MATHEMATICS STANDARD · YEAR 11

Substituting into formulas

IN THIS BOOKLET

NAME _____ DATE _____

MATHEMATICS STANDARD 11

Substituting into formulas

Name _____ Date _____

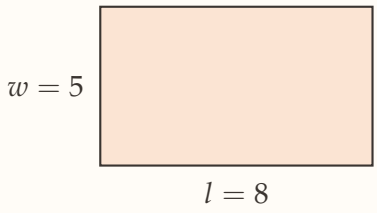
1 Substituting into a formula

Replace each pronumeral with the value you are given, then evaluate.

> Substitute first, then evaluate in order:
> brackets, indices, $\times$ and $\div$, $+$ and $-$

EXAMPLE

The perimeter of a rectangle is $P = 2(l + w)$. Find P when $l = 8$ and $w = 5$.



PRACTICE

1. $C = 2\pi r$. Find C when $r = 7$ (1 d.p.). The substitution is started for you.

$$C = 2 \times \pi \times \_\_\_\_\_ = \_\_\_\_\_$$

2. $F = 1.8C + 32$ converts degrees Celsius to degrees Fahrenheit. Complete the table.

C	F
0	_____
25	_____
100	_____

3. $y = 3x^2 - 2$. Find y when $x = 4$.

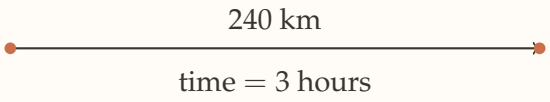
Write a formula of your own, choose a value to substitute, and work out the answer. Then give the formula and the value to someone else and see whether you agree.

2 Speed, distance and time

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

EXAMPLE

A car travels 240 km in 3 hours. Find its average speed.



PRACTICE

1. A cyclist rides 45 km in 1.5 hours. Find the average speed.

$$\text{speed} = \frac{\square}{\square} = \underline{\qquad\qquad}$$

2. The same formula, rearranged. In each row, one value is missing. Fill it in.

Distance	Time	Speed
120 km	2 h	_____
90 km	_____	60 km/h
_____	3 h	80 km/h

3. A bus travels at 60 km/h for 40 minutes. How far does it go?

> *Make up a speed question whose answer is exactly 20 km/h. Can you find more than one?*

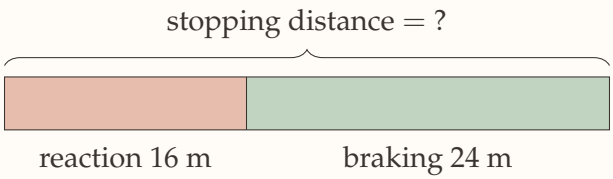
Stopping distance

After a driver reacts, the car keeps moving before the brakes take effect.

$$\text{stopping distance} = \text{reaction distance} + \text{braking distance}$$

EXAMPLE

A driver has a reaction distance of 16 m and a braking distance of 24 m. Find the stopping distance.



PRACTICE

1. At 100 km/h, a car's reaction distance is 28 m and braking distance is 42 m. Find the stopping distance.

3 Blood Alcohol Content (BAC)

BAC estimates the concentration of alcohol in a person's blood. It uses the number of standard drinks N, the hours spent drinking H, and body mass M in kilograms.

$$\text{BAC}_{\text{male}} = \frac{10N - 7.5H}{6.8M} \qquad \text{BAC}_{\text{female}} = \frac{10N - 7.5H}{5.5M}$$

EXAMPLE

A man with mass 80 kg has 5 standard drinks over 3 hours. Find his BAC (3 d.p.).

Time to reach zero BAC

$$\text{Time (hours)} = \frac{\text{BAC}}{0.015}$$

EXAMPLE

Using the BAC from the example above, find the time for him to reach zero BAC.

PRACTICE

1. A man with mass 70 kg has 3 standard drinks over 2 hours. Find his BAC (3 d.p.).

$$\text{BAC} = \frac{10 \times \square - 7.5 \times \square}{6.8 \times \square} = \underline{\qquad\qquad}$$

2. Find the time for the man in Q1 to reach zero BAC (1 d.p.).

3. A woman with mass 55 kg has 2 standard drinks over 1 hour. Find her BAC (3 d.p.). Is she under 0.05?

These formulas give an estimate only. Actual BAC also depends on food, hydration, metabolism and medication, so a calculated figure is never a guarantee that it is safe to drive.

> *Choose a mass. How many standard drinks over how many hours would keep that person under* 0.05*? Find a combination that works and one that does not.*

4 Medication dosages

Children's doses are worked out from the adult dose. Choose the formula that matches what you are given.

Fried's (1–2 yrs)	$\text{Dose} = \dfrac{\text{age in months} \times \text{adult dose}}{150}$
Young's (1–12 yrs)	$\text{Dose} = \dfrac{\text{age in years} \times \text{adult dose}}{\text{age in years} + 12}$
Clark's (by weight)	$\text{Dose} = \dfrac{\text{weight in kg} \times \text{adult dose}}{70}$

EXAMPLE

The adult dose is 400 mg. Use **Young's formula** to find the dose for an 8-year-old.

PRACTICE

1. Adult dose 300 mg. Use **Fried's formula** for an 18-month-old.

$$\text{Dose} = \frac{\square \times \square}{150} = \underline{\qquad\qquad}$$

2. Adult dose 250 mg. Use **Young's formula** for a 4-year-old.

3. Adult dose 600 mg. Use **Clark's formula** for a child weighing 35 kg.

*Describe a child that **Clark's formula** can give a dose for but **Young's formula** cannot. What information would you need in each case?*

5 Mixed practice

These are deliberately out of order. Choosing the right formula is part of the skill.

PRACTICE

1. $A = \frac{1}{2}bh$. Find A when $b = 12$ and $h = 5$.

2. A runner covers 8 km in 40 minutes. Find the speed in km/h.

3. Adult dose 480 mg. Find the dose for a 6-year-old using Young's formula.

4. A man with mass 90 kg has 6 standard drinks over 4 hours. Find his BAC (3 d.p.). Is he over 0.05?

Write one question of your own for each formula in this booklet. Swap with someone else and mark each other's work.