Algebra 1 TEKS Companion Guide

A review guide for the Algebra 1 Mathematics Texas Essential Knowledge and Skills **Student Edition**

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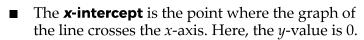
KEY FEATURES OF LINEAR FUNCTIONS



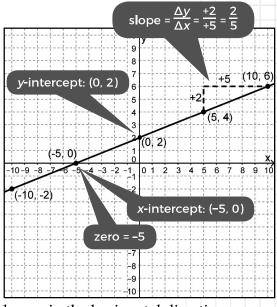
The student is expected to graph linear functions on the coordinate plane and identify key features, including *x*-intercept, *y*-intercept, zeros, and slope, in mathematical and real-world problems.

TELL ME MORE...

The graph of a linear function reveals certain attributes that are important to the function, especially when you are using a function to model real-world data or real-world situations. For example, the graph of $y = \frac{2}{5}x + 2$ (or, -2x + 5y = 10) is shown. Key features of the graph include the *x*-intercept, *y*-intercept, zero, and slope.



- The *y***-intercept** is the point where the graph of the line crosses the *y*-axis. Here, the *x*-value is 0.
- The **zero** of a linear function is the input value that generates an output value of 0. It is equivalent to the *x*-coordinate of the *x*-intercept.
- The **slope** of a linear function is the steepness of the graph of the line. Slope is measured as the ratio of the change in the vertical direction to the change in the horizontal direction.



EXAMPLES

EXAMPLE 1: The graph of a linear function is shown. What ordered pairs best represent the x-intercept and y-intercept of the line?

STEP 1 Use the coordinates of the two points provided to determine the slope of the line.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - (-3)}{7 - (-5)} = \frac{4}{12} = \frac{1}{3}$$

$$m = \frac{1}{3}$$

STEP 2 Use the point-slope formula to determine the equation of the line shown.

$$y = \frac{1}{3}x - \frac{4}{3}$$

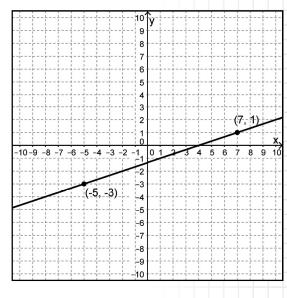
$$y - y_1 = m(x - x_1)$$

$$y - 1 = \frac{1}{3}(x - 7)$$

$$y - 1 = \frac{1}{3}x - \frac{7}{3}$$

$$y - 1 + 1 = \frac{1}{3}x - \frac{7}{3} + \frac{3}{3}$$

$$y = \frac{1}{3}x - \frac{4}{3}$$



STEP 3 Determine the coordinates of the *x*-intercept,
$$(x, 0)$$
, by substituting $y = 0$ and solving for x .

(4, 0)

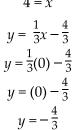
$$y = \frac{1}{3}x - \frac{4}{3}$$
$$0 = \frac{1}{3}x - \frac{4}{3}$$
$$0 = x - 4$$

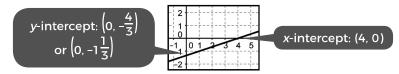
$$4 = x$$

STEP 4 Determine the coordinates of the *y*-intercept,
$$(0, y)$$
, by substituting $x = 0$ and solving for *y*.

$$\left(0, -\frac{4}{3}\right)$$

Check the reasonableness of your calculated intercepts by making STEP 5 sure the given graph crosses the line at these points.





EXAMPLE 2: The graph of r(x) is shown. What is the zero of r? Record your answer and fill in the bubbles on your answer document.

STEP 1 Use the coordinates of the two points provided to determine the slope of the line.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{7 - (-5)}{6 - 3} = \frac{12}{3} = 4$$

Use the point-slope formula to determine the STEP 2 equation of the line shown.

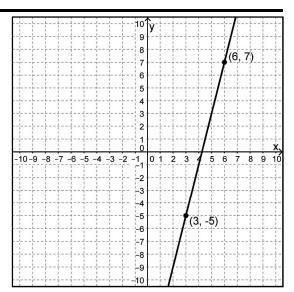
$$y - y_1 = m(x - x_1)$$

$$y - 7 = 4(x - 6)$$

$$y - 7 = 4x - 24$$

$$y = 4x - 17$$

$$r(x) = 4x - 17$$

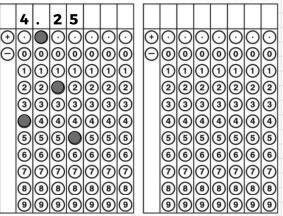


The zero of r is the x-value that makes r(x) = 0. Substitute 0 for r(x) and solve for x.

$$r(x) = 4x - 17$$
$$0 = 4x - 17$$
$$17 = 4x$$
$$\frac{17}{4} = x$$

The zero is $\frac{17}{4}$.

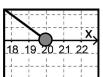
- **STEP 4** If the question is a gridded response question, enter your response on the grid provided. Practice using the grid with the instructions.
 - 1. Since the answer, $\frac{17}{4}$, is a fraction, convert it to a decimal, 4.25.
 - 2. Record a 4 in the first column containing numbers. Record a decimal point in the next column. Record and a 2 in the next column and a 5 in the next column.
 - 3. Bubble the 4 beneath the numeral 4. Bubble the . beneath the decimal point. Bubble the 2 beneath the numeral 2. Bubble the 5 beneath the numeral 5.



