

Lines in Action

Model, solve, graph, and interpret linear situations.

HIGH SCHOOL • MA.912.AR.2.5

MA.912.AR.2.5 "Solve and graph mathematical and real-world problems that are modeled with linear functions. Interpret key features and determine constraints in terms of the context."

NAME _____

DATE _____

GRAPHING LINEAR MODELS

A linear function has a constant rate of change and can be written as $y = mx + b$. The slope m tells how y changes when x changes, and b gives the starting value. In a real situation, use the context to decide which x -values and y -values make sense.

WORKED EXAMPLE

Graph $y = 7x + 11$ by finding two points.

1. Choose $x = 2$: $y = 7(2) + 11 = 25$.
2. Plot $(2, 25)$.
3. Choose $x = 4$: $y = 7(4) + 11 = 39$, then plot $(4, 39)$.
4. Draw the line through the two points.

Answer: A line through $(2, 25)$ and $(4, 39)$.

PRACTICE 6 problems

- 1** For $y = -5x + 9$, state the slope and y -intercept. List two points you can use to graph the line.

ANSWER _____

- 2** A table has x -values 0, 5, and 10. The matching y -values are -10, -5, and 0. Write the linear equation.

ANSWER _____

- 3** Solve the system. Give the intersection point. $y = 9x - 15$ $y = 3x + 15$

ANSWER _____

- 4** Graph $y = -3x + 9$. State the slope, y -intercept, and one additional point on the line.

ANSWER _____

- 5** Write the equation of the line through $(0, -12)$ and $(6, 6)$.

ANSWER _____

- 6** The cost C , in dollars, for x concert tickets is $C = 12x + 15$. Find $C(5)$ and state a reasonable domain for x .

ANSWER _____

APPLY IT Show your work

- 1** A game-streaming service costs \$9 each month plus \$3 for each downloadable movie. Let C be the total monthly cost and let x be the number of movies downloaded. Write a function for C , find the cost for 5 movies, and graph the model for $0 \leq x \leq 5$. State the constraints.

WORK SPACE

ANSWER _____

- 2** A student starts a sneaker fund with \$24 and adds \$6 each week. Let B be the balance after x weeks. Write a function for B , determine when the fund reaches \$54, and identify the initial balance and weekly rate. Graph the model through the week when the fund reaches \$54.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Two mobile data plans charge by the gigabyte. Plan A costs $A = 3x + 15$, and Plan B costs $B = 5x + 5$, where x is the number of gigabytes used in a month. Find when the plans cost the same. Then explain which plan costs less for fewer than that number of gigabytes and which costs less for more than that number. State a reasonable constraint for x .

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	For $y = -5x + 9$, state the slope and y-intercept. List two points you can use to graph the line.	Slope: -5. y-intercept: (0, 9). Sample points: (0, 9) and (5, -16).
2	A table has x-values 0, 5, and 10. The matching y-values are -10, -5, and 0. Write the linear equation.	$y = x - 10$
3	Solve the system. Give the intersection point. $y = 9x - 15$ $y = 3x + 15$	(5, 30)
4	Graph $y = -3x + 9$. State the slope, y-intercept, and one additional point on the line.	Slope: -3. y-intercept: (0, 9). One additional point: (5, -6).
5	Write the equation of the line through (0, -12) and (6, 6).	$y = 3x - 12$
6	The cost C , in dollars, for x concert tickets is $C = 12x + 15$. Find $C(5)$ and state a reasonable domain for x .	$C(5) = 75$. A reasonable domain is x is a whole number greater than or equal to 0.

PART 2 • APPLY IT

- $C = 3x + 9$; $C(5) = \$24$. Graph the discrete points on $C = 3x + 9$ for whole-number x -values from 0 through 5. The number of movies must be a whole number from 0 through 5 for this graph.** The monthly fee is the y-intercept, and the cost per movie is the slope. Because a student downloads a whole number of movies, use discrete points rather than every point on the line.
- $B = 6x + 24$. The fund reaches \$54 after 5 weeks. Initial balance: \$24. Weekly rate: \$6 per week. Graph the discrete model from $x = 0$ through $x = 5$, such as (0, 24), (3, 42), and (5, 54).** Set $6x + 24$ equal to 54 and solve to get $x = 5$. Weeks are counted in whole numbers, so the meaningful graph uses discrete nonnegative x -values.

CHALLENGE

The plans cost the same at $x = 5$ gigabytes, and each costs \$30. Plan B costs less for fewer than 5 gigabytes, and Plan A costs less for more than 5 gigabytes. A reasonable constraint is that x is a nonnegative whole number.

Accept equivalent equations and any correct pair of distinct points on each requested line. For context problems, accept a domain of nonnegative whole numbers when the quantity is counted, and accept discrete graphs when appropriate.