

Putting Numbers into Formulae

Prior Knowledge:

Before attempting this sheet, students should be confident in using BIDMAS and solving equations.

Sometimes, you might be given a **formula** and asked to work out its **value** when you put in certain numbers. Remember, a **formula** is a rule that helps you work something out. It will also have an = sign in it.

There are some steps that you can follow which will help you with these types of questions.

1. Write out the **formula**.
2. Write it again, directly underneath, but this time **substitute** the letters in the **formula** for the **numbers** you have been given.
3. Work it out in stages – you must remember the rules of **BIDMAS** (brackets, indices, division, multiplication, addition, subtraction). **Write down** values for each bit as you go along.

Example 1

The formula for converting from Celsius (C) to Fahrenheit (F) is $F = \frac{9}{5}C + 32$

Use this formula to convert -8°C into Fahrenheit ($^{\circ}\text{F}$).

1. Write out the formula: $F = \frac{9}{5}C + 32$
2. Write it again but this time substitute the C for the number you have been given (-8):

$$F = \frac{9}{5} \times -8 + 32$$

3. Work it out in stages:

$$F = -14.4 + 32$$

$$F = 17.6$$

$$\text{so } -8^{\circ}\text{C} = 17.6^{\circ}\text{F}$$

Sometimes, you may come across a question where you need to rearrange the formula to find the answer.

Example 2

The formula for converting from Celsius (C) to Fahrenheit (F) is $F = \frac{9}{5}C + 32$

Use this formula to convert 86°F into Celsius ($^{\circ}\text{C}$).

Begin by following the same first step as before:

1. $F = \frac{9}{5}C + 32$
2. $86 = \frac{9}{5}C + 32$

Note how, this time, the **F** has been **substituted** for 86 and the **C** has remained unchanged.

3. Now, you will need to rearrange this formula to find your answer.

Start by subtracting 32 from both sides:

$$\bullet \quad 54 = \frac{9}{5}C$$

- Divide 54 by $\frac{9}{5}$ to find the value of C.
 $30 = C$

$$C = 30$$

$$\text{so } 86^{\circ}\text{F} = 30^{\circ}\text{C}$$



Your Turn

1. In a restaurant, there are four chairs (c) for every table (t).

The formula can be written as $c = 4 \times t$.

Use this formula to work out the number of chairs needed for the following number of tables:

a. 6

b. 10

c. 12

d. 20

e. 17

f. 101

2. The formula that converts centimetres (cm) to millimetres (mm) is $\text{mm} = 10 \times \text{cm}$. Use this formula to convert the following measurements:

a. 5cm into mm.

b. 10cm into mm.

c. 10mm into cm.

d. 4.2cm into mm.

e. 8.6mm into cm.

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3. The cost (c) in pounds of hiring a bike is given by $c = 12d + 10$, where d is the number of days the bike is hired.

Calculate the total cost (c) of hiring the bike for 3 days.

4. The cost of hiring a car for a number of days is calculated using the formula:

Hire Cost = $28 \times \text{Number of Days} + 60$

a. Calculate the cost of hiring a car for 3 days.

b. Calculate the cost of hiring a car for 7 days.

c. Calculate the cost of hiring a car for 48 hours.

d. The hire cost is £200; how many days was the car hired for?

e. The hire cost is £452; how many days was the car hired for?



5. The cost of photocopying is given as:

Cost in pence (p) = $(2 \times \text{number of black and white copies}) + (20 \times \text{number of colour copies})$

- a. If Arabella orders 30 black and white copies and 8 colour copies, work out the total cost in pence.

- b. Tom orders 400 black and white copies and some colour copies. The total cost is 1100 pence. Work out the number of colour copies that Tom ordered.

Challenge

The formula for converting from Celsius (C) to Fahrenheit (F) is $F = \frac{9}{5}C + 32$.

Find the temperature at which Fahrenheit and Celsius have the same value.

Hint: Let F and C = x