EXAMPLE 3 The graph shows the volume of propane, V(x), in a propane tank after x months. What do the x-intercept, y-intercept, and slope of the graph represent.

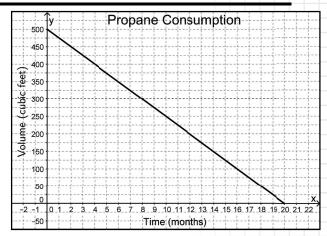
STEP 1 Identify the coordinates of the *x*-intercept from the graph, if possible.

(20, 0)



STEP 2 Interpret the coordinates of the *x*-intercept using the axis labels.

(20, 0) indicates 20 months and a volume of 0 cubic feet.



After 20 months, the volume of the propane tank was 0 cubic feet and the tank was empty.

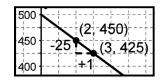
STEP 3 Identify the coordinates of the *y*-intercept from the graph, if possible. **(0, 500)**



STEP 4 Interpret the coordinates of the x-intercept using the axis labels. (0, 500) indicates 0 months and a volume of 500 cubic feet.

In the beginning (0 months), the tank had 500 cubic feet of propane.

STEP 5 Identify the slope from the graph. m = -25 cubic feet per month



STEP 6 Interpret the slope using the axis labels.

A slope of –25 cubic feet per month indicates a decrease of 25 cubic feet of propane from the tank each month.

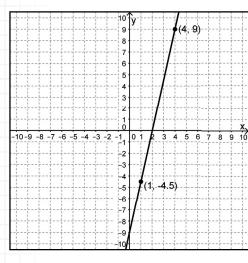
Each month, 25 cubic feet of propane was consumed.



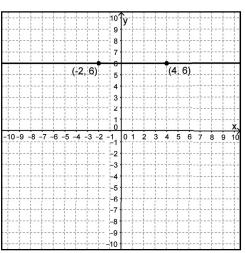
PRACTICE

For each graph shown, identify the slope, x-intercept, y-intercept, and zero (if they exist).

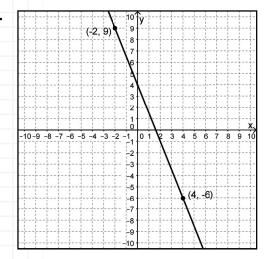
1.



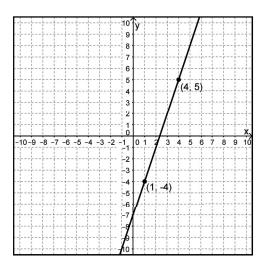
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2.

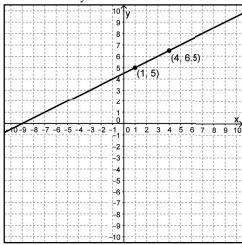


4.



5. Petra runs a snow cone stand in town. She sells snow cones in two sizes. Small cones sell for \$3 each and large cones sell for \$5 each. On Thursday evenings Petra sells an average of \$60 in snow cones. When the relationship of number of large cones sold, *x*, and the number of small cones sold, *y*, is plotted, what do the *x*- and *y*-intercepts represent?

6. The graph of linear function h(x) is shown. What is the zero of h(x)? Record your answer and fill in the bubbles on your answer document.



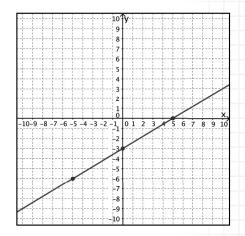
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Θ	0	0	0	0	0	0	0
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	4	4	4	4	4	4	4
	(5)	(5)	(5)	(5)	(5)	(5)	(5)
	6	6	6	6	_	_	6
	0	0	7	7	0	0	0
	8	8	8	8	8	8	8
	9	9	9	9	9	9	9

7. Maya's Coffee Club gift card balance information is shown in the table below.

Days used, x	Balance (\$), y		
13	71		
14	68		
20	50		
26	32		

If Maya writes a function to model the data on her gift card and graphs the function, where will the *x*- and *y*-intercepts be located?

- **8.** Carolina often calls her mother who lives in Canada. A 6-minute international call to her mother costs \$7 and a 15-minute international call costs \$10. On the graph of the function f(m) that represents the situation, what do the slope and y-intercept represent?
 - **A** The slope is the connection fee of \$5 and the *y*-intercept is the cost per minute.
 - **B** The slope is the cost per minute and the *y*-intercept is the cost of a 5-minute call.
 - **C** The slope is the cost per minute and the *y*-intercept is the connection fee of \$5.
 - **D** The slope is the cost to connect the call each minute and the *y*-intercept is the cost after talking 15-minutes.
- **9.** The graph of a linear function is shown below.



How will the graph change if the slope remains the same and the zero is changed to 7?

- **F** The graph will shift up 10 units.
- **G** The graph will shift down 2 units.
- **H** The graph will get steeper.
- **J** The graph will be less steep.