Lesson 6

Write Linear Equations

What You'll Learn

Scan the lesson. List two headings you would use to make an outline of the lesson.

- _____
- _____

Essential Question

WHY are graphs helpful?

Vocabulary

point-slope form

Common Core State Standards

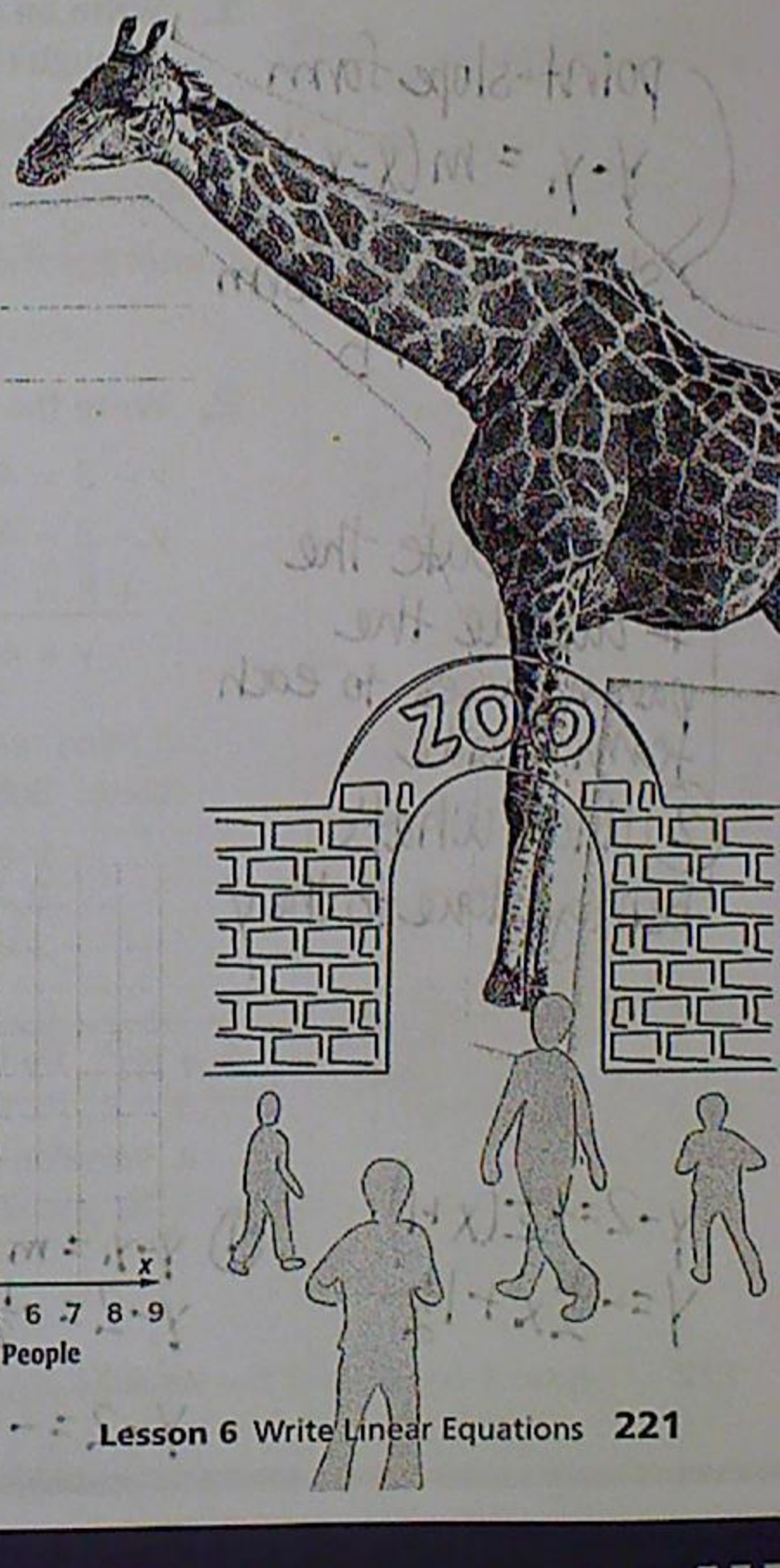
Content Standards
Preparation for 8.EE.8c

Mathematical Practices
1, 2, 3, 4, 5, 7

Real-World Link

Zoo The cost for 1, 2, 3, and 4 people to go the zoo is shown in the table.

