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I. Model Problems.
II. Practice
III. Challenge Problems
IV. Answer Key

Web Resources

Relations & Functions : www.mathwarehouse.com/algebra/relation/
Domain and Range of a Function/relation:
www.mathwarehouse.com/algebra/relation/math-function.php

Graph Paper Maker (free): www.mathworksheetsgo.com/paper/

Online Graphing Calculator(free): www.mathworksheetsgo.com/calculator/

Functions versus Relations

A function is a relation in which each element of the domain maps to exactly on element of the range.

I. Model Problems

In these examples we will determine if the relation is a function, identify the domain, and identify the range.

Example 1: $\{(-6,7),(8,14),(3,2),(1,-4)\}$

Check the ordered pairs to determine if every *x*-value maps to exactly one *y*-value.

$\{(-6,7),(8,14),(3,2),(1,-4)\}$

Domain is the *x*-values.

$\{(-6,7),(8,14),(3,2),(1,-4)\}$

$D = \{-6,1,3,8\}$

Range is the *y*-values

$\{(-6,7),(8,14),(3,2),(1,-4)\}$

$R = \{-4,2,7,14\}$

Answer: function, $D = \{-6,1,3,8\}$, $R = \{-4,2,7,14\}$

Example 2: $\{(4,-11),(3,1),(0,1),(2,6),(3,-1)\}$

Check the ordered pairs to determine if every *x*-value maps to exactly one *y*-value.

$\{(4,-11),(3,1),(0,1),(2,6),(3,-1)\}$

x = 3 maps to both *y* = 1 and *y* = −1

$\{(4,-11),(3,1),(0,1),(2,6),(3,-1)\}$

Domain is the *x*-values.

$\{(4,-11),(3,1),(0,1),(2,6),(3,-1)\}$

$D = \{0,2,3,4\}$

Range is the *y*-values

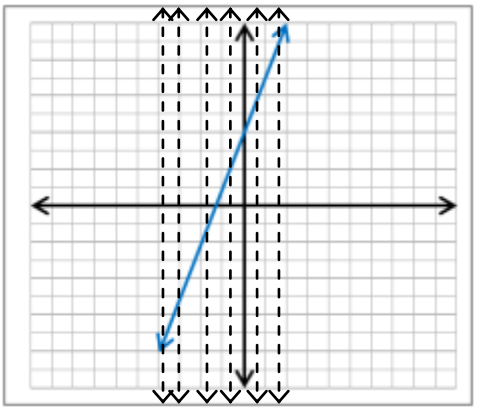
$\{(4,-11),(3,1),(0,1),(2,6),(3,-1)\}$

$R = \{-11,-1,1,6\}$

Answer: not a function, $D = \{0,2,3,4\}$, $R = \{-11,-1,1,6\}$

Example 3: $y = 3x + 4$

Is there a value of *x* that maps to more than one *y*? If needed, check with vertical line test. The vertical lines represent *x*-values. If the lines do not hit the graph more than once the relations are functions.



(scale of graph is one)

Domain is the *x*-values. The line continues in both directions.

$D = \{x | x \in \mathbb{R}\}$

Range is the *y*-values. The line continues in both directions.

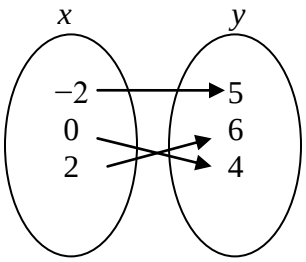
$R = \{x | x \in \mathbb{R}\}$

Answer: not a function, $D = \{x | x \in \mathbb{R}\}$, $R = \{x | x \in \mathbb{R}\}$

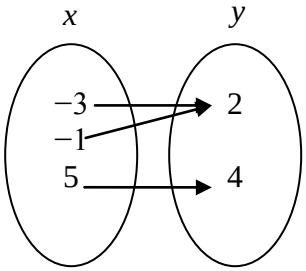
II. Practice Problems

Determine if the relation is a function

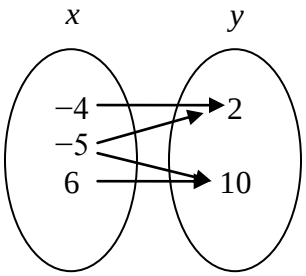
1. $\{(3,4),(4,-6),(5,-7),(3,2),(-2,5)\}$
2. $\{(-4,6),(-3,2),(1,0),(7,6),(8,2)\}$
3. $\{(-3,4),(-2,5),(0,0),(-2,5),(4,8)\}$
4.



5.



6.



