Function: replace y with $f(x)$ (function notation)

ex) $y = 2x - 3$ ← line

Activity

3-2 Linear Functions

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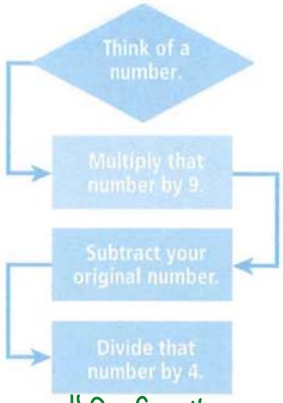
MODEL & DISCUSS

The flowchart shows the steps of a math puzzle.



A. Try the puzzle with 6 different integers.

Find y when $x = 5$.

$y = 2(5) - 3$

$y = 10 - 3$

$y = 7 \rightarrow (5, 7)$

OR use function notation...

$f(x) = 2x - 3$ (5 5)

B. Record each number you try and the result.

Find $f(5)$. (x, y) "f of 5"

$f(5) = 2(5) - 3$

$f(5) = 10 - 3 = 7$

$f(5) = 7 \rightarrow (5, 7)$

C. Make a prediction about what the final number will be for any number. Explain.

D. **Use Structure** Would your prediction be true for all numbers? Explain. MP.7

HABITS OF MIND

Construct Arguments Is it possible to find a counterexample? MP.3

Notes

Assess

EXAMPLE 1 Try It! Evaluate Functions in Function Notation

1. Evaluate each function for $x = 4$.

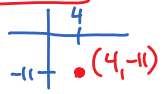
a. $g(x) = -2x - 3$

$g(4)$?

$g(4) = -2(4) - 3$

$= -8 - 3$

$g(4) = -11$



b. $h(x) = 7x + 15$

$h(4)$?

$h(4) = 7(4) + 15$

$= 28 + 15$

$h(4) = 43$

EXAMPLE 2 Try It! Write a Linear Function Rule

2. Write a linear function for the data in each table using function notation.

a.

x	1	2	3	4
y	6.5	13	19.5	26

+1, +1, +6.5, +6.5

$y = mx + b$

$y = \frac{6.5}{1}x + 0$

or

$f(x) = 6.5x + 0$

b.

x	1	2	3	4
y	1	4	7	10

$m = \frac{\text{rise}}{\text{run}}$, +1, +3

$y = mx + b$

$y = \frac{+3}{+1}x + b$

$1 = 3(1) + b$

$1 = 3 + b$

$-3 \quad -3$

$-2 = b$ (y-int, $x = 0$)

$\therefore y = 3x - 2$

or $f(x) = 3x - 2$

HABITS OF MIND

Look for Relationships What can the relationship between the values of x and the values of y reveal about a function? MP.7

Notes

Assess

EXAMPLE 3 **Try It! Analyze a Linear Function**

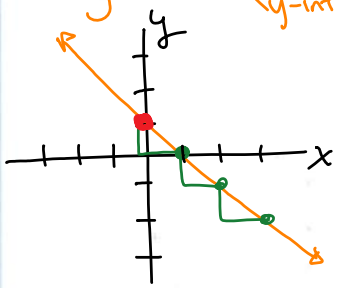
3. Sketch the graph of each function.

a. $f(x) = -x + 1$

$m: \frac{-1}{1}$

$y = -x + 1$

y-int

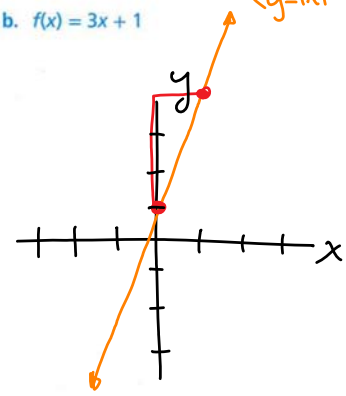


b. $f(x) = 3x + 1$

$f(x) = mx + b$

slope

y-int



EXAMPLE 4 **Try It! Use Linear Functions to Solve Problems**

4. In Example 4, how would the function, graph, and equation change if the speed is 4 mph? What is the effect on the domain?

HABITS OF MIND

Reason How is a linear function related to a linear equation? Explain. MP.2

Assess

Do You UNDERSTAND?

1. ESSENTIAL QUESTION How can you identify a linear function?

2. **Communicate Precisely** Give a real-world example of a function that is linear and one that is not linear. Explain. MP.6

3. **Vocabulary** What is the difference between a *linear function* and a linear equation?

4. **Error Analysis** The cost of using a game facility is $1 for every 12 minutes. Talisa writes the function for the cost per hour as $f(x) = 12x$. Explain Talisa's error. MP.3

Do You KNOW HOW?

Evaluate each function for $x = 2$ and $x = 6$.

5. $f(x) = 4x - 3$

Find $f(2)$: $y = 4(2) - 3$
$= 8 - 3$
$= 5$ (2, 5)

Find $f(6)$: $y = 4(6) - 3$
$= 24 - 3$
$= 21$ (6, 21)

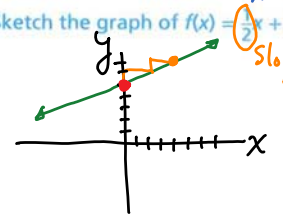
6. $f(x) = -(x - 2)$

$f(2) = -((2) - 2)$
$= -(0)$
$= 0$ (2, 0)

$f(6) = -((6) - 2)$
$= -(4)$
$= -4$ (6, −4)

7. Sketch the graph of $f(x) = \frac{1}{3}x + 5$.

$mx + b$; slope; y-int



8. What function models the height of the periscope lens at time t? If the periscope reaches its maximum height after ascending for 22 seconds, what is the maximum height in feet?

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