Student Portal where you can access more mathematics and numeracy resources, find and register for our Enhancing Numeracy workshops or make a 1:1 appointment with our numeracy advisers.

References

The following resource will provide you with further useful information on this topic:

Gatford, J. D., & Phillips, N. (2011). *Nursing calculations* (8th ed.). Churchill.