Selective Algebra and Graphing

SELECTIVE (YEAR 6)

Name **Ava**

Date

KEY IDEA

Reading a Line's Equation

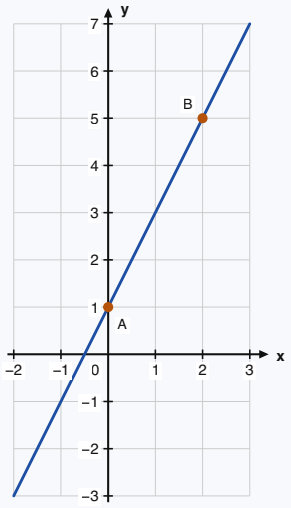
A straight line has equation $y = mx + c$, where m is its gradient and c is its vertical-axis intercept. Find the gradient by dividing the vertical change by the horizontal change between two points, moving in the same direction for both changes.

WORKED EXAMPLE

Find the equation of the graphed line in the form $y = mx + c$.

1. Read the intercept where the line crosses the vertical axis.
   $c = 1$
2. Read the coordinates of two clear points on the line.
   $A = (0, 1)$, $B = (2, 5)$
3. Divide the vertical change by the horizontal change, moving from left to right.
   $$m = \frac{5 - 1}{2 - 0} = \frac{4}{2} = 2$$

Answer: $y = 2x + 1$

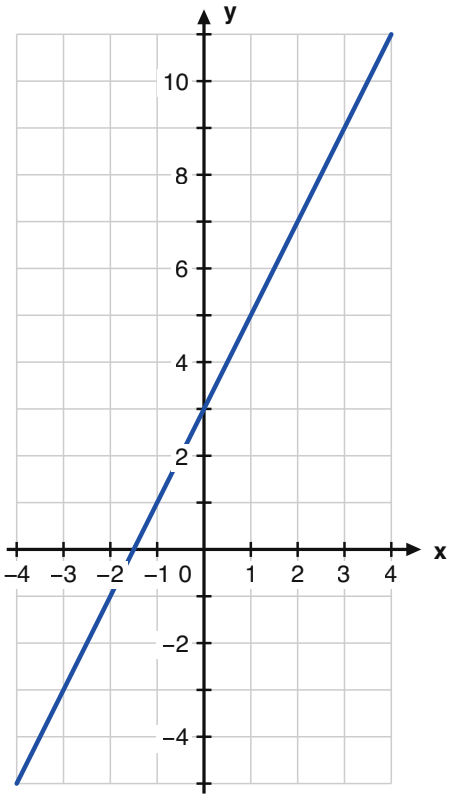


WATCH OUT FOR

- Dividing horizontal change by vertical change. Use vertical change divided by horizontal change, checking each axis's scale.
- Using the horizontal-axis crossing as the intercept. For c, find where the line crosses the vertical axis, where $x = 0$.

Reading a Straight Line

Use the graph to answer each question.



1 What is the gradient of the line? Write a number.

2 What is the y-intercept of the line? Write a number.

3 Write the equation of the line in the form $y = mx + c$.

Midpoints and Gradients

Show your working for each calculation.

4 Find the midpoint of the line segment joining $(-10, 3)$ and $(6, 13)$. Write your answer as an ordered pair.

5 A line segment has endpoints $(5, -7)$ and $(14, 4)$. Find its midpoint. Write your answer as an ordered pair, using decimals where needed.

6 Find the gradient of the straight line through (−11, 1) and (9, 16). Write your answer as a fraction in simplest form.

7 A straight line passes through (−3, 19) and (18, −16). Calculate its gradient. Write your answer as a fraction in simplest form.

Cordial Mixing Ratios

Use the table's mixing ratio to solve each problem.

Canteen cordial recipe

Batch	Concentrate (mL)	Water (mL)
Small	150	400
Medium	330	880
Large	540	1440

Each batch uses the same ratio of concentrate to water.

8 To follow the recipe, _____ mL of concentrate must be mixed with 2320 mL of water.

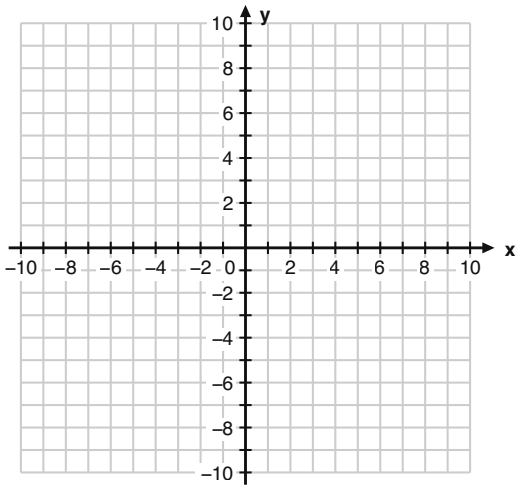
9 One of each batch is combined and stirred thoroughly. After some cordial is served, the remaining mixture contains 720 mL of concentrate. What volume of mixed cordial was served? Give your answer in mL.

10 Another batch contains 420 mL of concentrate and 980 mL of water. How much extra water must be added to match the table's recipe? Give your answer in mL.

Algebra and Coordinate Challenges

Show your working and label your graph clearly.

11 Draw and complete a small table of values for $y = 2x + 3$, using $x = -3$, $x = -1$, $x = 1$ and $x = 3$. Use your completed table to plot the straight line on the grid.



12 A point lies on both $y = 3x + 2$ and $y = 5x - 10$. Find the value of $x + y$ at that point. Give a numerical answer.

13 A point lies on $y = 2x + 1$. When its coordinates are **reversed**, the new point lies on $y = x - 5$. Find the original point. Write your answer as an ordered pair.

14 A rectangle has vertices (0, 0), (x, 0), (x, y) and (0, y), where x and y are positive. Its upper-right vertex lies on $y = 38 - 2x$, and its perimeter is 50 units. Find the rectangle's area in square units.