LESSON MAKER PRO

Numbers Tell Stories

Find what a model says about a starting amount and how it changes.

HIGH SCHOOL · MT.CORE.ALG.MOD.2

MT.CORE.ALG.MOD.2 "Interpret the coefficients in a linear, quadratic, and exponential model in context. This standard should incorporate cultural context relating to Montana Indigenous Peoples and local communities."

NAME _____ DATE _____

READ THE COEFFICIENTS

In $y = mx + b$, b is the amount at $x = 0$, and m is the change when x increases by 1. In $y = ax^2 + bx + c$, c is the amount at $x = 0$, and the one-step changes increase by 2a each time. In $y = p(r)^x$, p is the amount at $x = 0$, and r is the factor multiplied each time x increases by 1.

WORKED EXAMPLE

A student club starts with $13 in its supply fund and adds $11 each week. The model is $F(x) = 11x + 13$, where x is the number of weeks. Interpret both coefficients.

1. At $x = 0$, $F(0) = 11(0) + 13 = 13$.
2. Each time x increases by 1, F(x) increases by 11.

Answer: The club starts with $13 and adds $11 per week.

PRACTICE 6 problems

1 A school concert's funds are modeled by $R(x) = 8x + 15$ dollars after x tickets are sold. What does 8 mean?

ANSWER _____

2 A trail cleanup team models its remaining supply as $B(x) = 40 - 4x$ bags after x volunteer groups pick up bags. What does -4 mean?

ANSWER _____

3 A club models its total planning time as $H(x) = x^2 + 4x + 4$ hours for x community events. What does the final 4 mean?

ANSWER _____

4 A model for printing x art posters is $C(x) = 2x^2 + 5x + 6$ dollars. What does the coefficient 2 tell you about the cost of each additional poster?

ANSWER _____

5 A school podcast models its listeners as $L(x) = 30(2)^x$, where x is days after release. What does 30 mean?

ANSWER _____

6 A student-run video channel models weekly views as $V(x) = 80(3/4)^x$, where x is weeks after posting. What does 3/4 mean?

ANSWER _____

APPLY IT Show your work

1 For a hypothetical youth art showcase near Salish Kootenai College in Pablo, Montana, students model the cost of making x display panels as $C(x) = 3x^2 + 2x + 18$ dollars. What does 18 mean? As the students make more panels, how does the cost of each additional panel change?

WORK SPACE

ANSWER _____

2 Suppose a youth media team at Aaniiih Nakoda College in Harlem, Montana, shares an invitation for a community STEM night. The model $V(x) = 24(3/2)^x$ estimates views x days after posting. What do 24 and 3/2 mean? How many views does the model predict after 2 days?

WORK SPACE

ANSWER _____

CHALLENGE One step up

A youth event budget follows $C(x) = 4x^2 + 6x + 10$ dollars, where x is the number of display tables. A student says, "The 6 means the cost rises by $6 for the first table." Is the student correct? Explain what the 6 contributes and find the actual cost increase from zero to one table.

WORK SPACE AND ANSWER

Numbers Tell Stories

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A school concert's funds are modeled by $R(x) = 8x + 15$ dollars after x tickets are sold. What does 8 mean?	**Each ticket sold adds $8 to the funds.**
2	A trail cleanup team models its remaining supply as $B(x) = 40 - 4x$ bags after x volunteer groups pick up bags. What does -4 mean?	**The supply drops by 4 bags for each group.**
3	A club models its total planning time as $H(x) = x^2 + 4x + 4$ hours for x community events. What does the final 4 mean?	**The club has spent 4 hours planning before any events.**
4	A model for printing x art posters is $C(x) = 2x^2 + 5x + 6$ dollars. What does the coefficient 2 tell you about the cost of each additional poster?	**The cost of each additional poster is $4 more than the cost of the previous additional poster.**
5	A school podcast models its listeners as $L(x) = 30(2)^x$, where x is days after release. What does 30 mean?	**The model starts with 30 listeners on the release day.**
6	A student-run video channel models weekly views as $V(x) = 80(3/4)^x$, where x is weeks after posting. What does 3/4 mean?	**Each week's predicted views are 3/4 of the previous week's, a decrease of 25% per week.**

PART 2 · APPLY IT

1. **The $18 is the starting cost before any panels are made. Each additional panel costs $6 more than the previous additional panel.** $C(0) = 18$. Because the coefficient of x^2 is 3, the one-step increases rise by $2(3) = 6$ dollars each time.
2. **The model starts at 24 views. Views are multiplied by 3/2 each day, an increase of 50% per day. After 2 days, the model predicts 54 views.** The starting amount is 24, and the daily factor is 3/2. $V(2) = 24(3/2)(3/2) = 54$.

CHALLENGE

No. The $6x$ term contributes $6 for the first table, but the $4x^2$ term contributes another $4. The cost rises by $10 from zero to one table.

Accept equivalent descriptions of increases and decreases. For quadratic models, distinguish a term's contribution from the total cost of adding one item.