LESSON MAKER PRO

Growth Matchup

Compare how functions change and when one overtakes another.

HIGH SCHOOL · PC.F.A.24

PC.F.A.24 "Compare and contrast families of functions and their representations algebraically, graphically, numerically, and verbally in terms of their key features. Families of functions include but are not limited to linear, quadratic, polynomial..."

NAME _____ DATE _____

LOOK AT THE CHANGE

For equal steps in x, a linear function changes by the same amount each time. An exponential function multiplies by the same factor each time. To compare two functions, use the same x-value for both.

WORKED EXAMPLE

The table shows A and B. Identify each function family, then tell which function is greater at x = 2.

FUNCTION VALUES

x	A	B
0	14	14
1	23	42
2	32	126

1. A increases by 9 each time, so A is linear.
2. B is multiplied by 3 each time, so B is exponential.
3. At x = 2, compare 32 and 126.

Answer: A is linear, B is exponential, and B is greater at x = 2.

PRACTICE 6 problems

1 Identify the family of each function. State the amount added or the factor multiplied when x increases by 1.

FUNCTION VALUES

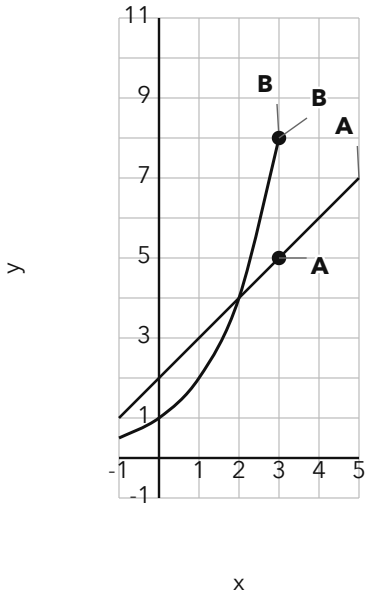
x	A	B
0	6	6
1	12	18
2	18	54

ANSWER _____

2 At x = 2, how much greater is $G(x) = 10 \cdot 2^x$ than $F(x) = 10 + 5x$?

ANSWER _____

3 On the graph, how much greater is B than A at x = 3?



ANSWER _____

4 Plan A starts with 15 followers and gains 10 followers each day. Plan B starts with 15 followers and doubles its number of followers each day. Which plan is exponential? Explain using how it changes.

ANSWER _____

5 For x = 0, 1, or 2, what is the first x-value at which $G(x) = 6 \cdot 2^x$ is greater than F(x) = 6 + 2x?

ANSWER _____

6 At which listed x-value are A and B equal?

FUNCTION VALUES

x	A	B
0	25	5
1	30	10
2	35	20
3	40	40

ANSWER _____

APPLY IT Show your work

1 Your phone has 12 GB of storage in use, and you add 2 GB each week. A friend's backup starts at 3 GB and doubles each week. After 2 weeks, how many GB does each use? Which uses more?

WORK SPACE

ANSWER _____

2 One video starts with 40 views and gains 30 views each day. Another starts with 10 views and triples its views each day. Which video has more views after 2 days? Which has more after 3 days?

WORK SPACE

ANSWER _____

CHALLENGE One step up

For whole numbers $x \geq 0$, let $A(x) = 20 + 10x$ and $B(x) = 5 \cdot 2^x$. Find the first x-value for which $B(x) > A(x)$. Explain why B stays greater for every later whole-number x-value.

WORK SPACE AND ANSWER

ANSWER KEY # Growth Matchup

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Identify the family of each function. State the amount added or the factor multiplied when x increases by 1.	**A is linear and adds 6 each time. B is exponential and multiplies by 3 each time.**
2	At x = 2, how much greater is $G(x) = 10 \cdot 2^x$ than $F(x) = 10 + 5x$?	**20**
3	On the graph, how much greater is B than A at x = 3?	**3**
4	Plan A starts with 15 followers and gains 10 followers each day. Plan B starts with 15 followers and doubles its number of followers each day. Which plan is exponential? Explain using how it changes.	**Plan B is exponential because its number of followers is multiplied by 2 each day.**
5	For x = 0, 1, or 2, what is the first x-value at which $G(x) = 6 \cdot 2^x$ is greater than $F(x) = 6 + 2x$?	**1**
6	At which listed x-value are A and B equal?	**3**

PART 2 · APPLY IT

1. **Your phone uses 16 GB. Your friend's backup uses 12 GB. Your phone uses 4 GB more.** Add 2 GB twice to 12 GB to get 16 GB. Double 3 GB twice to get 12 GB, then compare.
2. **After 2 days, the first video has more views, 100 versus 90. After 3 days, the second video has more views, 270 versus 130.** For the first video, add 30 views per day. For the second, multiply the view count by 3 each day.

CHALLENGE

The first value is x = 4: B(3) = 40 < A(3) = 50, but B(4) = 80 > A(4) = 60. From then on, B doubles each step, so it gains at least 80, while A gains only 10. B stays greater.

Accept equivalent wording for constant differences and multiplication factors. In the challenge, accept any valid explanation that the gap continues to grow after x = 4.