LESSON MAKER PRO

Line Builder Lab

Find the rate, the start, and the rule.

GRADE 8 · 8.FGR.5.7

8.FGR.5.7 "Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values..."

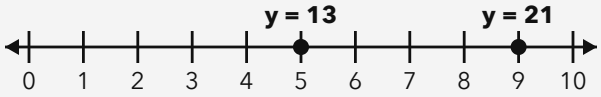
NAME _____ DATE _____

BUILD THE RULE

A linear function has a constant rate of change, m, and an initial value, b. Find m by dividing the change in y by the change in x, then use y = mx + b and a known point to find b.

WORKED EXAMPLE

On the number line, each marked x-value is paired with the y-value in its label. Construct the linear function.



1. Read the pairs as (5, 13) and (9, 21).
2. Find the rate: m = (21 - 13)/(9 - 5) = 8/4 = 2.
3. Use (5, 13): 13 = 2(5) + b, so b = 3.
4. Write the function as y = 2x + 3.

Answer: y = 2x + 3

PRACTICE 6 problems

1 A bike rental costs $6 to start and $7 for each hour. Let x be the number of hours and y be the total cost. Write the function. State the rate of change and initial value.

ANSWER _____

2 A linear function passes through (1, 16) and (4, 31). Write the function. State the rate of change and initial value.

ANSWER _____

3 At the start of a game, a player has -5 points. The player loses 3 points each round. Let x be the number of rounds and y be the score. Write the function.

ANSWER _____

_____

4 A linear function passes through (-3, 16) and (1, 4). Write the function. State the rate of change and initial value.

ANSWER _____

_____

5 A linear function increases by 12 when x increases by 4. It passes through (5, 0). Write the function.

ANSWER _____

_____

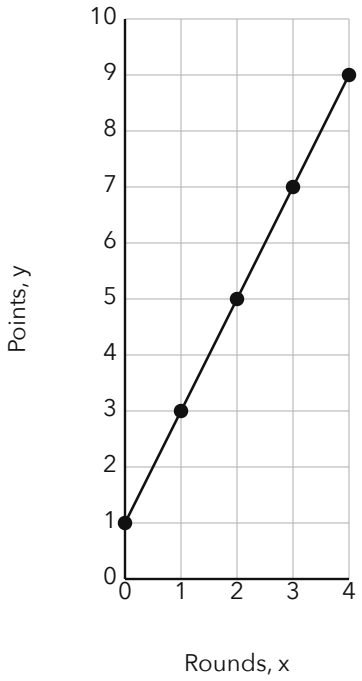
6 A linear function has y = -8 when x = 0 and y = 10 when x = 6. Write the function.

ANSWER _____

_____

APPLY IT Show your work

1 The graph shows points earned in a mobile game after x rounds. Let y be the total points. Write a function for the relationship, then state the rate of change and initial value.



ANSWER _____

2 The table shows the total dollars, y, in an esports team's snack-sale fund after x sales shifts. Write a function for the fund. State the rate of change and initial value.

SNACK-SALE FUND

Sales shifts, x	Total dollars, y
0	9
2	15
5	24

ANSWER _____

CHALLENGE One step up

The ordered pairs (2, 11), (6, 23), and (10, 34) are reported for one linear relationship. Can all three pairs be on the same linear function? Use rates of change to explain. If not, write a function through the first two points.

WORK SPACE AND ANSWER

ANSWER KEY # Line Builder Lab

GRADE 8 · 8.FGR.5.7

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A bike rental costs $6 to start and $7 for each hour. Let x be the number of hours and y be the total cost. Write the function. State the rate of change and initial value.	**y = 7x + 6; rate of change: 7 dollars per hour; initial value: 6 dollars**
2	A linear function passes through (1, 16) and (4, 31). Write the function. State the rate of change and initial value.	**y = 5x + 11; rate of change: 5; initial value: 11**
3	At the start of a game, a player has -5 points. The player loses 3 points each round. Let x be the number of rounds and y be the score. Write the function.	**y = -3x - 5; rate of change: -3; initial value: -5**
4	A linear function passes through (-3, 16) and (1, 4). Write the function. State the rate of change and initial value.	**y = -3x + 7; rate of change: -3; initial value: 7**
5	A linear function increases by 12 when x increases by 4. It passes through (5, 0). Write the function.	**y = 3x - 15; rate of change: 3; initial value: -15**
6	A linear function has y = -8 when x = 0 and y = 10 when x = 6. Write the function.	**y = 3x - 8; rate of change: 3; initial value: -8**

PART 2 · APPLY IT

1. **y = 2x + 1; rate of change: 2 points per round; initial value: 1 point** Read the initial value at x = 0, which is 1. The graph rises 2 points for each 1 round, so m = 2.
2. **y = 3x + 9; rate of change: 3 dollars per shift; initial value: 9 dollars** The fund starts with $9 when x = 0. The total increases $6 in 2 shifts, so the rate is $3 per shift.

CHALLENGE

No. The rate from (2, 11) to (6, 23) is 3, but the rate from (6, 23) to (10, 34) is 11/4. The rates are not equal. The function through the first two points is y = 3x + 5.

Accept equivalent function forms, such as 7x + 6 = y. For the challenge, students must show that the two rates of change are different and give y = 3x + 5 for the first two points.