

Growth or Fade

Classify exponential models by their change factor.

HIGH SCHOOL • MA.912.AR.5.3

MA.912.AR.5.3 "Given a mathematical or real-world context, classify an exponential function as representing growth or decay."

NAME _____

DATE _____

THE BIG IDEA

In an exponential function $y = a(b)^x$, the base b is the change factor. If $b > 1$, the function represents growth. If $0 < b < 1$, the function represents decay.

WORKED EXAMPLE

Classify $P(x) = 24(1.25)^x$ as growth or decay.

1. Identify the base: $b = 1.25$.
2. Compare the base to 1: $1.25 > 1$.
3. A base greater than 1 represents growth.

Answer: $P(x)$ represents exponential growth.

PRACTICE 6 problems

- 1** Classify $A(x) = 6(3)^x$ as growth or decay.

ANSWER _____

- 2** Classify $B(x) = 10(1/5)^x$ as growth or decay.

ANSWER _____

- 3** Classify $C(x) = 14(0.7)^x$ as growth or decay.

ANSWER _____

- 4** Classify $D(x) = 8(1.4)^x$ as growth or decay.

ANSWER _____

- 5** Classify $E(x) = 30(2/3)^x$ as growth or decay.

ANSWER _____

- 6** A quantity is multiplied by 0.9 every week. Does this represent growth or decay?

ANSWER _____

APPLY IT Show your work

- 1** A gaming channel has 80 subscribers. Its subscriber count is modeled by $S(x) = 80(3/2)^x$, where x is the number of months. Does the model represent growth or decay?

WORK SPACE

ANSWER _____

- 2** A pair of wireless headphones has a battery level modeled by $B(t) = 96(3/4)^t$, where t is the number of hours of use. Does the model represent growth or decay?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Classify $R(x) = 45(5/3)^{-x}$ as growth or decay. Explain your reasoning.

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Classify $A(x) = 6(3)^x$ as growth or decay.	Growth
2	Classify $B(x) = 10(1/5)^x$ as growth or decay.	Decay
3	Classify $C(x) = 14(0.7)^x$ as growth or decay.	Decay
4	Classify $D(x) = 8(1.4)^x$ as growth or decay.	Growth
5	Classify $E(x) = 30(2/3)^x$ as growth or decay.	Decay
6	A quantity is multiplied by 0.9 every week. Does this represent growth or decay?	Decay

PART 2 · APPLY IT

1. **Growth** The base is $3/2$. Since $3/2$ is greater than 1, the subscriber count represents exponential growth.
2. **Decay** The base is $3/4$. Since $3/4$ is between 0 and 1, the battery level represents exponential decay.

CHALLENGE

Decay, because $(5/3)^{-x} = (3/5)^x$, and $3/5$ is between 0 and 1.

Accept "exponential growth" or "growth," and "exponential decay" or "decay." For the challenge, accept any correct explanation that rewrites the negative exponent or identifies the effective base as $3/5$.