

LESSON

Reteach

5-1 Identifying Linear Functions

You can determine if a function is linear by its graph, ordered pairs, or equation.

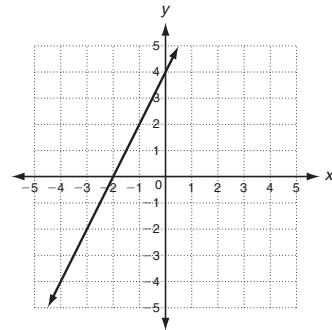
Identify whether the graph represents a linear function.

Step 1: Determine whether the graph is a function.

Every x -value is paired with exactly one y -value; therefore, the graph is a function. Continue to step 2.

Step 2: Determine whether the graph is a straight line.

Conclusion: Because this graph is a function and a straight line, this graph represents a linear function.



Identify whether $\{(4, 3), (6, 4), (8, 6)\}$ represents a linear function.

Step 1: Write the ordered pairs in a table.

Step 2: Find the amount of change in each variable. Determine if the amounts are constant.

Conclusion: Although the x -values show a constant change, the y -values do not. Therefore, this set of ordered pairs does not represent a linear function.

x	y
4	3
6	4
8	6

Annotations: A bracket between $x=4$ and $x=6$ is labeled $+2$. A bracket between $x=6$ and $x=8$ is labeled $+2$. A bracket between $y=3$ and $y=4$ is labeled $+1$. A bracket between $y=4$ and $y=6$ is labeled $+2$.

Identify whether the function $y = 5x - 2$ is a linear function.

Try to write the equation in standard form ($Ax + By = C$).

$$y = 5x - 2$$

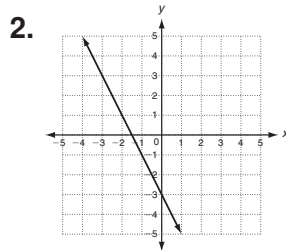
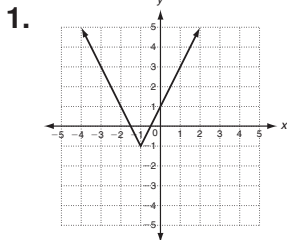
$$\begin{array}{r} -5x \quad -5x \\ -5x + y = -2 \end{array}$$

In standard form, x and y

- have exponents of 1
- are not multiplied together
- are not in denominators, exponents, or radical signs

Conclusion: Because the function can be written in standard form, ($A = -5, B = 1, C = -2$), the function is a linear function.

Tell whether each graph, set of ordered pairs, or equation represents a linear function. Write *yes* or *no*.



3.

x	y
-9	5
-5	10
-1	15

4. $\{(-3, 5), (-2, 8), (-1, 12)\}$

5. $2y = -3x^2$

6. $y = 4x - 7$

LESSON

Reteach

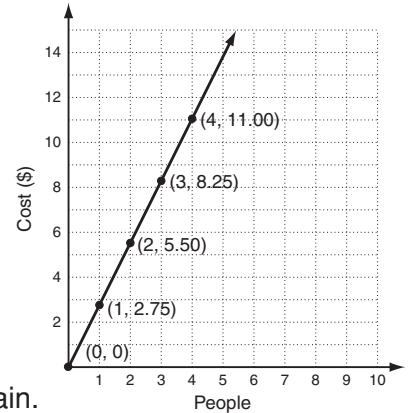
5-1 Identifying Linear Functions (continued)

In real-life problems, the domain and range are sometimes restricted.

Swimming at the park pool costs \$2.75 for each person. The total cost is given by $f(x) = 2.75x$ where x is the number of people going swimming. Graph this function and give its domain and range.

Step 1: Graph.

x	$f(x) = 2.75x$
0	$f(0) = 2.75(0) = 0$
1	$f(1) = 2.75(1) = 2.75$
2	$f(2) = 2.75(2) = 5.50$
3	$f(3) = 2.75(3) = 8.25$



Step 2: Determine the domain and range.

Ask yourself the following questions to help determine the domain.

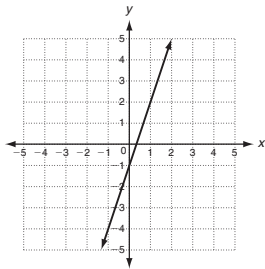
- Can the x -value be all fractions or decimals in between the whole numbers?
- Can the x -value be 0?
- Can the x -value be negative?

The domain is the number of people. So the domain is restricted to whole numbers. Because the range is determined by the domain, it is also restricted.

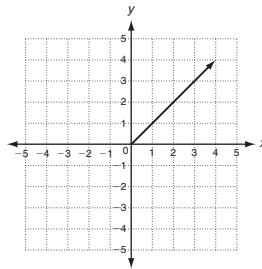
Domain: $\{0, 1, 2, 3, \dots\}$ Range: $\{\$0, \$2.75, \$5.50, \$8.25, \dots\}$

Give the domain and range for the graphs below.

