

Build the Line

Find the rate, initial value, and equation.

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 _____

THE BIG IDEA

A linear relationship changes by the same amount for each increase of 1 in x . Find the rate of change m by dividing the change in y by the change in x . Then use $y = mx + b$ and a known point to find b , the initial value when $x = 0$.

WORKED EXAMPLE

A line passes through (4,17) and (10,35). Write its equation.

1. $m = (35 - 17)/(10 - 4) = 18/6 = 3$.

2. Use (4,17): $17 = 3(4) + b$.

3. $b = 5$.

Answer: $y = 3x + 5$

PRACTICE 6 problems

- 1** The table shows a linear relationship. x : 0, 1, 2 y : 9, 16, 23 Find the rate of change, initial value, and equation.

ANSWER _____

- 2** A line passes through (1,9) and (8,23). Find the rate of change, initial value, and equation.

ANSWER _____

- 3** A plant is 11 cm tall when $x = 0$. It grows 8 cm each day. Write an equation for its height y after x days. State the rate of change and initial value.

ANSWER _____

- 4** On a graph, a line crosses the y -axis at 14 and passes through (7,28). Find the rate of change and write the equation.

ANSWER _____

- 5** The table shows a linear relationship. x : 0, 2, 8 y : 13, 27, 69 Find the rate of change, initial value, and equation.

ANSWER _____

- 6** A line passes through (1,13) and (7,1). Find the rate of change, initial value, and equation.

ANSWER _____

APPLY IT Show your work

- 1** A gaming tournament gives a player 15 bonus points for joining and 7 points for each round the player completes. Let x be the number of rounds. Write a function for the total points y . State the rate of change and initial value. Then find the total after 8 rounds.

WORK SPACE

ANSWER _____

- 2** Your class orders custom phone cases. The company charges a \$13 design fee and \$8 for each case. Let x be the number of cases and y be the total cost. Write a function, state the rate of change and initial value, and find the cost of 9 cases.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A line passes through $(2, 15)$ and $(9, 1)$. Jordan says the initial value is 15 because it is a y -value. Is Jordan correct? Explain, then write the function.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	The table shows a linear relationship. x: 0, 1, 2 y: 9, 16, 23 Find the rate of change, initial value, and equation.	Rate of change: 7; initial value: 9; $y = 7x + 9$
2	A line passes through (1,9) and (8,23). Find the rate of change, initial value, and equation.	Rate of change: 2; initial value: 7; $y = 2x + 7$
3	A plant is 11 cm tall when $x = 0$. It grows 8 cm each day. Write an equation for its height y after x days. State the rate of change and initial value.	Rate of change: 8 cm per day; initial value: 11 cm; $y = 8x + 11$
4	On a graph, a line crosses the y-axis at 14 and passes through (7,28). Find the rate of change and write the equation.	Rate of change: 2; $y = 2x + 14$
5	The table shows a linear relationship. x: 0, 2, 8 y: 13, 27, 69 Find the rate of change, initial value, and equation.	Rate of change: 7; initial value: 13; $y = 7x + 13$
6	A line passes through (1,13) and (7,1). Find the rate of change, initial value, and equation.	Rate of change: -2; initial value: 15; $y = -2x + 15$

PART 2 • APPLY IT

- $y = 7x + 15$; rate of change: 7 points per round; initial value: 15 points; after 8 rounds: 71 points** The player starts with 15 points and gains 7 points per round, so $y = 7x + 15$. Substitute $x = 8$ to get $y = 71$.
- $y = 8x + 13$; rate of change: \$8 per case; initial value: \$13; cost of 9 cases: \$85** The design fee is the initial value, and the price per case is the rate of change. Use $y = 8x + 13$, then substitute $x = 9$.

CHALLENGE

No. The rate of change is $(1 - 15)/(9 - 2) = -2$. The function is $y = -2x + 19$, so the initial value is 19 because it is the value when $x = 0$.

Accept equivalent equation forms, such as $f(x)$ in place of y . For word problems, accept correct rate and initial value descriptions with matching units.