The Form y = a · b^x

y = a · b^x. a is the starting value and y-intercept; b is the growth factor multiplied each step. Build tables from equations, evaluate power first, and read a and b.

Name _____ Date _____

Words we use

say the math word, then the plain English

WORD	PLAIN ENGLISH	WHAT YOU DO
Family, member, parameter	The exponential family shares the form $y = a \cdot b^x$; each member is picked out by its own a and b.	Name the family, find its numbers, say what each does.
Initial value (starting value), a	The output when x = 0. Also the y-intercept, because $b^0 = 1$ and $a \cdot 1 = a$.	Read it as the number in front. Start the table here.
Growth factor, b	The number you multiply by each step: the constant ratio down the table.	Read it as the base. Multiply by it for each step right.
y-intercept	Where the curve crosses the y-axis: (0, a).	Same idea as b in y = mx + b.
Power first	In $a \cdot b^x$, work out b^x before multiplying by a.	$3 \cdot 2^4 = 3 \cdot 16 = 48$.
Invisible 1	$y = 2^x$ means $y = 1 \cdot 2^x$: a = 1.	Same invisible 1 as Unit 1.

Part A Read a and b

Write a and b, and what each one does.

EQUATION	A	B	WHAT EACH DOES
$y = 4 \cdot 3^x$			
$y = 7 \cdot 1.5^x$			
$y = 2^x$			
$y = 10 \cdot (1/2)^x$			

Part B Build the table

Start at a, multiply by b each step.

EQUATION	X = 0	1	2	3	4
$y = 5 \cdot 2^x$					
$y = 2 \cdot 3^x$					

$y = 16 \cdot (1/2)^x$

Part C Function notation, power first

1. $f(x) = 3 \cdot 2^x$. Find f(0), f(3), f(4). Show the power first.

2. $g(x) = 9 \cdot 4^x$. Find g(0). Why does it come out to a?

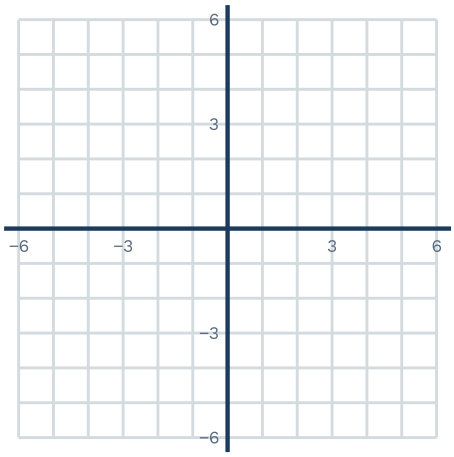
3. $h(x) = 2 \cdot 5^x$. Find h(3).

Part D Write the equation from a table

TABLE (X = 0, 1, 2)	A	B	EQUATION
y: 6, 12, 24			
y: 4, 12, 36			
y: 1, 5, 25			

Part E Plot it, and in your own words

Plot $y = 2 \cdot 3^x$ for x = 0, 1, 2, 3 on the grid (y up to 60, each square is 6).



1. Why is a the y-intercept? Use the words b to the zero and multiply by 1.

2. What does changing a do to the curve? Changing b?

Part F Exit ticket

1. $y = 6 \cdot 4^x$: a, b, and their jobs.

2. $f(x) = 2 \cdot 5^x$: f(0) and f(3).

Answer key

Part A. 4 and 3; 7 and 1.5; 1 and 2 (invisible 1); 10 and 1/2. a starts, b multiplies.

Part B. 5, 10, 20, 40, 80. 2, 6, 18, 54, 162. 16, 8, 4, 2, 1.

Part C. 1. 3, 24, 48. 2. g(0) = 9 · 1 = 9: $4^0 = 1$. 3. 250.

Part D. $y = 6 \cdot 2^x$; $y = 4 \cdot 3^x$; $y = 5^x$ (a = 1).

Part E. Points (0, 2), (1, 6), (2, 18), (3, 54). 1. $b^0 = 1$, so $y = a \cdot 1 = a$. 2. a moves the start on the y-axis; b changes how fast it multiplies.

Part F. 1. a = 6 (start, y-intercept), b = 4 (multiply by 4 each step). 2. 2 and 250.