LESSON MAKER PRO

Function Builder Lab

Turn changing quantities into rules.

HIGH SCHOOL · HSF-BF.A.1a

CCSS.Math.Content.HSF-BF.A.1a "Determine an explicit expression, a recursive process, or steps for calculation from a context."

NAME _____ DATE _____

BUILD THE RULE

For a quantity that changes by the same amount each time, begin with the starting amount and add the rate times the input. For a quantity that is repeatedly multiplied, state the starting value and multiply by the same factor for each new step.

WORKED EXAMPLE

A pop-up photo booth charges a $13 setup fee and $17 for each printed strip. Write an explicit expression for the total cost T(n) for n strips.

1. Let n represent the number of printed strips.
2. The setup fee contributes 13 dollars.
3. The strips contribute 17n dollars.
4. Add the two parts: T(n) = 13 + 17n.

Answer: T(n) = 13 + 17n

PRACTICE 6 problems

1 A bike-share ride costs $4 to unlock and $3 for each 10-minute block. Write an explicit expression C(b) for the cost of b blocks.

ANSWER _____

2 A game character has 5 energy units at level 1. At each later level, the character has 2 more energy units than at the previous level. Write a recursive rule for E(n).

ANSWER _____

3 A school's recycling contest collects 6 cans on day 1. Each following day, it collects 3 times as many cans as the day before. Write a recursive rule for c(n).

ANSWER _____

4 A playlist has 8 songs this week. You add 4 songs each week. Write an explicit expression P(w) for the number of songs after w weeks.

ANSWER _____

5 A digital art file is 2 MB after its first saved version. Its size doubles with each later revision. Write a recursive rule for A(r).

ANSWER _____

6 A club pays $9 for a booth permit and earns $5 from each bracelet sold. Write an explicit expression P(x) for the club's profit after selling x bracelets.

ANSWER _____

APPLY IT Show your work

1 You have $15 saved for a concert ticket. You earn $8 for each dog-walking job. Write an explicit expression S(j) for the amount saved after j jobs.

WORK SPACE

ANSWER _____

2 A student's tutorial video is watched by 7 people on day 1. Each following day, the number of new viewers is twice the previous day's number. Write an explicit expression V(d) for the number of new viewers on day d.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A coding club completes 1 challenge on day 1, 4 challenges on day 2, 9 challenges on day 3, and 16 challenges on day 4. Write an explicit expression D(d) for the number of challenges completed on day d. Then explain why a recursive rule that adds one fixed amount each day does not fit this pattern.

WORK SPACE AND ANSWER

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A bike-share ride costs $4 to unlock and $3 for each 10-minute block. Write an explicit expression C(b) for the cost of b blocks.	**C(b) = 4 + 3b**
2	A game character has 5 energy units at level 1. At each later level, the character has 2 more energy units than at the previous level. Write a recursive rule for E(n).	**E(1) = 5, E(n) = E(n-1) + 2 for n >= 2**
3	A school's recycling contest collects 6 cans on day 1. Each following day, it collects 3 times as many cans as the day before. Write a recursive rule for c(n).	**c(1) = 6, c(n) = 3c(n-1) for n >= 2**
4	A playlist has 8 songs this week. You add 4 songs each week. Write an explicit expression P(w) for the number of songs after w weeks.	**P(w) = 8 + 4w**
5	A digital art file is 2 MB after its first saved version. Its size doubles with each later revision. Write a recursive rule for A(r).	**A(1) = 2, A(r) = 2A(r-1) for r >= 2**
6	A club pays $9 for a booth permit and earns $5 from each bracelet sold. Write an explicit expression P(x) for the club's profit after selling x bracelets.	**P(x) = 5x - 9**

PART 2 · APPLY IT

1. **S(j) = 15 + 8j** The starting savings amount is 15 dollars. Each job adds 8 dollars, so add 8j to 15.
2. **V(d) = 7 * $2^{(d-1)}$** The first-day value is 7 when d = 1. The factor of 2 is applied d - 1 times.

CHALLENGE

D(d) = d^2. The increases are 3, 5, and 7, not one fixed amount, so a fixed-addition recursive rule does not fit.

Accept equivalent algebraic forms, such as 3b + 4 for C(b). For recursive rules, accept equivalent notation when the initial value, repeated operation, and starting index are all correct.