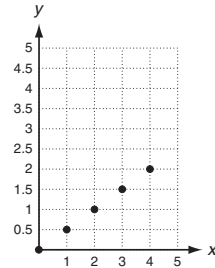
7.



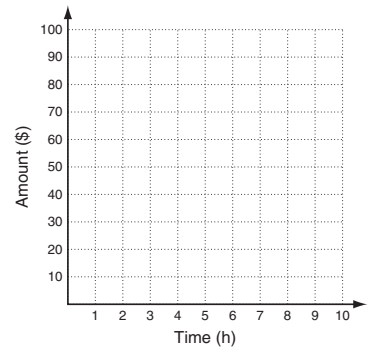
8.



9.

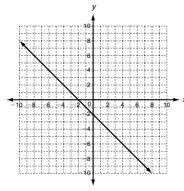


10. Tyler makes \$10 per hour at his job. The function $f(x) = 10x$ gives the amount of money Tyler makes after x hours. Graph this function and give its domain and range.



LESSON 5-1 Practice A
Identifying Linear Functions

Use the graph for 1-3.



- Is this graph a function? yes
- Explain how you know it is a function.
Each domain value is paired with exactly one range value.
- If this graph is a function, is it also a linear function? yes

Use the set $\{(1, 8), (2, 6), (3, 4), (4, 2), (5, 0)\}$ for 4-5.

- Does the set of ordered pairs satisfy a linear function? yes
- Explain how you decided. A constant change of +1 in x corresponds to a constant change of -2 in y.

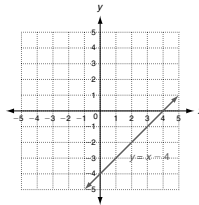
6. Write the equation $y = x - 4$ in standard form ($Ax + By = C$).

$-x + y = -4$

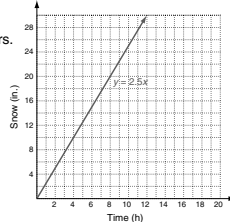
7. Is $y = x - 4$ a linear function?

yes

8. Graph $y = x - 4$ to check.



9. In 2005, a storm in Milwaukee, WI was dropping 2.5 inches of snow every hour. The total amount of snow is given by $f(x) = 2.5x$, where x is the number of hours. Graph this function and give its domain and range.



D: $x \geq 0$; R: $y \geq 0$

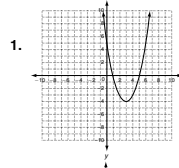
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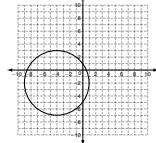
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LESSON 5-1 Practice B
Identifying Linear Functions

Identify whether each graph represents a function. Explain. If the graph does represent a function, is the function linear?



1. function (not linear); each domain value is paired with exactly one range value.



2. not a function; several domain values are paired with two range values.

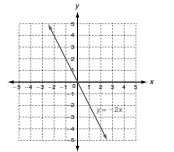
3. Which set of ordered pairs satisfies a linear function? Explain.

Set A: $\{(5, 1), (4, 4), (3, 9), (2, 16), (1, 25)\}$ Set B; A constant change of +1 in x corresponds to a constant change of +2 in y.

Set B: $\{(1, -5), (2, -3), (3, -1), (4, 1), (5, 3)\}$

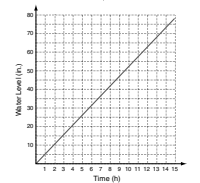
4. Write $y = -2x$ in standard form. Then graph the function.

$2x + y = 0$



5. In 2005, the Shabelle River in Somalia rose an estimated 5.25 inches every hour for 15 hours. The increase in water level is represented by the function $f(x) = 5.25x$, where x is the number of hours. Graph this function and give its domain and range.

D: $0 \leq x \leq 15$; R: $0 \leq y \leq 78.75$



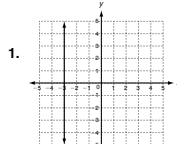
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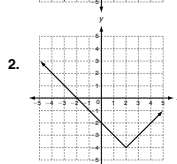
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LESSON 5-1 Practice C
Identifying Linear Functions

Identify whether each graph represents a function. Explain. If the graph does represent a function, is the function linear?



1. not a function; One domain value is paired with an infinite number of range values.



2. nonlinear function; Each domain value is paired with exactly one range value.

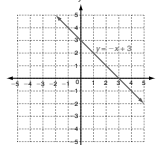
3. Which of the sets of ordered pairs satisfies a linear function? Explain.

