TABLES, EQUATIONS AND GRAPHS
ANSWERS

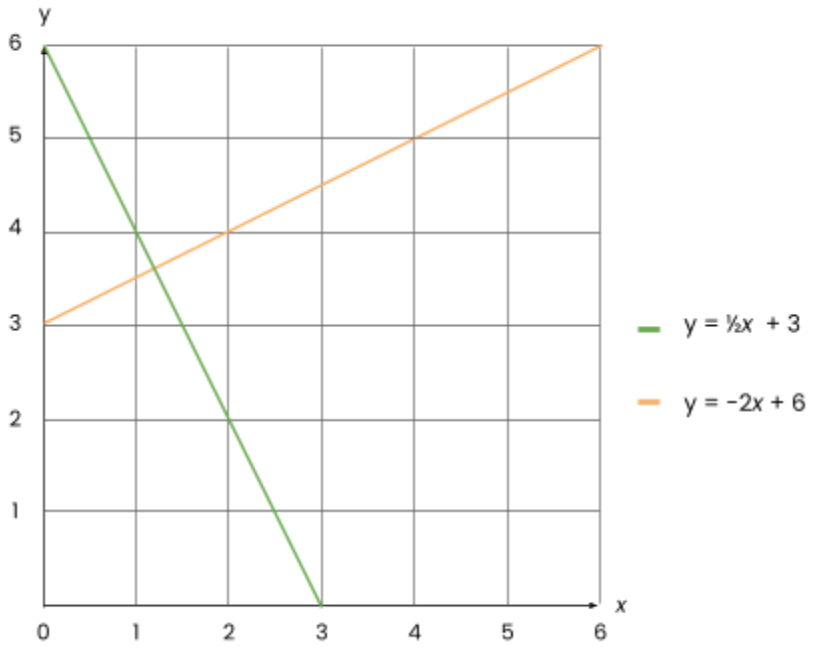
Linear Equations

Linear Equations
STOP AND CHECK (PAGE 10)

- They always have an x and y-intercept, they have a constant gradient and they can always be represented by an equation in the form: $y = mx + c$
- The equations on the diagram are:
    - $y = 15x$
    - $y = 4$
    - $y = -2x - 1$

How to draw Straight Lines from an Equation
STOP AND CHECK (PAGE 12)

- $y = \frac{1}{2}x + 3$
- $y = -2x + 6$



Forming an Equation From a Table

STOP AND CHECK (PAGE 14)

- Some examples of discrete data are the number of shoes you own or how many pets you have.
- $y = 5x + 1$

Simultaneous Equations

STOP AND CHECK (PAGE 17)

- $a = 2, b = 1$
- $x = 0, y = 3$

Linear Equations in Context

STOP AND CHECK (PAGE 17)

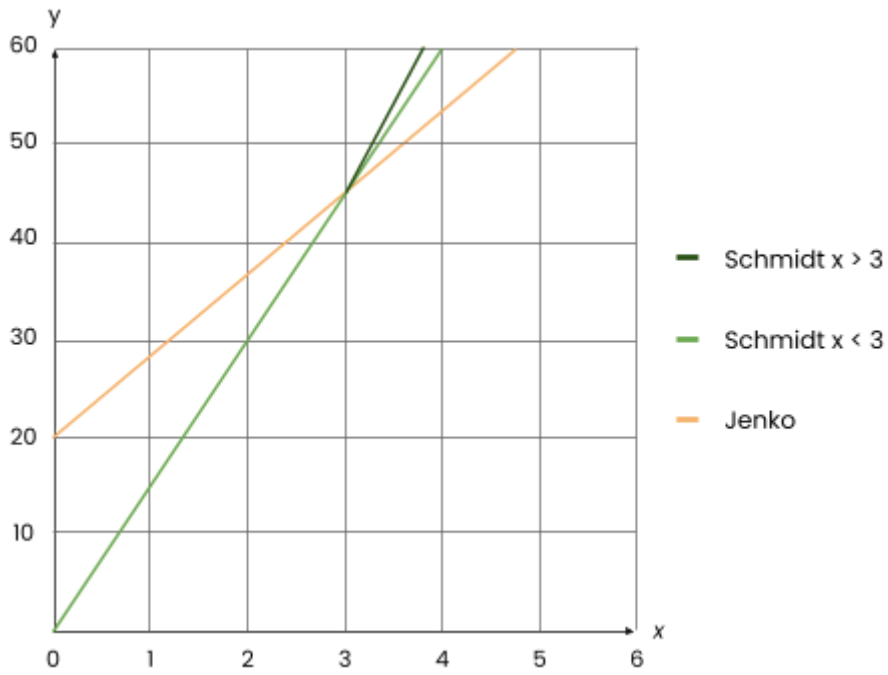
- The gradient of a line on a distance-time graph tells us the speed (or velocity) of an object being measured.
- The gradient of line a is $\frac{20}{10}$ which simplifies to 2. The equation for this line is:

$$y = 2x$$

Linear Equations

QUICK QUESTIONS (PAGE 19)

- $45. We find this value by following Schmidt's line on the graph and find the money value on the line when the time is 3 hours.



