

Growth Pattern Lab

Write exponential functions from patterns and contexts.

HIGH SCHOOL • MA.912.AR.5.4

MA.912.AR.5.4 "Write an exponential function to represent a relationship between two quantities from a graph, a written description or a table of values within a mathematical or real-world context."

NAME _____

DATE _____

BUILD THE FUNCTION

Use $y = a(b)^x$ for an exponential relationship. The value of a is the output when $x = 0$, and b is the factor multiplied each time x increases by 1. Find b by dividing consecutive outputs, then use a known point to find a .

WORKED EXAMPLE

A lab culture has 9 cells when $x = 0$. The number of cells triples each hour. Write an exponential function.

1. Start with $y = a(b)^x$.
2. When $x = 0$, $y = 9$, so $a = 9$.
3. Triples each hour means $b = 3$.
4. Substitute the values: $y = 9(3)^x$.

Answer: $y = 9(3)^x$

PRACTICE 6 problems

- 1** A table shows x values 0, 1, 2 and y values 4, 8, 16. Write an exponential function for the table.

ANSWER _____

- 2** A quantity starts at 12 and is multiplied by $1/2$ each day. Let x be the number of days. Write an exponential function.

ANSWER _____

- 3** A table shows x values 1, 2 and y values 30, 15. Write an exponential function for the table.

ANSWER _____

- 4** A graph passes through the points (0, 11) and (1, 44). Write an exponential function for the graph.

ANSWER _____

- 5** A value starts at 25 and is multiplied by $4/5$ for each mile traveled. Let x be the number of miles. Write an exponential function.

ANSWER _____

- 6** A table shows x values 0, 1, 2 and y values 18, 108, 648. Write an exponential function for the table.

ANSWER _____

APPLY IT Show your work

- 1** An esports team's video has 16 views when it is posted. Its view count doubles each day. Let x be the number of days since posting. Write an exponential function for the number of views, y .

WORK SPACE

ANSWER _____

- 2** During a battery-drain test, a phone has 96% charge at the start. Each hour, it retains $\frac{1}{2}$ of its current charge. Let x be the number of hours. Write an exponential function for the charge percentage, y .

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

An exponential relationship passes through $(2, 50)$ and $(4, 800)$. Write an exponential function in the form $y = a(b)^x$. Explain how you found the growth factor.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A table shows x values 0, 1, 2 and y values 4, 8, 16. Write an exponential function for the table.	$y = 4(2)^x$
2	A quantity starts at 12 and is multiplied by $1/2$ each day. Let x be the number of days. Write an exponential function.	$y = 12(1/2)^x$
3	A table shows x values 1, 2 and y values 30, 15. Write an exponential function for the table.	$y = 60(1/2)^x$
4	A graph passes through the points (0, 11) and (1, 44). Write an exponential function for the graph.	$y = 11(4)^x$
5	A value starts at 25 and is multiplied by $4/5$ for each mile traveled. Let x be the number of miles. Write an exponential function.	$y = 25(4/5)^x$
6	A table shows x values 0, 1, 2 and y values 18, 108, 648. Write an exponential function for the table.	$y = 18(6)^x$

PART 2 • APPLY IT

1. $y = 16(2)^x$ The initial number of views is 16, so $a = 16$. Doubling each day gives $b = 2$.
2. $y = 96(1/2)^x$ The starting charge is 96, so $a = 96$. Retaining half each hour gives $b = 1/2$.

CHALLENGE

$y = (25/8)(4)^x$. From $x = 2$ to $x = 4$, the output is multiplied by $800/50 = 16$, so $b^2 = 16$ and $b = 4$. Then $a = 50/4^2 = 25/8$.

Accept algebraically equivalent exponential functions, such as shifted forms that produce the same outputs. For the challenge, accept a correct explanation that identifies a growth factor of 4 and an initial value of $25/8$.