Set A: $\{(-10, 3), (-9.9, 4.5), (-9.8, 6), (-9.7, 7.5)\}$ Set A; A constant change of +0.1 in x corresponds to a constant change of +1.5 in y.

Set B: $\{(1, 5), (2, 10), (4, 15), (8, 20), (16, 25)\}$

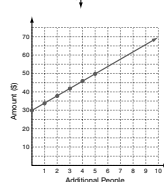
4. Write $y = -x + 3$ in standard form. Then graph the function.

$x + y = 3$



5. A campground charges \$30 for 2 people plus \$4 for each additional person. The total amount owed is given by $f(x) = 30 + 4x$ where x is the number of additional people. Graph this function and give its domain and range.

D: $\{0, 1, 2, 3, 4, \dots\}$;
R: $\{\$30, \$34, \$38, \$42, \$46, \dots\}$



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LESSON 5-1 Reteach
Identifying Linear Functions

You can determine if a function is linear by its graph, ordered pairs, or equation.

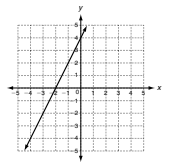
Identify whether the graph represents a linear function.

Step 1: Determine whether the graph is a function.

Every x -value is paired with exactly one y -value; therefore, the graph is a function. Continue to step 2.

Step 2: Determine whether the graph is a straight line.

Conclusion: Because this graph is a function and a straight line, this graph represents a linear function.



Identify whether $\{(4, 3), (6, 4), (8, 6)\}$ represents a linear function.

Step 1: Write the ordered pairs in a table.

Step 2: Find the amount of change in each variable. Determine if the amounts are constant.

Conclusion: Although the x -values show a constant change, the y -values do not. Therefore, this set of ordered pairs does not represent a linear function.

x	y
4	3
6	4
8	6

+2 (between x values), +1 (between y values)

Identify whether the function $y = 5x - 2$ is a linear function.

Try to write the equation in standard form ($Ax + By = C$).

$$y = 5x - 2$$

$$-5x - 5x = -5x - 5x$$

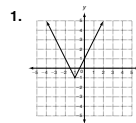
$$-5x + y = -2$$

In standard form, x and y

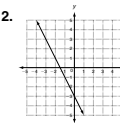
- have exponents of 1
- are not multiplied together
- are not in denominators, exponents, or radical signs

Conclusion: Because the function can be written in standard form, ($A = -5, B = 1, C = -2$), the function is a linear function.

Tell whether each graph, set of ordered pairs, or equation represents a linear function. Write **yes** or **no**.



1. no



2. yes

3.

x	y
-9	5
-5	10
-1	15

yes

4. $\{(-3, 5), (-2, 8), (-1, 12)\}$

no

5. $2y = -3x^2$

no

6. $y = 4x - 7$

yes

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LESSON **Reteach**

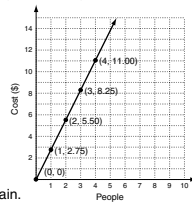
5-1 Identifying Linear Functions (continued)

In real-life problems, the domain and range are sometimes restricted.

Swimming at the park pool costs \$2.75 for each person. The total cost is given by $f(x) = 2.75x$ where x is the number of people going swimming. Graph this function and give its domain and range.

Step 1: Graph.

x	$f(x) = 2.75x$
0	$f(0) = 2.75(0) = 0$
1	$f(1) = 2.75(1) = 2.75$
2	$f(2) = 2.75(2) = 5.50$
3	$f(3) = 2.75(3) = 8.25$



Step 2: Determine the domain and range.

Ask yourself the following questions to help determine the domain.

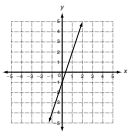
- Can the x -value be all fractions or decimals in between the whole numbers?
- Can the x -value be 0?
- Can the x -value be negative?

The domain is the number of people. So the domain is restricted to whole numbers. Because the range is determined by the domain, it is also restricted.

Domain: $\{0, 1, 2, 3, \dots\}$ Range: $\{\$0, \$2.75, \$5.50, \$8.25, \dots\}$

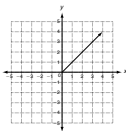
Give the domain and range for the graphs below.

7.



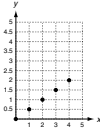
D: all real numbers;
R: all real numbers

8.



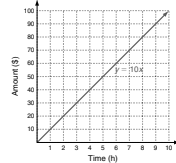
D: $x \geq 0$; R: $y \geq 0$

9.



D: $\{0, 1, 2, 3, 4\}$;
R: $\{0, 0.5, 1, 1.5, 2\}$

10. Tyler makes \$10 per hour at his job. The function $f(x) = 10x$ gives the amount of money Tyler makes after x hours. Graph this function and give its domain and range.



