

Exponential Graphs

GCSE Maths · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

Complete a table of values for $y = 2^x$ from $x = -2$ to $x = 3$.

Step 1 · Negative powers are fractions

$$2^{-2} = 0.25, 2^{-1} = 0.5$$

Step 2 · $2^0 = 1$

the y-intercept

Step 3 · Then doubling

2, 4, 8

Answer: 0.25, 0.5, 1, 2, 4, 8

Check: Each value is double the one before ✓

2. Now try one with the steps

The curve $y = ab^x$ passes through (0, 3) and (2, 48). Find a and b ($b > 0$).

Step 1 · $x = 0$ gives a

Step 2 · Use (2, 48)

Step 3 · $b > 0$

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. Find the value of $y = 3^x$ when $x = 2$. [1]

2. Find the value of $y = 3^x$ when $x = -1$. [1]

3. Where does $y = 5^x$ cross the y-axis? Give the y-coordinate. [1]

4. Where does $y = 4 \times 2^x$ cross the y-axis? Give the y-coordinate. [1]

5. Does $y = 0.8^x$ show growth or decay? Explain. [1]

6. Find y when $x = 3$ for $y = 2 \times 3^x$. [1]

7. Find y when $x = 4$ for $y = 10 \times 0.5^x$. [2]

8. $y = ab^x$ passes through (0, 5) and (1, 15). Find a and b. [2]

9. $y = ab^x$ passes through (0, 2) and (3, 54). Find a and b. [3]

10. $y = ab^x$ passes through (1, 6) and (2, 18). Find a and b. [3]

11. $y = ab^x$ passes through (1, 40) and (3, 10), with $b > 0$. Find a and b. [3]

12. Which line does the graph of $y = 2^x$ get closer and closer to becomes very negative? [1]

13. A car's value after t years is $V = 18\,000 \times 0.85^t$ pounds. Find its value after 3 years. [2]

14. A town's population is $P = 2000 \times 1.05^n$ after n years. After how many whole years does it first exceed 2500? [3]

15. At which point do the graphs of $y = 2^x$ and $y = 3^x$ meet? [1]

4. Before you hand it in

$y = 2^x$ passes through the origin

$2^0 = 1$, so the curve crosses the y-axis at (0, 1). It never reaches $y = 0$.

Plotting $y = 2^x$ straight line through (1, 2), (2, 4), (3, 6)

2^x means 2 multiplied by itself x times: 2, 4, 8, 16. It multiplies, so it curves upwards.

$y = 3 \times 2^x$ at $x = 2$ is $6^2 = 36$

Powers come before multiplication: $3 \times 2^2 = 3 \times 4 = 12$.

A decay curve crosses the x-axis eventually

Multiplying a positive number by $\frac{1}{2}$ always leaves a positive number. The x-axis is an asymptote.