- The total charge is $105, as he charges $45 in the first 3 hours, then $20 per hour for the next 3 hours. This totals to $105 which is then divided by 6 hours to find the average hourly rate.

$$\frac{105}{6} = 17.5$$

Schmidt makes an average of $17.5 an hour if they work for 6 hours.

- The point where they both cost the same is represented by the intersection on the graph, so we expect them to make the same amount of money in 3 hours.

Quadratic Equations

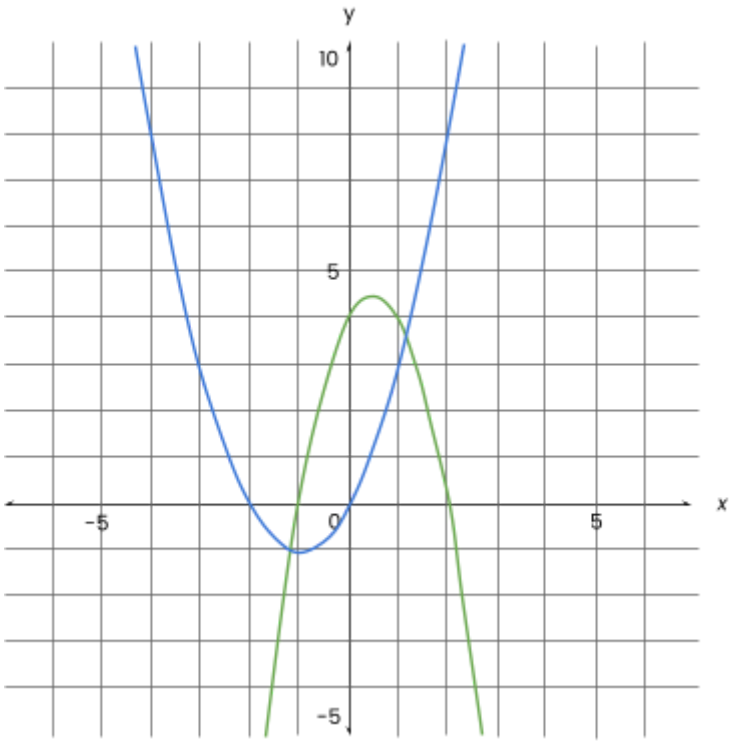
How to Form Quadratic Equations from a Graph

STOP AND CHECK (PAGE 24)

- Parabolas have symmetry, a vertex and a y intercept.
- $y = ax^2 + bx + c$
- The two forms that can be found easily on a graph are the vertex form and the factorised form.
- Using a graph, you can use the x-intercepts to construct the factorised form, or the vertex to construct the vertex form. Don't forget to substitute in a known value to solve for k (sometimes written using a). This is the coefficient that controls how steep or shallow the parabola is.
- $y = -0.5(x - 3)(x + 3)$
- $y = x^2$

How to Graph Quadratic Equations

STOP AND CHECK (PAGE 27)