D: $x \geq 0$; R: $y \geq 0$

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LESSON **Challenge**

5-1 Identifying Linear Functions

Linear functions are functions that can be written in the form $Ax + By = C$ where A , B , and C are real numbers and A and B are not both 0.

Follow a path from start to finish in the maze below. Each box you cross through must be a linear function. You may move horizontally or vertically.

Start

$3x + 2y = 7$	$y = 4x$	$y = -\frac{1}{2}x$	$\frac{5}{x} = y + 2$	$x^3 = 27$	$xy = 8$
$x(x + y) = 4$	$x^2 - 16 = 0$	$4x - y = 0$	$y = 3$	$\frac{x}{5} = y + 2$	$y = x $
$\frac{3}{x} + y = 0$	$x(3 + y) = 4$	$x + \frac{6}{y} = 3$	$y(x + 2y) = 9$	$-y = x$	$\frac{4}{y} + x = 16$
$ x + y = 5$	$7x - 5y = 8$	$\frac{x}{8} = \frac{y}{3}$	$2(x + y) = 4$	$\frac{y}{4} = 3x$	$x(x + 2) = 5$
$xy + y = 10$	$-y = \frac{2}{5}$	$x^2 - y^2 = 1$	$x(4x + y) = 3$	$xy + x = 20$	$x^2 + 8 = -20$
$xy = 5$	$x = 3y$	$8(y + x) = 9$	$2x + 3y = x$	$12x = \frac{y}{6}$	$y = x^2$
$x^2 - 20 = 0$	$xy = 10$	$y = x + 4 $	$x^3 = 10$	$5x - 4y = 8y$	$y(3x + y) = 4$

Finish

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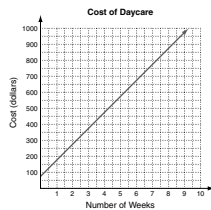
LESSON **Problem Solving**

5-1 Identifying Linear Functions

Write the correct answer.

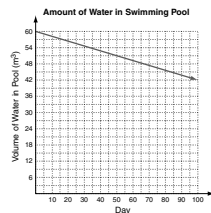
1. A daycare center charges a \$75 enrollment fee plus \$100 per week. The function $f(x) = 100x + 75$ gives the cost of daycare for x weeks. Graph this function and give its domain and range.

D: $\{0, 1, 2, 3, \dots\}$
R: $\{\$75, \$175, \$275, \$375, \dots\}$



2. A family swimming pool holds 60 m^3 of water. The function $f(x) = 60 - 0.18x$ gives the cubic meters of water in the pool, taking into account water lost to evaporation over x days. Graph this function and give its domain and range.

D: $x \geq 0$
R: $0 \leq y \leq 60$



Elijah is using a rowing machine. The table shows how many Calories he can burn for certain lengths of time. Select the best answer.

Time (min)	Calories
2	24
4	48
6	72
8	96
10	120

3. Which function could be used to describe the number of Calories burned after x minutes?

- F $y = 12 + x$ H $xy = 12$
G $x + y = 12$ J $y = 12x$

4. What is the domain of the function?

- A $\{0, 1, 2, 3, \dots\}$ C $x \geq 0$
B $\{2, 4, 6, \dots\}$ D $x \geq 2$

5. What is the range of the function?

- F $\{0, 12, 24, 36, \dots\}$ H $y \geq 0$
G $\{24, 48, 72, \dots\}$ J $y \geq 24$

6. Elijah graphed the function in problem 4. Which best describes the graph?

- A It is a line that increases from left to right.
B It is a line that decreases from left to right.
C It forms a U-shape.
D It forms a V-shape.

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LESSON **Reading Strategies**

5-1 Use Multiple Representations

Linear functions can be represented in many forms. The same function is represented below in five different ways.

Linear Function

Ordered Pairs: $\{(-1, 5), (0, 3), (1, 1), (2, -1)\}$

Sentence: The sum of 2 times x and y is 3.

Equation: $2x + y = 3$ or $y = -2x + 3$

Table:

x	y
-1	5
0	3
1	1
2	-1

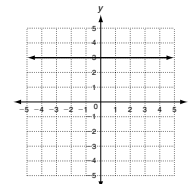
Answer each of the following.

1. Write the following linear function as an equation: "The sum of x and $4y$ is 9."

$x + 4y = 9$

2. Does the graph at right represent a linear function? Tell why or why not.

yes;
Each domain value is paired with exactly one range value.



3. Represent the list of ordered pairs in table form: $\{(6, -3), (4, -1), (2, 0), (0, 2), (-2, 3)\}$.

no; A constant change of $+2$ in x does not correspond to a constant change in y .

x	6	4	2	0	-2
y	-3	-1	0	2	3

4. Write $y = -x + 4$ in standard form ($Ax + By = C$).

$x + y = 4$

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