Linear functions: coefficients, graphs and determination — Teacher answers

Year 8, lower volume • text pp. 59–66 • textbook lessons 30–33

Use the two prerequisite checks to choose support. Project the worked and guided tasks, then collect the eight paper core questions. Follow-ups and extensions are optional; accept other complete valid methods. This page does not save learners' paper answers.

Ordinary route: prerequisites 4, short inquiry 5, worked/guided 8, independent 15, correction 5, exit 3 minutes. Advanced route: inquiry 18, organise 4, selected practice 13, exit 5 minutes.

Prerequisites: Function representations, coordinates and simultaneous equations.

Ordinary route: use the first fixed case for the five-minute demonstration. Advanced route: complete the full investigation.

1. 3′ With b=1 fixed, predict the stationary point as k changes in y=kx+b.
2. 8′ In the existing one-line inquiry, save k=1,2,−1 with b=1. Then fix k=2 and save b=−2,0,3. Compare the saved cases and draw their lines on paper; the engine shows one line at a time.
3. 5′ Explain the common point (0,1) in the first set and parallel lines in the second. Use x=−1 to test "a larger k always gives a larger y". Treat k=0 as a constant-function boundary; in this course a linear function requires k≠0.
4. 2′ Individually state the intercept and increasing/decreasing behaviour of y=−2x+3.

Worked example 1

Find the linear function through $(0, 2)$ and $(3, 8)$. Show the equations used to find k and b.

Reference answer

$y = 2x + 2$

$$y = 2x + 2$$

1. Substitute both coordinate pairs into y=kx+b.
2. The solution is $k = 2,\ b = 2$; check both points.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Guided attempt 2

Find the linear function through $(1, 1)$ and $(3, 5)$. Show the equations used to find k and b.

1. First point: $k + b = \square$.
2. Second point: $3k + b = \square$.
3. Subtract: $2k = \square$; then $k = \square$, $\quad b = 1 - \square$.

Reference answer

$y = 2x - 1$

$$y = 2x - 1$$

1. Substitute both coordinate pairs into y=kx+b.
2. The solution is $k = 2,\ b = -1$; check both points.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Prerequisite 3

Is the given relation a direct-proportion function? State k and b.

$$y = 3x$$

Reference answer

Yes; k=3≠0 and b=0.

1. Compare with y=kx+b and inspect the constant term.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Prerequisite 4

For the given relation, find y when $x = 0$.

$$y = -2x + 4$$

Reference answer

$y = 4$

$$y = 4$$

1. Substitute $x = 0$ into the complete relation.
2. $-2 \times (0) + (4) = 4$.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Independent practice 5

Find the x-intercept and explain why y is set to zero.

$$y = -3x + 6$$

Reference answer

$x = 2$

$$x = 2$$

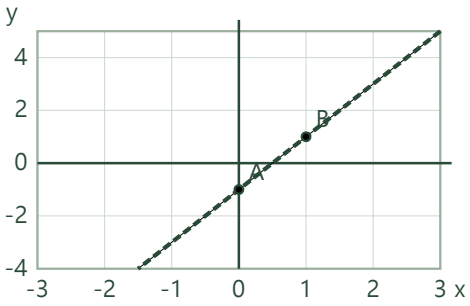
1. Every point on the x-axis has y=0.
2. Solve $-3x + 6 = 0$ to obtain $x = 2$.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Independent practice 6

Draw the graph of the given function. Mark the y-intercept and at least one more point.

$$y = 2x - 1$$



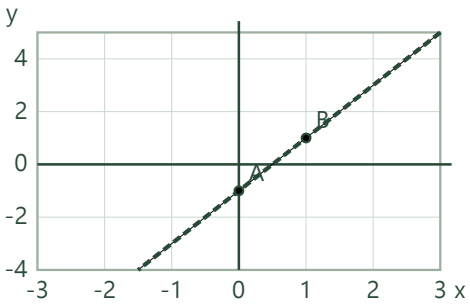
Use the stated conditions and the labelled scales.

Reference answer

The line passes through (0,−1) and (1,1), with slope 2.