How to Write a Quadratic from a Table

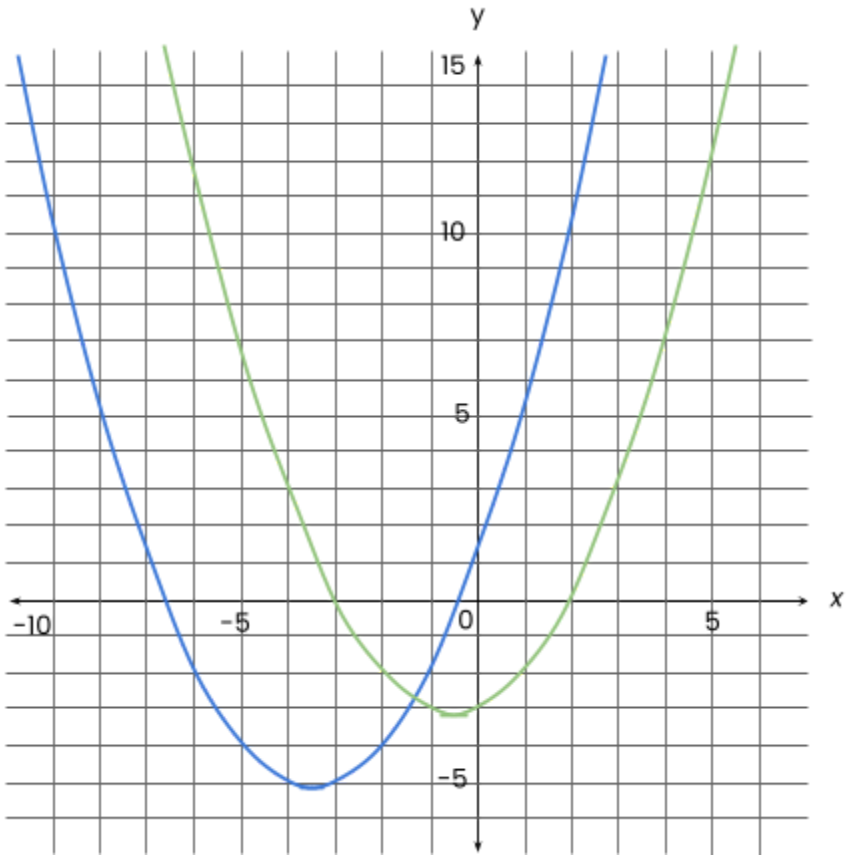
STOP AND CHECK (PAGE 29)

- The second difference is equal to 2a.
- We use simultaneous equations, putting in values for *x* and y that are given in the table.

Transforming Parabolas

STOP AND CHECK (PAGE 31)

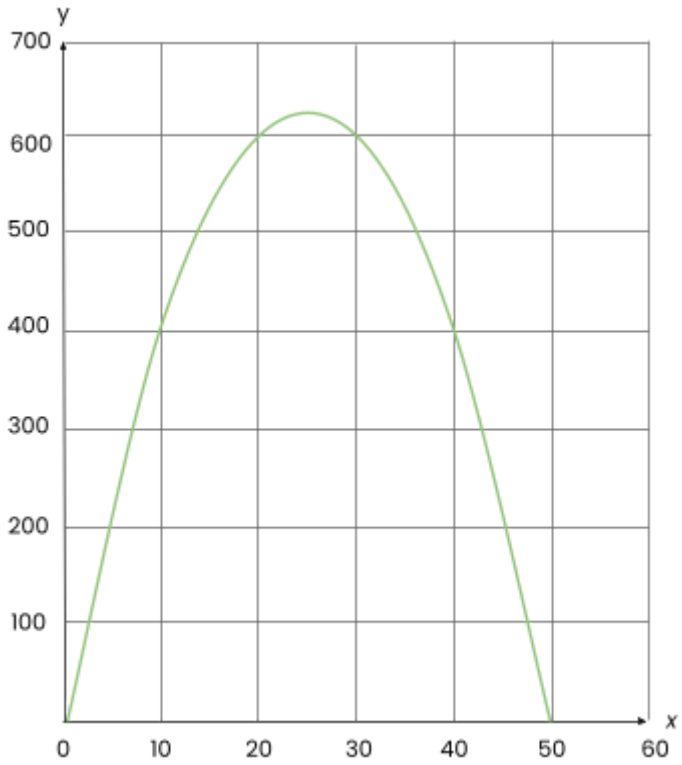
- You can move a parabola vertically by changing the constant value.
- You can move a parabola horizontally by adding a constant to every x-value. To shift to the right we subtract, to shift to the left we add a constant.



- New equation: $0.5(x + 1)(x + 6) - 2$

Quadratic Equations in Context

STOP AND CHECK (PAGE 34)



- The maximum area is represented by the vertex on our graph. The vertex is at (25, 625) so the maximum area of a rug is 625cm^2. We solve our equation to find the values of x when area (A) equals 400:

$$400 = -(x^2 - 50x)$$

We need to make this equal to zero and then factorise to find our solutions:

$$-(x^2 - 50x + 400) = 0$$
$$-(x - 10)(x - 400) = 0$$

This means the rug has an area of 400cm^2 when $x = 10$ or $x = 40$.
We are looking for values when the rug has an area less than 400cm^2 so this will be $0 < x < 10$ and $40 < x < 50$.

- The *x* value of the vertex of this graph will be $\frac{g}{2}$. This will be the *x* value where the area is the greatest so we put this value into the equation:

$$A = -\left(\frac{g}{2}\right)^2 + g\left(\frac{g}{2}\right)$$
$$A = -\frac{g^2}{4} + \frac{g^2}{2}$$
$$A = \frac{g^2}{4}$$

Exponential Equations

What Exponential Equations are

STOP AND CHECK (PAGE 39)

- The components of an exponential graph are:
  - The exponential equation has a variable as the exponent.
  - The constant, *k*, is the growth rate.
  - The asymptote, or the value the line on the graph will never touch. (0, 1) if it hasn't been translated and (1, *k*).
- The intercept points of an untransformed exponential equation are (0, 1) and (1, 2).

