WHAT IS GRADIENT? (y = mx)

BUILDING BLOCKS

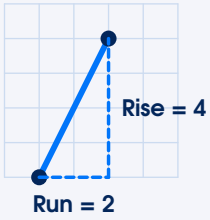
NAME _____ CLASS _____ DATE _____

KEY IDEA

The gradient tells you how steep a line is.

$$\text{Gradient} = \frac{\text{Rise}}{\text{Run}}$$

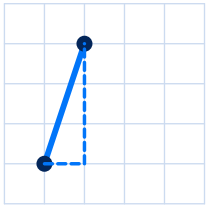
Here: $\frac{4}{2} = 2$



Rise = how many squares UP.
Run = how many squares ACROSS.

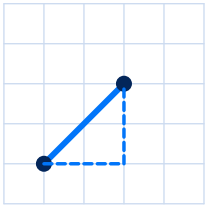
1 Count the Run (across) and the Rise (up) for each line.

a)



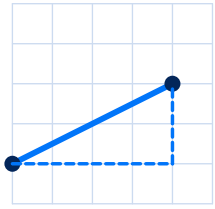
Run ☐ Rise ☐

b)



Run ☐ Rise ☐

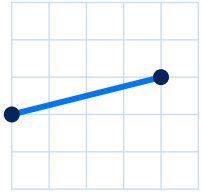
c)



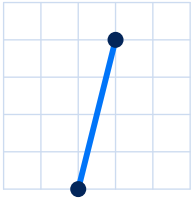
Run ☐ Rise ☐

2 Which line is steeper?

A



B



The steeper line is

(A) (B)

3 Work out each gradient.

$\frac{6}{2} =$ ☐ Rise 6, Run 2

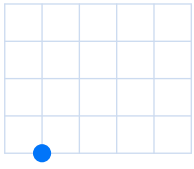
$\frac{8}{4} =$ ☐ Rise 8, Run 4

$\frac{9}{3} =$ ☐ Rise 9, Run 3

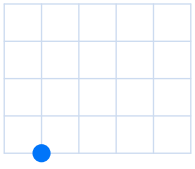
$\frac{5}{1} =$ ☐ Rise 5, Run 1

4 Start at the blue dot. Draw each line.

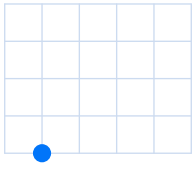
a) **Run 1, Rise 3**



b) **Run 2, Rise 2**



c) **Run 3, Rise 1**



WHAT IS GRADIENT? (y = mx)

SUPPORT

NAME _____ CLASS _____ DATE _____

KEY IDEA

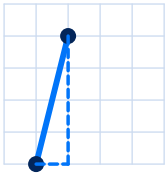
Gradient $= \frac{\text{Rise}}{\text{Run}}$

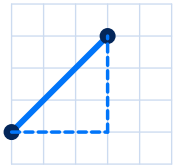
Draw a right-angled triangle under the line: the Run goes across, the Rise goes up.

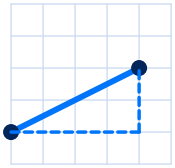
Here: Gradient $= \frac{6}{2} = 3$ **Rise 1, Run 2:** $\frac{1}{2}$



1 Find the gradient of each line.

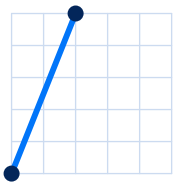
a) 
Rise ☐ Run ☐
Gradient = $\frac{\text{Rise}}{\text{Run}}$ = ☐

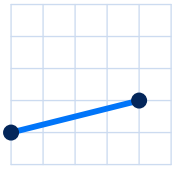
b) 
Rise ☐ Run ☐
Gradient = $\frac{\text{Rise}}{\text{Run}}$ = ☐

c) 
Rise ☐ Run ☐
Gradient = $\frac{\text{Rise}}{\text{Run}}$ = ☐

2 Draw a Run and Rise triangle on each line. Then find the gradient.

a) 
Gradient = $\frac{\text{Rise}}{\text{Run}}$ = ☐

b) 
Gradient = $\frac{\text{Rise}}{\text{Run}}$ = ☐

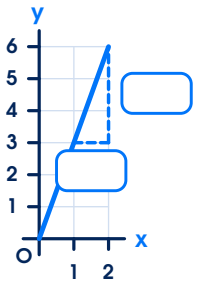
c) 
Gradient = $\frac{\text{Rise}}{\text{Run}}$ = ☐

3 This grid shows the line y = 3x

a) Fill in the Run and the Rise on the triangle.

b) **Gradient of y = 3x** $= \frac{\text{Rise}}{\text{Run}} =$ ☐

c) So the gradient of y = 5x is ☐



4 Look at this line.



Ella says, "The gradient is ½ because Run ÷ Rise = 1 ÷ 2." Is Ella right? Explain.

WHAT IS GRADIENT? (y = mx)

CORE

NAME _____ CLASS _____ DATE _____

KEY IDEA

Gradient = $\frac{\text{Rise}}{\text{Run}} = \frac{\text{change in y}}{\text{change in x}}$

Use two points with whole-number coordinates. Leave fractions as fractions.