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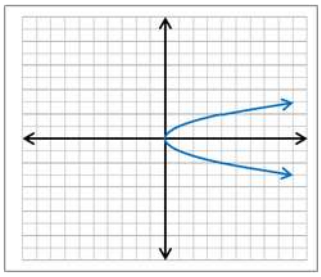
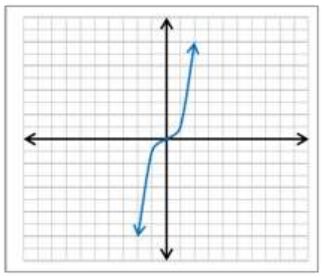
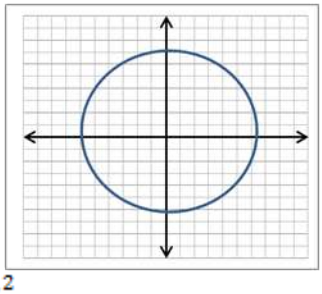


8.



9.



10. $y = 2x - 4$

11. $x = y^2$
12. $x = \sqrt{y}$
13. $y = x^2$

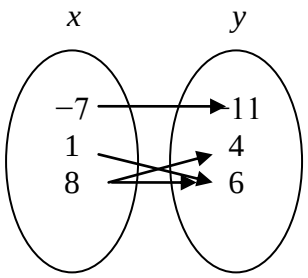
Determine the Domain and Range of each relation.

14. $\{(-5,1),(-3,0),(-1,2),(0,3)\}$

15. $\left\{\left(-4,\frac{1}{2}\right),\left(-2,\frac{1}{4}\right),\left(0,\frac{1}{2}\right),\left(1,\frac{1}{4}\right)\right\}$

16. $\left(\frac{2}{3},-1\right),\left(\frac{-3}{4},0\right),\left(\frac{-2}{3},1\right),\left(\frac{3}{5},0\right),\left(\frac{3}{4},1\right)$

17.



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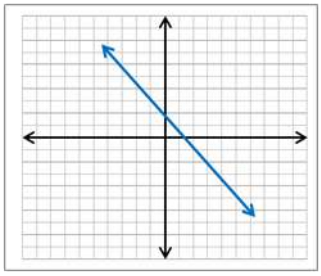
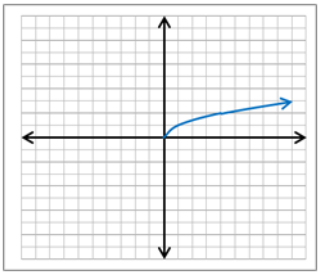


19.

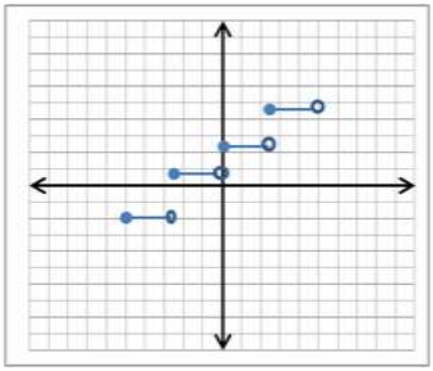


20. $y = x^2 - 3$

21. $y = |x - 4|$

III. Challenge Problems

1. Is the relation graphed below a function? Justify your answer.



2. Is a person's weight a function of their height? Why?
3. Is the height of a rocket a function of time? Why?
4. James says that since $y = |x|$ is a function, then $x = |y|$ is a function. Is he correct? Why?

IV. Answer Key

1. no, $x = 3$ maps to $y = 4$ and $y = 2$
2. yes
3. yes
4. yes
5. yes
6. no, $x = -5$ maps to $y = 2$ and $y = 10$
7. no, fails vertical line test
8. yes
9. no, fails vertical line test
10. yes
11. no, answers will vary. One possible: $x = 9$ maps to $y = 3$ and $y = -3$
12. yes
13. yes
14. $D = \{-5, -3, -1, 0\}, R = \{0, 1, 2, 3\}$
15. $D = \{-4, -2, 0, 1\}, R = \left\{\frac{1}{4}, \frac{1}{2}\right\}$
16. $D = \left\{-\frac{2}{3}, \frac{3}{5}, \frac{2}{3}, \frac{3}{4}\right\}, R = \{-1, 0, 1\}$
17. $D = \{-7, 1, 8\}, R = \{-11, 4, 6\}$
18. $D = \{x \in \mathbb{R}\}, R = \{y \in \mathbb{R}\}$
19. $D = \{x \in \mathbb{R} | x \geq 0\}, R = \{y \in \mathbb{R} | y \geq 0\}$
20. $D = \{x \in \mathbb{R}\}, R = \{y \in \mathbb{R} | y \geq -3\}$
21. $D = \{x \in \mathbb{R}\}, R = \{y \in \mathbb{R} | y \geq 0\}$

Challenge Problems

1. yes; vertical line test
2. no; people of the same height have different weights; a given height maps to more than one weight
3. yes; at any given time the rocket is at exactly one height; a give time maps to exactly one height
4. no, $y = |x|$ for any x there is exactly one absolute value for $x = |y|$ for a value of $x > 0$ there are two $|y|$; one example if $x = 2$, $y = 2$ or -2