LESSON MAKER PRO

Growth or Gain?

Read what each number in a function tells you.

HIGH SCHOOL · A1P.AF.H.27

A1P.AF.H.27 "Interpret the parameters of functions in terms of a context. Extend from linear functions, written in the form mx + b, to exponential functions, written in the form ab^x."

NAME _____ DATE _____

STARTING VALUE AND CHANGE

In a linear function written as mx + b, b is the starting value and m is the amount added each time x increases by 1. In an exponential function written as ab^x, a is the starting value and b is the factor multiplied each time x increases by 1. A factor greater than 1 means growth; a factor between 0 and 1 means decay.

WORKED EXAMPLE

A video has $V(x) = 24(5/4)^x$ thousand views x days after posting. Interpret the numbers in the function, then find its views after 2 days.

1. $V(0) = 24(5/4)^0 = 24$, so the video starts with 24 thousand views.
2. $5/4 = 1.25$, so views increase by 25% each day.
3. $V(2) = 24(5/4)^2 = 37.5$ thousand.

Answer: The video starts with 24 thousand views and grows by 25% per day. After 2 days, it has 37.5 thousand views.

PRACTICE 6 problems

1 A music app charges C(x) = 9x + 32 dollars after x months. What does 9 mean?

ANSWER _____

2 A gift card has B(x) = 120 - 8x dollars left after x game rentals. What does 120 mean?

ANSWER _____

3 A phone's battery level is $P(x) = 64(1/2)^x$ percent after x hours. What percent of its battery level does it lose each hour?

ANSWER _____

4 A club models its membership as $N(x) = 70(3/2)^x$ members after x years. What do 70 and 3/2 mean?

ANSWER _____

5 A streaming service charges an $11 sign-up fee and $7 for each month. Write a linear function C(x) for the total cost after x months.

ANSWER _____

6 A pair of sneakers has a resale value of $160. Its value drops by 10% each month. Write an exponential function V(x) for its value after x months.

ANSWER _____

APPLY IT Show your work

1 Two students post videos on the same day. Video A starts with 200 views and gains 50 views each day. Video B starts with 100 views and doubles its views each day. Write a function for each video's views x days after posting. Which video has more views after 3 days? Explain what 50 and the doubling factor mean.

WORK SPACE

ANSWER _____

2 A student buys a used bike for $300. Its resale value drops by 20% each year. A repair fund starts at $30, and the student adds $40 each year. Write functions for the bike's resale value and the repair fund x years after purchase. Explain what each yearly change means. After 1 year, is the fund large enough to cover the bike's loss in value?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Channel A starts with 80 subscribers and gains 40 each week. Channel B starts with 32 subscribers and doubles each week. Write a function for each channel's subscribers x weeks from now. Find the first whole week when Channel B has more subscribers than Channel A, and show how you know it is the first.

WORK SPACE AND ANSWER

ANSWER KEY

Growth or Gain?

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A music app charges C(x) = 9x + 32 dollars after x months. What does 9 mean?	**The cost increases by $9 each month.**
2	A gift card has B(x) = 120 - 8x dollars left after x game rentals. What does 120 mean?	**The gift card starts with $120.**
3	A phone's battery level is $P(x) = 64(1/2)^x$ percent after x hours. What percent of its battery level does it lose each hour?	**50% of its battery level each hour.**
4	A club models its membership as $N(x) = 70(3/2)^x$ members after x years. What do 70 and 3/2 mean?	**The club starts with 70 members. Its modeled membership increases by 50% each year.**
5	A streaming service charges an $11 sign-up fee and $7 for each month. Write a linear function C(x) for the total cost after x months.	**C(x) = 7x + 11**
6	A pair of sneakers has a resale value of $160. Its value drops by 10% each month. Write an exponential function V(x) for its value after x months.	**$V(x) = 160(9/10)^x$**

PART 2 · APPLY IT

1. **$A(x) = 200 + 50x$; $B(x) = 100(2)^x$. After 3 days, Video A has 350 views and Video B has 800, so Video B has more. Video A gains 50 views each day, while Video B's views are multiplied by 2 each day.** Substitute x = 3 into both functions: $A(3) = 200 + 50(3) = 350$ and $B(3) = 100(2)^3 = 800$.
2. **$V(x) = 300(4/5)^x$ and $F(x) = 30 + 40x$. The bike keeps 4/5 of its value each year, while the fund gains $40 each year. After 1 year, the bike has lost $60 and the fund holds $70, so the fund is large enough.** The bike is worth $300(4/5) = \$240$ after 1 year, a loss of $60. The fund has $30 + 40 = \$70$.

CHALLENGE

$A(x) = 80 + 40x$ and $B(x) = 32(2)^x$. At weeks 0, 1, and 2, A has 80, 120, and 160 subscribers while B has 32, 64, and 128. At week 3, A has 200 and B has 256. Week 3 is the first whole week B has more.

Accept equivalent function notation and descriptions such as "multiplies by 3/2 each year" for 50% yearly growth. In the challenge, students must check the earlier whole weeks to support their claim that week 3 is first.