

Build the Rule

Turn real situations into function rules.

HIGH SCHOOL • AII-F.BF.1.a

AII-F.BF.1.a "Determine a function from context. Determine an explicit expression, a recursive process, or steps for calculation from a context."

NAME _____

DATE _____

START, THEN CHANGE

First identify the starting amount and how the amount changes for each unit of x . For a constant change, use output = starting amount + (change per unit) x . When each new value depends on the value before it, write a recursive rule with a starting value and an update rule.

WORKED EXAMPLE

A bike rental charges an \$18 unlock fee and \$4 for each hour ridden. Write a function $C(x)$ for the total cost after x hours.

1. Let x be the number of hours and $C(x)$ be the total cost.
2. The unlock fee is the starting cost, 18.
3. The hourly charge is $4x$.
4. Add the two parts: $C(x) = 18 + 4x$.

Answer: $C(x) = 18 + 4x$

PRACTICE 6 problems

- 1** A plant is 7 cm tall when $x = 0$ and grows 3 cm each week. Write $h(x)$, the plant's height after x weeks.

ANSWER _____

- 2** A video game's score multiplier starts at 2 in round 1 and doubles each new round. Write a recursive rule for $m(x)$, where x is the round number.

ANSWER _____

- 3** A scooter battery has 45% charge at $x = 0$ and loses 6 percentage points each hour. Write $b(x)$, the battery charge after x hours.

ANSWER _____

- 4** A music venue charges a \$5 service fee plus \$9 for each ticket. Write $c(x)$, the total cost of x tickets.

ANSWER _____

- 5** At $x = 0$, a science lab is 64 degrees F. It cools 2 degrees each minute. Write $T(x)$, the temperature after x minutes.

ANSWER _____

- 6** A gaming club has 11 points before any matches. It earns 8 points per match. Write $p(x)$, and state what x represents.

ANSWER _____

APPLY IT Show your work

- 1** Jordan earns a \$26 platform bonus for posting digital art, plus \$13 for each avatar design sold. Write $E(x)$, Jordan's earnings after selling x designs. Then find $E(7)$.

WORK SPACE

ANSWER _____

- 2** A student has \$90 saved for a concert trip and adds \$15 every week. Write a recursive rule for $B(x)$, where x is the number of completed weeks, including the starting value. Then find $B(6)$.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A student club orders event stickers. A print shop charges \$30 for up to 20 stickers. Each sticker beyond 20 costs \$2 more. Write a rule for $C(x)$, the cost of x stickers. Find $C(27)$, and explain why you used the second part of the rule.

WORK SPACE AND ANSWER

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A plant is 7 cm tall when $x = 0$ and grows 3 cm each week. Write $h(x)$, the plant's height after x weeks.	$h(x) = 7 + 3x$
2	A video game's score multiplier starts at 2 in round 1 and doubles each new round. Write a recursive rule for $m(x)$, where x is the round number.	$m(1) = 2$; $m(x) = 2m(x - 1)$ for $x \geq 2$
3	A scooter battery has 45% charge at $x = 0$ and loses 6 percentage points each hour. Write $b(x)$, the battery charge after x hours.	$b(x) = 45 - 6x$
4	A music venue charges a \$5 service fee plus \$9 for each ticket. Write $c(x)$, the total cost of x tickets.	$c(x) = 5 + 9x$
5	At $x = 0$, a science lab is 64 degrees F. It cools 2 degrees each minute. Write $T(x)$, the temperature after x minutes.	$T(x) = 64 - 2x$
6	A gaming club has 11 points before any matches. It earns 8 points per match. Write $p(x)$, and state what x represents.	$p(x) = 11 + 8x$; x represents the number of matches

PART 2 • APPLY IT

- $E(x) = 26 + 13x$; $E(7) = 117$** Use 26 as the starting amount and add 13 for each design. Substitute 7 into the function to get $26 + 13(7) = 117$.
- $B(0) = 90$; $B(x) = B(x - 1) + 15$ for $x \geq 1$; $B(6) = 180$** The balance starts at 90 when zero weeks are complete, then increases by 15 each week. After 6 weeks, the balance is $90 + 6(15) = 180$.

CHALLENGE

$C(x) = 30$ for $0 \leq x \leq 20$; $C(x) = 30 + 2(x - 20)$ for $x > 20$. $C(27) = 44$. The order has 7 stickers beyond 20, so the extra cost is $2(7) = 14$.

Accept equivalent algebraic forms, such as $3x + 7$. Accept recursive rules with a different starting index only if the stated starting value and update rule are consistent.