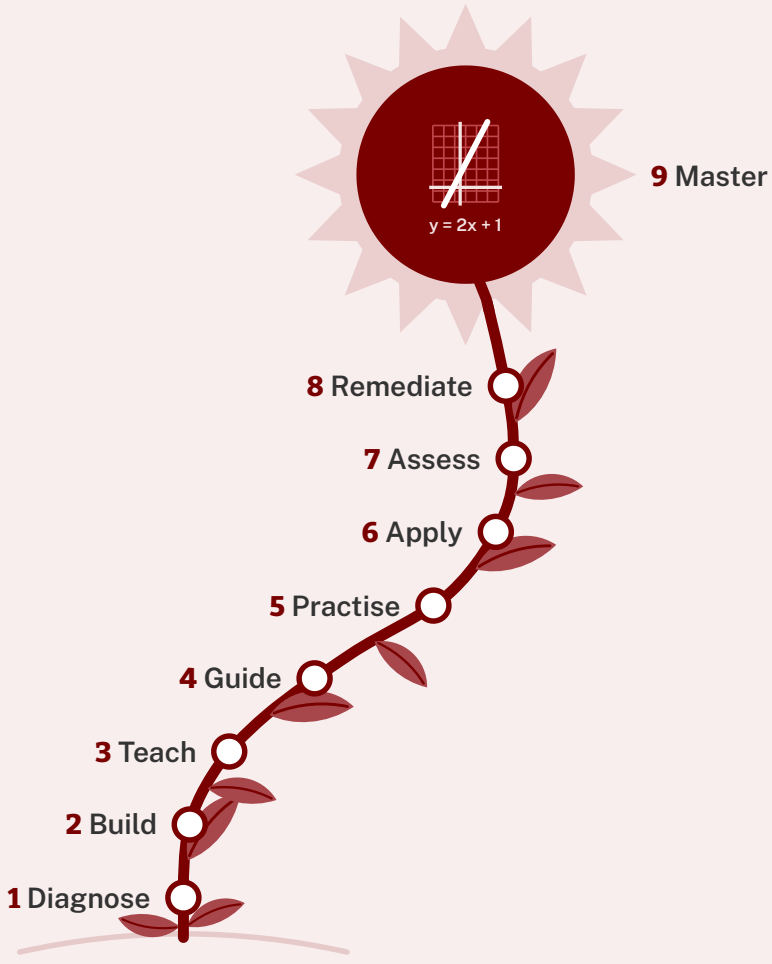
GRADES 10–12

Functions and graphs

MATHEMATICS PROGRESSION WORKBOOK



THIS BOOK BELONGS TO

Name _____

Class _____

School _____

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START HERE

How to use this book

Start with the **Diagnose** check to find your starting point. Type equations with x, for example 2x^2-8 or 3/(x-1)+2.

Before you start

I can substitute into a formula, solve linear and quadratic equations, and find a gradient. If not, ask for another example first.

In this book

1. Function notation and straight lines
2. The parabola $y = ax^2 + q$
3. The hyperbola $y = a/x + q$
4. The exponential graph $y = ab^x + q$
5. The parabola $y = a(x + p)^2 + q$
6. The parabola $y = ax^2 + bx + c$
7. Shifted hyperbolas and exponential graphs
8. Finding equations from graphs
9. Interpreting two graphs together

Every concept follows the same nine steps

1 **Diagnose** Find your starting point	2 **Build** Practise the skills you need first	3 **Teach** Learn the idea, with a worked example
4 **Guide** Try one with help	5 **Practise** Work on your own	6 **Apply** Use it in a real situation
7 **Assess** Check yourself without looking back	8 **Remediate** Find and fix a mistake	9 **Master** Show you have mastered it

Tips

- Write your working in the book. Every step counts, not only the answer.
- Check your answers at the back only after you have tried. Each answer starts with the rule, then shows every step.
- Stuck? Read the worked example again, then try the next question.
- Parents and tutors: the **Tutor tip** on each concept gives a hands-on way to help.

STEP 1

Diagnose

Try these without help. Mark them with the answers at the back. The first question you get wrong is your starting point.

1 Find the x- and y-intercepts of $f(x) = -2x + 6$.

WORKING

x-intercept _____

y-intercept _____

2 For $y = 2x^2 - 8$, find the turning point and the x-intercepts.

WORKING

Turning point x _____

Turning point y _____

Larger x-intercept _____

Smaller x-intercept _____

3 Write down the asymptotes of $y = \frac{6}{x} + 1$.

WORKING

Vertical asymptote x = _____

Horizontal asymptote y = _____

CONCEPT 1 · GRADE 10

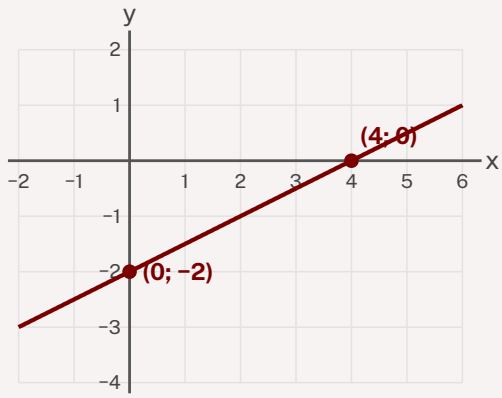
1 Function notation and straight lines

Learning goal

I can use f(x) notation and work with straight-line graphs.

3 Teach

f(x) is the output for input x: if f(x) = 3x − 6, then f(4) = 6. A straight line is y = mx + c, where m is the **gradient** (change in y ÷ change in x) and c is the **y-intercept**. For the x-intercept, set y = 0. Parallel lines have equal gradients.



f(x) = $\frac{1}{2}$x − 2: gradient $\frac{1}{2}$, y-intercept −2, x-intercept 4.

Worked example

Find the equation of the line through (1; 3) and (3; 7).

1. m = $\frac{7-3}{3-1}$ = 2.
2. Substitute (1; 3) in y = 2x + c: 3 = 2 + c, c = 1.
3. y = 2x + 1.

Watch out

Subtract the coordinates in the same order: $\frac{y_2-y_1}{x_2-x_1}$.

Tutor tip

Ask the learner to plot two points and count the rise and run on grid paper.

4 Guide

18 f(x) = 3x − 6. Find f(4). Replace x with 4.

WORKING

f(4) _____

5 Practise

Work on your own.

19 Find the x-intercept of y = 3x − 6.

WORKING

x-intercept _____

20 Find the gradient of the line through (−1; 4) and (3; −4).

WORKING

Gradient _____

21 Find the equation of the line with gradient 4 through (1; 1).

WORKING

y = _____

22 Find the equation of the line through (2; 1) and (5; 7).

WORKING

y = _____

23 f(x) = −x + 5. For which x is f(x) = 8?

WORKING

x _____

24 Which line is parallel to y = 3x + 1? Circle one.

Circle one

(A) y = 3x − 4 (B) y = −3x + 1 (C) $y = \frac{1}{3}x$

25 True or false: “y = −2x + 4 slopes upwards from left to right.” Give a reason.

Circle one

(A) True (B) False

Your reason

_____

_____

_____

6 Apply

26 A plumber charges R250 to come out plus R180 per hour: C(h) = 180h + 250. Find C(3).

WORKING

C(3) (R) _____