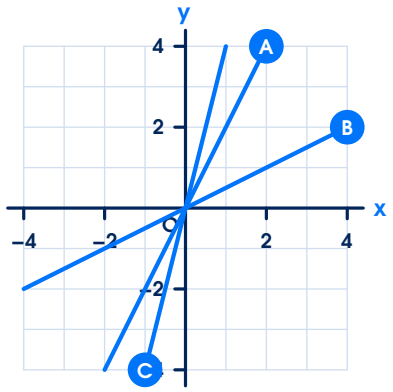
FLUENCY

1 Find the gradient and the equation of each line.

Gradient of A ☐ Equation ☐

Gradient of B ☐ Equation ☐

Gradient of C ☐ Equation ☐



2 A straight line passes through each pair of points. Find its gradient.

a) (0, 0) and (3, 12) ☐

b) (1, 3) and (4, 12) ☐

c) (2, 1) and (8, 4) ☐

d) Gradient of y = 7x: ☐

REASONING

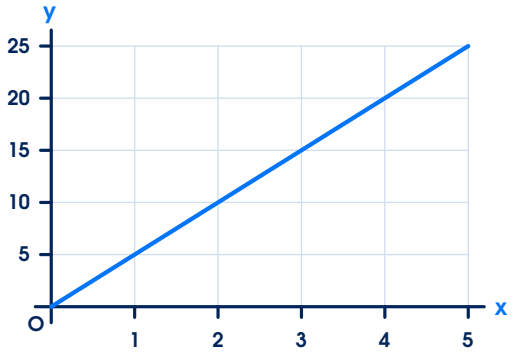
3 Look at the scales on the axes.

Sam counts a Run of 1 square and a Rise of 1 square, so he says the gradient of this line is 1.

a) Explain Sam's mistake.

.....

b) Find the correct gradient. ☐



4 Ella finds the gradient of y = 3x by doing Run ÷ Rise. She gets 1/3. Explain her mistake.

.....

.....

WHAT IS GRADIENT? (y = mx)

GREATER DEPTH

NAME _____ CLASS _____ DATE _____

REASONING

1 Is each statement always, sometimes or never true? Circle your answer.

If it is sometimes true, give an example of when it is true and when it is not.

a) A gradient of 2 is steeper than a gradient of ½. ALWAYS SOMETIMES NEVER

b) Two lines with the same gradient are parallel. ALWAYS SOMETIMES NEVER

c) A line through (0, 0) has a whole-number gradient. ALWAYS SOMETIMES NEVER

d) Any two points on a straight line give the same gradient. ALWAYS SOMETIMES NEVER

PROBLEM SOLVING

2 A straight line passes through (0, 0) and (6, 4).

a) Find the gradient. **b)** Write the equation. y =

c) Does the point (15, 10) lie on the line? Show how you know.

3 Find the missing values.

a) The segment from (2, 5) to (k, 17) has gradient 3. Find k.

b) The segment from (−1, 4) to (3, h) has gradient ½. Find h.

★ CHALLENGE FOR ALL

4 Rearrange each equation to the form y = mx if you need to.

a) Find the gradient of each line.

y = 3x	2y = x	y = 2.5x	3y = 4x

b) Write the lines in order from least steep to steepest.

WHAT IS GRADIENT? (y = mx)

ANSWERS

BUILDING BLOCKS

1. a) Run 1, Rise 3 · b) Run 2, Rise 2 · c) Run 4, Rise 2
2. B (Rise 4 for a Run of 1; A has Rise 1 for a Run of 4)
3. 6/2 = 3 · 8/4 = 2 · 9/3 = 3 · 5/1 = 5
4. Lines drawn from the dot: a) 1 right, 3 up · b) 2 right, 2 up · c) 3 right, 1 up

SUPPORT

1. a) Rise 4, Run 1, gradient 4/1 = 4 · b) Rise 3, Run 3, gradient 3/3 = 1 · c) Rise 2, Run 4, gradient 2/4 = 1/2
2. a) 3/1 = 3 · b) 5/2 · c) 1/4
3. a) Run 1, Rise 3 · b) 3/1 = 3 · c) 5
4. No. Gradient = Rise/Run = 2/1 = 2. Ella divided the Run by the Rise.

CORE

1. A gradient 4/2 = 2, y = 2x · B gradient 2/4 = 1/2, y = (1/2)x · C gradient 4/1 = 4, y = 4x
2. a) 12/3 = 4 · b) 9/3 = 3 · c) 3/6 = 1/2 · d) 7
3. a) He counted squares, but each square up is worth 5 and each square across is worth 1 · b) Rise/Run = 5/1 = 5 (e.g. from (0, 0) to (1, 5))
4. Gradient = Rise/Run. From (0, 0) to (1, 3): Rise 3, Run 1, so 3/1 = 3, not Run/Rise = 1/3.

GREATER DEPTH

1. a) Always · b) Always (or they are the same line) · c) Sometimes: y = 4x has gradient 4 but y = (1/2)x has gradient 1/2 · d) Always
2. a) Rise/Run = 4/6 = 2/3 · b) y = (2/3)x · c) Yes: 2/3 × 15 = 10
3. a) k = 6 (Rise 12, so Run 4) · b) h = 6 (Run 4, so Rise 2)
4. a) y = 3x: 3 · 2y = x: 1/2 · y = 2.5x: 2.5 · 3y = 4x: 4/3 · b) 2y = x, 3y = 4x, y = 2.5x, y = 3x