

Line Story Lab

Show one linear relationship in several clear ways.

GRADE 8 • TEKS 8.1.D

8.1.D "communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;"

NAME _____

DATE _____

CONNECT THE REPRESENTATIONS

A linear relationship can be shown with an equation, a table, ordered pairs, and a graph. The rate of change tells how y changes when x changes, and the starting value is the y -value when $x=0$. Use the same rate and starting value in every representation.

WORKED EXAMPLE

A table has x -values 12, 16, and 24 and y -values 95, 123, and 179. Write an equation for the relationship.

1. Find the change in y : $123 - 95 = 28$.
2. Find the change in x : $16 - 12 = 4$.
3. Find the rate of change: $28/4 = 7$.
4. Substitute a point: $95 = 7(12) + b$, so $b = 11$.

Answer: $y=7x+11$

PRACTICE 6 problems

- 1** A table has x -values 0, 5, and 10 and y -values 9, 19, and 29. Write an equation for the relationship.

ANSWER _____

- 2** For $y=-3x+8$, state the rate of change and the y -intercept. Then list the points when $x=0$ and when $x=1$.

ANSWER _____

- 3** A graph includes the points (1,9), (5,21), and (9,33). Write the equation of the line.

ANSWER _____

- 4** A line has a y -intercept of 30 and rises 5 units whenever x increases by 1. Write an equation and list two points on the line, including the y -intercept.

ANSWER _____

- 5** Complete the relationship shown by the table: x -values 6, 9, and 15; y -values 2, 3, and 5. Write an equation and state the rate of change.

ANSWER _____

- 6** A line passes through (0,-5) and (8,35). Find its rate of change and equation.

ANSWER _____

APPLY IT Show your work

- 1** A music app charges a one-time \$9 activation fee and \$2 for each song download. Let x be the number of downloads and y be the total cost. Write an equation, find the cost for 5 downloads, and give two points that could be graphed.

WORK SPACE

ANSWER _____

- 2** In a game, Jalen starts with 30 energy points. Each level-up uses 5 energy points. Let x be the number of level-ups and y be the energy points left. Write an equation, find y after 6 level-ups, and explain what the negative rate means.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Two video-editing apps charge by the project. App A costs $y=6x+10$ dollars. App B costs $y=8x$ dollars. Find the number of projects when the costs are equal. Then state which app costs less for fewer than 5 projects and for more than 5 projects. Explain using the rates and starting costs.

WORK SPACE AND ANSWER

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A table has x-values 0, 5, and 10 and y-values 9, 19, and 29. Write an equation for the relationship.	$y=2x+9$
2	For $y=-3x+8$, state the rate of change and the y-intercept. Then list the points when $x=0$ and when $x=1$.	Rate of change: -3; y-intercept: 8; points: (0,8) and (1,5)
3	A graph includes the points (1,9), (5,21), and (9,33). Write the equation of the line.	$y=3x+6$
4	A line has a y-intercept of 30 and rises 5 units whenever x increases by 1. Write an equation and list two points on the line, including the y-intercept.	$y=5x+30$; possible points: (0,30) and (2,40)
5	Complete the relationship shown by the table: x-values 6, 9, and 15; y-values 2, 3, and 5. Write an equation and state the rate of change.	$y=x/3$; rate of change: $1/3$
6	A line passes through (0,-5) and (8,35). Find its rate of change and equation.	Rate of change: 5; $y=5x-5$

PART 2 • APPLY IT

- $y=2x+9$; 5 downloads cost \$19; possible points: (0,9) and (5,19)** The activation fee is the starting value, so it is the y-intercept. The cost increases by \$2 for each download, so the rate of change is 2.
- $y=30-5x$; after 6 level-ups, $y=0$; the negative rate means the energy decreases by 5 points for each level-up.** The game begins with 30 points, which is the y-intercept. Subtract 5 for each level-up, then substitute $x=6$.

CHALLENGE

The costs are equal at 5 projects, and each costs \$40. App B costs less for fewer than 5 projects because it has no starting cost. App A costs less for more than 5 projects because its rate, \$6 per project, is lower than App B's rate, \$8 per project.

Accept equivalent equation forms, such as $2x+9=y$. Accept any correct ordered pairs that satisfy the stated equation. For explanations, require that students connect the rate of change and y-intercept to the context.