

Lesson 2: Representing linear relations

By the end of this lesson you should be able to:

- Write a linear equation to represent a linear relation
- Use a table or graph to represent a linear relation

In a linear relation:

- The first differences in a table of values (the y-value differences) are constant

x	y	
1	0	> 5
2	5	> 5
3	10	> 5
4	15	> 5

- The graph will be a straight line
- The equation has a degree of 1 (highest exponent is 1)
- The equation of a linear relation can be written in a variety of equivalent forms, such as

- standard form: $ax + by + c = 0$

- slope y-intercept form: $y = mx + b$

- A graph and a table of values display some of the ordered pairs for a relation.
- You can use the equation of a relation to calculate ordered pairs.

Example 1: Creating a table of values

Jacob has \$15 to buy muffins and doughnuts at the school bake sale, as a treat for the Camera Club. Muffins are 75¢ each and doughnuts are 25¢ each. How many muffins and doughnuts can he buy?

→ \$0.25

~~\$0.75~~

a) Create a table to show the possible combinations of muffins and doughnuts.

# of muffins	\$	# of doughnuts	\$	total
0	0	60	15	15
20	15	0	0	15
10	7.50	30	7.50	15

b) What is the maximum number of muffins that Jacob can buy?

20

c) What is the maximum number of doughnuts that he can buy?

60

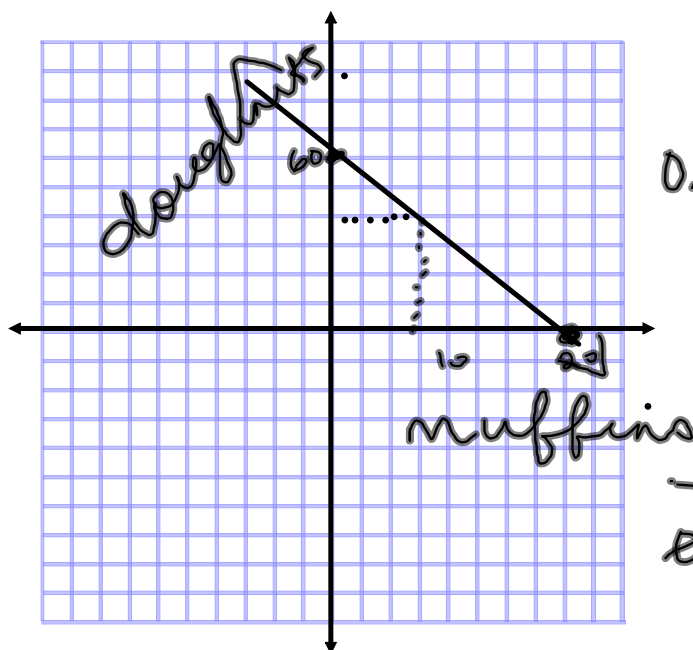
Example 2: Writing an equation and using it to make a graph

a) Write an equation that describes Jacob's options (from previous example).

let m = # of muffins
let d = # of doughnuts

$$0.75m + 0.25d = 15.00$$

b) Graph the possible combinations.



$$0.75x + 0.25y = 15$$

$$0.75x + 0.25(0) = 15$$

$$\frac{0.75x}{0.75} = \frac{15}{0.75}$$

$$x = 20$$

$$0.75(0) + 0.25y = 15$$

$$\frac{0.25y}{0.25} = \frac{15}{0.25}$$

$$y = 60$$

Example 3: Define suitable variables for each situation, and write an equation.

(d) (e)
a) Madeline has a day job and an evening job. She works a total of 40 h/week.

$$d + e = 40$$

(d)
(e) b) Caroline earns \$15/h at her day job and \$11/h at her evening job. Last week, she earned \$540.

$$15d + 11e = \$540$$

c) Justin earns \$500/week plus 6% commission selling cars.

$$y = 0.06x + 500$$

d) Jason is offered a new job that would pay \$800/week plus 4% commission.

$$y = 0.04x + 800$$

e) A piggy bank contains \$5.25 in nickels and dimes.

$$n + d = 5.25$$

↓

$$\rightarrow 0.05n + 0.10d = 5.25$$

EXAMPLE 4: Selecting a representation for a linear relation

Judy is considering two sales positions. Sam's store offers \$1600/month plus 2.5% commission on sales. Carol's store offers \$1000/month plus 5% commission on sales. In the past, Judy has had about \$15 000 in sales each month.

a) Represent the two offers so that Judy can compare them. Which offer pays more?

let y = total monthly wage
let s = sales.

Sam's:

$$0.025s + 1600 = y$$

Carol's:

$$0.05s + 1000 = y$$

$$\text{Sam's: } 0.025(15\,000) + 1600 = y$$
$$\$1975 = y$$

$$\text{Carol's } 0.05(15\,000) + 1000 = y$$
$$\$1750 = y$$

\therefore Sam's store is better.

Pg 12-14 #1, 4, 6, 8, 9, 11