1. At x=0, y=−1; at x=1, y=1.
2. Plot the two distinct points and join them with a straight line.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.



Use the stated conditions and the labelled scales.

Independent practice 7

Find the linear function through $(1, 3)$ and $(3, 1)$. Show the equations used to find k and b.

Reference answer

$y = -1x + 4$

$$y = -1x + 4$$

1. Substitute both coordinate pairs into y=kx+b.
2. The solution is $k = -1,\ b = 4$; check both points.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Independent practice 8

A linear function y=kx+3 passes through (2,7). Find k and check that the result is a linear function.

Reference answer

k=2≠0; the function is y=2x+3.

$$k = 2$$

1. 7=2k+3, hence 2k=4.
2. k=2 is nonzero.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Exit question 9

Under this chapter’ s definition, is y=5 a linear function with nonzero k? Classify it accurately.

$$y = 5$$

Reference answer

It is a constant function with k=0, so it is excluded from this definition of a linear function.

1. A horizontal line can still represent a function.
2. The extra nonzero-slope requirement is not met.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Exit question 10

Find the x-intercept and explain why y is set to zero.

$$y = 3x - 6$$

Reference answer

$x = 2$

$$x = 2$$

1. Every point on the x-axis has y=0.
2. Solve $3x - 6 = 0$ to obtain $x = 2$.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Further practice 11

As x increases, does y increase or decrease? Explain using k.

$$y = -x + 2$$

Reference answer

It decreases because k=−1<0.

1. Each increase of 1 in x changes y by −1.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Further practice 12

For the given relation, find y when $x = 0$.

$$y = 2x - 4$$

Reference answer

$y = -4$

$$y = -4$$

1. Substitute $x = 0$ into the complete relation.
2. $2 \times (0) + (-4) = -4$.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Further practice 13

Find the linear function through $(0, 0)$ and $(2, 6)$. Show the equations used to find k and b.

Reference answer

$y = 3x + 0$

$$y = 3x + 0$$

1. Substitute both coordinate pairs into y=kx+b.
2. The solution is $k = 3,\ b = 0$; check both points.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Further practice 14

Find the linear function through $(-1, 4)$ and $(2, -2)$. Show the equations used to find k and b.

Reference answer

$y = -2x + 2$

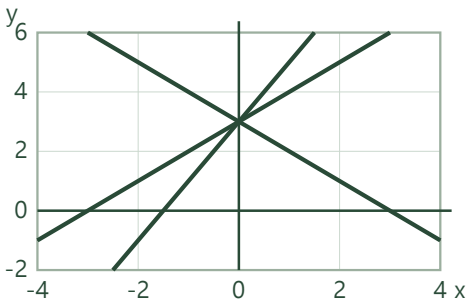
$$y = -2x + 2$$

1. Substitute both coordinate pairs into y=kx+b.
2. The solution is $k = -2,\ b = 2$; check both points.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Extension 15

The lines y=x+3, y=2x+3 and y=−x+3 have different slopes. Find their common point and explain why the coefficient of x disappears there.



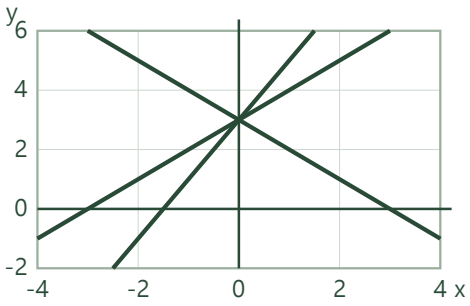
Use the stated conditions and the labelled scales.

Reference answer

(0,3); setting x=0 leaves y=b=3 for every line.

1. All three intercepts equal 3.
2. Substitute (0,3) into each original equation.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.



Use the stated conditions and the labelled scales.

Extension 16

A learner says every straight line is the graph of $y=kx+b$. Use the two listed points on $x=2$ to explain the missing exception.

x	y
2	0
2	3

Use the stated conditions and the labelled scales.

Reference answer

No. At least one input is paired with two different outputs.

1. Check repeated inputs, not merely repeated outputs.
2. The repeated input has conflicting outputs.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.