How to Form Exponential Equations from a Graph

STOP AND CHECK (PAGE 40)

- $y = 3 \times 2^x$

Transforming Exponential Equations

STOP AND CHECK (PAGE 43)

- The vertical shift for an exponential equation is changed by the constant, c. The new equation would be: $y = 3x - 3$. The new asymptote will be -2.

- The horizontal shift for an exponential equation is altered by adding a constant to the x-variable. The new equation would be: $y = 3(x - 2)$. The new y-intercept would be around 0.1 and the asymptote is still 0.

Reflecting Exponential Equations

STOP AND CHECK (PAGE 45)

- $y = -(3^x)$
- $y = 2^{-x}$

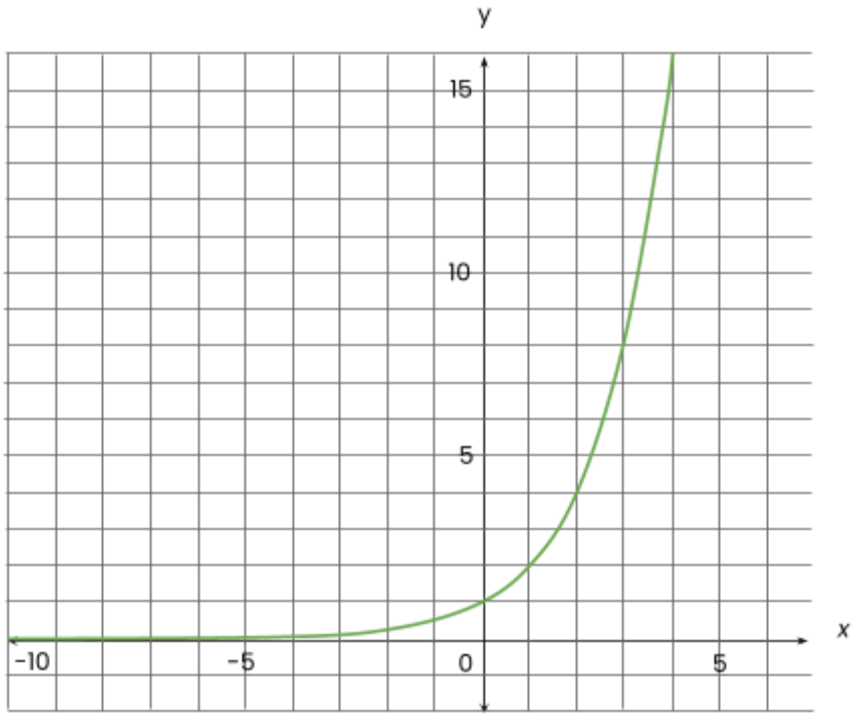
Exponential Equations in Context

STOP AND CHECK (PAGE 46)

- Some contexts include growth (e.g. a plant) and decay (e.g. paying back debt at a % rate).

Exponential Equations in Context

QUICK QUESTIONS (PAGE 46)



- $c = 2^w$ Where c is the number of cockroaches and w is the number of weeks.
- In week 9 the number of cockroaches will equal 512. This means that sometime in the 8th week the number of cockroaches reaches 500. This was found by trial and error and testing values of 2^w until it was found that 29 = 512.

Interpreting Equations and Graphs

How to Answer 'Explain your Reasoning' Questions

STOP AND CHECK (PAGE 48)

- When h = 45m: The graph is flat because Nicole is not climbing up or down the cliff, instead the graph is showing the time Nicole has spent at the top of the cliff.
- This means that Nicole descends the cliff at the same rate because the gradient is the same. However, the y-intercept is much smaller than the initial equation which means she didn't descend the cliff till much later. The y-intercept is 200 which equates to 40 hours as it takes Nicole 1 hour to descend 5m. This means that Nicole didn't start to descend the cliff until after 40hours, but when she did descend it was at the same speed as shown in the graph.

How to Answer 'What's Wrong with this Graph' Questions

STOP AND CHECK (PAGE 49)

- The graph should be in discrete points, not a continuous line because the number of cells can only be measured with discrete values.

Interpreting Equations and Graphs

STOP AND CHECK (PAGE 50)

- The equation is A = 2t where A represents Area and t represents time.

- The graph is in discrete points which is unrealistic as both area and time can be measured with continuous values so this graph should be a continuous line, not just discrete points.