Number of People, x	1	2	3	4
Total Cost, y	$13	$22	$31	$40



1. Is the relationship linear? Explain.

2. What is the slope of the related graph? ☐

3. Choose an ordered pair. (☐, ☐) Then substitute the values in the equation below.

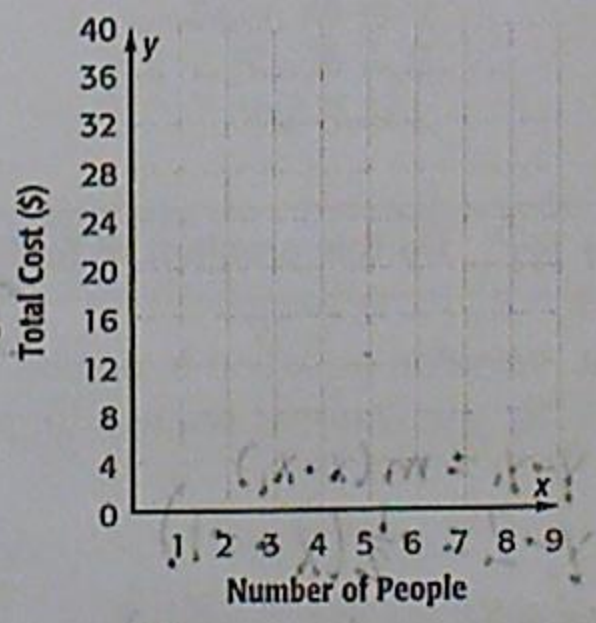
$$y = m \cdot x + b$$
$$\square = \square \cdot \square + b$$

4. Solve for b to find the y-intercept.

$b =$ ☐

5. Write an equation of the line in slope-intercept form.

6. Graph the data from the table on the coordinate plane.



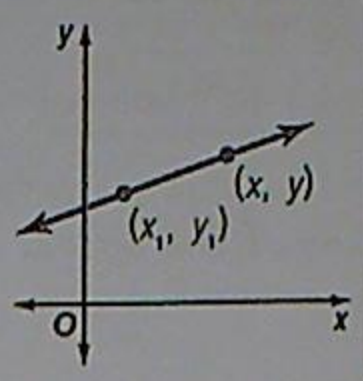
Key Concept

Point-Slope Form of a Linear Equation

Words The linear equation $y - y_1 = m(x - x_1)$ is written in point-slope form, where (x_1, y_1) is a given point on a nonvertical line and m is the slope of the line.

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

Graph



Work Zone

Slope
The point-slope form of a linear equation is tied directly to the definition of slope.

$$\frac{y - y_1}{x - x_1} = m$$
$$(y - y_1) = m(x - x_1)$$

point-slope form
$y - y_1 = m(x - x_1)$
↓
slope-intercept form
$y = mx + b$

Steps
① Distribute the # outside the parentheses to each term inside
② Undo what's being done to the y

You can write an equation of a line in slope-intercept form when you know the slope and the y-intercept. You can write an equation of a line in **point-slope form** when you are given the slope and the coordinates of a point on the line that is not the y-intercept.

Examples

Tutor

1. **Write an equation in point-slope form for the line that passes through $(-2, 3)$ with a slope of 4.**

$y - y_1 = m(x - x_1)$ Point-slope form

$y - 3 = 4[x - (-2)]$ $(x_1, y_1) = (-2, 3), m = 4$

$y - 3 = 4(x + 2)$ Simplify.

$y - y_1 = m(x - x_1)$
$y - 3 = 4(x - -2)$
$y - 3 = 4(x + 2)$

2. **Write the slope-intercept form of the equation from Example 1.**

$y = mx + b$

$y - 3 = 4(x + 2)$ Write the equation.

$y - 3 = 4x + 8$ Distributive Property

$+3 = \quad +3$ Addition Property of Equality

$y = 4x + 11$ Simplify.

$y - 3 = 4(x + 2)$
$y = 4x + 8 + 3$
$y = 4x + 11$

Check: Substitute the coordinates of the given ~~point in the equation~~.

$y = 4x + 11$
$3 \stackrel{?}{=} 4(-2) + 11$
$3 = 3$ ✓

Show your work.

Got It? **Do this problem to find out.**

a. Write an equation in point-slope form and slope-intercept form for the line that passes through $(-1, 2)$ and has a slope of $-\frac{1}{2}$.

a. $y - 2 = -\frac{1}{2}(x + 1)$
$y = -\frac{1}{2}x + 1\frac{1}{2}$

① $y - y_1 = m(x - x_1)$
$y - 2 = -\frac{1}{2}(x - -1)$
$y - 2 = -\frac{1}{2}(x + 1)$

② $y - 2 = -\frac{1}{2}(x + 1)$
$y - 2 = -\frac{1}{2}x + -\frac{1}{2}$
$+2 \quad +2$
$y = -\frac{1}{2}x + 1\frac{1}{2}$