

Function Pattern Hunt

Build equations from changing values.

HIGH SCHOOL • HSF-LE.A.2

CCSS.Math.Content.HSF-LE.A.2 "Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table)."

NAME _____

DATE _____

SPOT THE CHANGE

A linear function has a constant additive change, so its equation can be written $y=mx+b$. An exponential function has a constant multiplier, so its equation can be written $y=a*b^x$, where a is the starting value when $x=0$.

WORKED EXAMPLE

Construct a linear function through (8, 14) and (11, 29).

1. Find the slope: $m=(29-14)/(11-8)=15/3=5$.
2. Use (8, 14): $14=5(8)+b$.
3. Solve for b : $b=-26$.

Answer: $y=5x-26$

PRACTICE 6 problems

- 1** The table shows a relationship. Construct a linear function. x : 1, 4 y : 7, 25

ANSWER _____

- 2** An arithmetic sequence begins at 17 when $n=1$ and increases by 4 each term. Write an explicit formula for a_n .

ANSWER _____

- 3** The table shows an exponential relationship. Construct a function. x : 1, 3 y : 12, 108

ANSWER _____

- 4** A geometric sequence has terms 6, 24, 96, ... Write an explicit formula for a_n .

ANSWER _____

- 5** A graph includes the points (-2, 13) and (2, 1). Construct the linear function represented by the graph.

ANSWER _____

- 6** The number of shares of a video is 160 at $m=0$ and doubles every month. Write a function $S(m)$ for the number of shares after m months.

ANSWER _____

APPLY IT Show your work

- 1** A student podcast has 120 listeners at the start of tracking. It gains 18 listeners each week. Let $L(w)$ be the number of listeners after w weeks. Write $L(w)$, then find $L(7)$.

WORK SPACE

ANSWER _____

- 2** An indie game has 40 beta testers on day 1. The tester count triples each day. Let $T(d)$ be the number of testers on day d . Write $T(d)$, then find $T(4)$.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A table has values $f(1)=6$, $f(2)=18$, and $f(3)=54$. One student says the relationship is linear because the line through $(1, 6)$ and $(3, 54)$ is $f(x)=24x-18$. Another student says the relationship is exponential. Which student is correct? Explain by checking all three table values.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	The table shows a relationship. Construct a linear function. x: 1, 4 y: 7, 25	$y=6x+1$
2	An arithmetic sequence begins at 17 when $n=1$ and increases by 4 each term. Write an explicit formula for a_n .	$a_n=17+4(n-1)$
3	The table shows an exponential relationship. Construct a function. x: 1, 3 y: 12, 108	$y=4 \cdot 3^x$
4	A geometric sequence has terms 6, 24, 96, ... Write an explicit formula for a_n .	$a_n=6 \cdot 4^{(n-1)}$
5	A graph includes the points (-2, 13) and (2, 1). Construct the linear function represented by the graph.	$y=-3x+7$
6	The number of shares of a video is 160 at $m=0$ and doubles every month. Write a function $S(m)$ for the number of shares after m months.	$S(m)=160 \cdot 2^m$

PART 2 • APPLY IT

1. $L(w)=120+18w$; $L(7)=246$ The constant weekly increase makes this linear, with slope 18 and starting value 120. Substitute 7 for w to get 246.
2. $T(d)=40 \cdot 3^{(d-1)}$; $T(4)=1080$ The count is multiplied by 3 each day, so use an exponential function with exponent $d-1$. At day 4, multiply 40 by 3^3 .

CHALLENGE

The second student is correct. The exponential function $f(x)=2 \cdot 3^x$ gives $f(1)=6$, $f(2)=18$, and $f(3)=54$. The line $f(x)=24x-18$ gives $f(2)=30$, so it does not match all three values.

Accept equivalent linear forms, such as $y=4x+13$ for problem 2 if students rewrite the sequence formula as a function of n . Accept equivalent exponential notation, including parentheses around exponents.