



1 Here is a table of values for $y = 2^x$.

x	-2	-1	0	1	2	3
y						

a. Complete the table.

b. What happens to y as x gets more and more negative?

(2 marks)

a)

$$x = -2: 2^{-2} = \frac{1}{4}$$

$$x = -1: 2^{-1} = \frac{1}{2}$$

$$x = 0: 2^0 = 1$$

$$x = 1, 2, 3: 2, 4, 8$$

b)

y gets smaller and smaller
but is always positive

a) $\frac{1}{4}, \frac{1}{2}, 1, 2, 4, 8$ b) $y \rightarrow 0$, never reaches it

2 Write down the coordinates of the point where the graph of $y = 4^x$ crosses the y -axis.

(1 mark)

On the y -axis, $x = 0$

$4^0 = 1$, so the graph crosses the y -axis at $(0, 1)$

$(0, 1)$

3

Here are four equations.

A: $y = 3 \times 1.2^x$ B: $y = 5 \times 0.8^x$ C: $y = 0.5 \times 4^x$ D: $y = 2 \times (\frac{1}{3})^x$

Which of the graphs show exponential decay (the curve goes down as x increases)? Give a reason.

(2 marks)

$$y = a \times b^x$$

$b > 1$ means growth

$0 < b < 1$ means decay

A: $b = 1.2$ growth

B: $b = 0.8$ decay

C: $b = 4$ growth

D: $b = \frac{1}{3}$ decay

B and D

4

Complete the table of values for $y = 3^x$

x	-1	0	1	2	3
y		1	3		

(2 marks)

$$3^{(-1)} = \frac{1}{3}$$

$$3^2 = 9$$

$$3^3 = 27$$

5

Lena says, "The graph of $y = 3 \times 2^x$ goes through the point (2, 36), because $3 \times 2 = 6$ and $6^2 = 36$."

Lena is wrong. Explain her mistake and work out the correct y -value when $x = 2$.

(2 marks)

Powers come before multiplying

Lena did $(3 \times 2)^2 = 36$

It should be 3×2^2

$$y = 3 \times 2^2$$

$$y = 3 \times 4$$

$$y = 12$$

She squared the 3 too. $y = 12$

- 6 The graph of $y = k^x$, where k is a positive constant, passes through the point (3, 125).

Find the value of k .

(2 marks)

Substitute the point

$$k^3 = 125$$

Take the cube root

$$k = 5$$

$$k = 5$$

- 7 The table shows some values on a curve with equation $y = ab^x$.

x	0	1	2	3
y	6	18	54	162

a. Find the values of a and b .

b. Work out the value of y when $x = 5$.

(3 marks)

a)

$$x = 0: y = a \times b^0 = a$$

$$a = 6$$

$$18 \div 6 = 3, 54 \div 18 = 3$$

$$b = 3$$

b)

$$y = 6 \times 3^5$$

$$y = 6 \times 243$$

$$y = 1458$$

$$a = 6, b = 3; y = 1458$$

- 8 The curve $y = ab^x$, where $b > 0$, passes through the points (0, 7) and (2, 63).

Find the value of a and the value of b .

(2 marks)

At (0, 7)

$$a \times b^0 = a = 7$$

At (2, 63)

$$7b^2 = 63, \text{ so } b^2 = 9$$

$$\text{Since } b > 0, b = 3$$

- 9 The curve $y = ab^x$, where $b > 0$, passes through the points (1, 24) and (3, 6).
Find the value of a and the value of b . Is the curve growth or decay?

(3 marks)

$$ab = 24$$

$$ab^3 = 6$$

Divide the second by the first

$$\{ab^3\} / \{ab\} = \{6\} / \{24\}$$

$$b^2 = \frac{1}{4}$$

$$b = \frac{1}{2}$$

$$a \times \frac{1}{2} = 24$$

$$a = 48$$

$b < 1$ so decay

$$a = 48, b = \frac{1}{2}, \text{decay}$$

- 10 The value, £ V , of a car after t years is given by $V = 14\,000 \times 0.85^t$
- Work out the value of the car after 2 years.
 - What do the numbers 14 000 and 0.85 tell you about the car?
 - After how many whole years does the value first fall below £7000?

(4 marks)

a)

$$V = 14000 \times 0.85^2$$

$$V = 14000 \times 0.7225$$

$$V = £10115$$

b)

$$14000 = \text{value when } t = 0$$

$$\times 0.85 \text{ each year} = 15\% \text{ loss each year}$$

c)

$$t = 4: 14000 \times 0.85^4 = £7308.09 \text{ (too high)}$$

$$t = 5: 14000 \times 0.85^5 = £6211.87 \text{ (below £7000)}$$

$$a) £10115 \text{ c) } 5 \text{ years}$$