

Line Clues

Find the rate, starting value, and equation.

GRADE 8 • 8.F.B.4

CCSS.Math.Content.8.F.B.4 "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 A LINEAR MODEL

For a linear relationship, the rate of change tells how much y changes when x increases by 1. From two points, find the rate with $(\text{change in } y)/(\text{change in } x)$, then use $y = mx + b$ to find b , the value of y when $x = 0$. In $y = mx + b$, m is the rate of change and b is the initial value.

WORKED EXAMPLE

A line goes through (13, 31) and (17, 43). Write its equation.

1. Find the rate: $(43 - 31) / (17 - 13) = 12 / 4 = 3$.
2. Use $y = mx + b$ with (13, 31): $31 = 3(13) + b$.
3. Solve: $31 = 39 + b$, so $b = -8$.

Answer: $y = 3x - 8$

PRACTICE 6 problems

- 1** A line passes through (0, 7) and (5, 27). Find the rate of change, the initial value, and the equation.

ANSWER _____

- 2** Use the table to write an equation and identify the rate of change and initial value.
 x : -4, 0, 4 y : -14, -6, 2

ANSWER _____

- 3** A temperature is 18 degrees at the start and drops 4 degrees each hour. Let x be hours and y be temperature. Write an equation. Identify the rate of change and initial value.

ANSWER _____

- 4** A line passes through (9, -1) and (15, 11). Find the rate of change and write the equation.

ANSWER _____

- 5** Use the table to write an equation. x : 1, 6, 11 y : 10, 30, 50 Then identify the initial value.

ANSWER _____

- 6** A graph crosses the y -axis at -9. It rises 5 units for every 2 units it moves right. Write the equation of the line. What do the rate of change and initial value mean on the graph?

ANSWER _____

APPLY IT Show your work

- 1** A skate park charges a \$6 unlock fee for a helmet rental and \$5 for each hour of use. Let C be the total cost in dollars and h be the number of hours. Write a function for the cost. What do the rate of change and initial value mean?

WORK SPACE

ANSWER _____

- 2** Jay has 42 songs in a playlist. Each week, Jay adds 7 songs. Let S be the number of songs after w weeks. Write a function for the situation. What do the rate of change and initial value mean?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A game profile has 47 points after 4 completed quests and 83 points after 10 completed quests. Assume the relationship is linear. Let p be points and q be completed quests. Write an equation, then explain how you found the rate of change and initial value.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A line passes through (0, 7) and (5, 27). Find the rate of change, the initial value, and the equation.	Rate of change: 4. Initial value: 7. Equation: $y = 4x + 7$.
2	Use the table to write an equation and identify the rate of change and initial value. x: -4, 0, 4 y: -14, -6, 2	Rate of change: 2. Initial value: -6. Equation: $y = 2x - 6$.
3	A temperature is 18 degrees at the start and drops 4 degrees each hour. Let x be hours and y be temperature. Write an equation. Identify the rate of change and initial value.	$y = -4x + 18$. Rate of change: -4 degrees per hour. Initial value: 18 degrees.
4	A line passes through (9, -1) and (15, 11). Find the rate of change and write the equation.	Rate of change: 2. Equation: $y = 2x - 19$.
5	Use the table to write an equation. x: 1, 6, 11 y: 10, 30, 50 Then identify the initial value.	Equation: $y = 4x + 6$. Initial value: 6.
6	A graph crosses the y-axis at -9. It rises 5 units for every 2 units it moves right. Write the equation of the line. What do the rate of change and initial value mean on the graph?	$y = 5/2x - 9$. The rate of change is 5/2, so the line rises 5 units for every 2 units right. The initial value is -9, the y-coordinate where the line crosses the y-axis.

PART 2 • APPLY IT

- $C = 5h + 6$. The rate of change is \$5 per hour. The initial value is the \$6 unlock fee.** The hourly charge is the rate of change, so $m = 5$. The fee paid before any hours are used is the initial value, so $b = 6$.
- $S = 7w + 42$. The rate of change is 7 songs per week. The initial value is 42 songs.** Jay adds 7 songs each week, so the rate is 7. The playlist starts with 42 songs, so the initial value is 42.

CHALLENGE

$p = 6q + 23$. The points increase by $83 - 47 = 36$ while completed quests increase by $10 - 4 = 6$, so the rate is $36/6 = 6$ points per quest. Using $47 = 6(4) + b$ gives $b = 23$, so the profile began with 23 points.

Accept equivalent equation forms, such as $4x + 7 = y$. For contextual items, accept correct units and equivalent descriptions of the rate of change and initial value.