Name: Class Period: key

<u>**First Semester Day 2 Review: Equations & Functions**</u>

Guided Notes

Solving Equations

The goal of solving equations is for one side of the equal sign to have a variable (with a coefficient of one) and on the other side a simplified number.

The solution to an equation could look like: $x = -1$.

A solution to an equation could also look like: y = 2/3.

<u>Example 1</u>

Solve the equation $-2(b-4) = 12$.

Original Equation	$-2(b-4) = 12$
Use the Distributive Property	$-2b+8 = 12$
Subtract 8 from each side	$-2b + 8 - 8 = 12 - 8$
Simplify	$-2b = 4$
Divide each side by −2	$\frac{\cancel{-2}b}{\cancel{-2}} = \frac{4}{-2}$
Simplify	$b = -2$

Example 2

Solve $\frac{2x}{3} + \frac{x}{2} = 7$.

Original Equation	$\frac{2x}{3} + \frac{x}{2} = 7$
Multiply each side by 6	$\left(\frac{2x}{3} + \frac{x}{2} = 7\right) \cdot 6$
Use the Distributive Property	$6\left(\frac{2x}{3}\right) + 6\left(\frac{x}{2}\right) = 6(7)$
Multiply	$4x + 3x = 42$
Combine like terms	$7x = 42$
Divide each side by 7	$\frac{\cancel{7}x}{\cancel{7}} = \frac{42}{7}$
Simplify	$x = 6$

Example 3

Solve $6x + 3 = 8x - 21$.

Original Equation	$6x + 3 = 8x - 21$
Subtract $6x$ from each side.	$\cancel{6x} + 3 - \cancel{6}x = 8x - 21 - 6x$
Combine like terms	$3 = 2x - 21$
Add 21 to each side	$3 + 21 = 2x - 21 + 21$
Simplify	$24 = 2x$
Divide each side by 2	$\frac{24}{2} = \frac{\cancel{2}x}{\cancel{2}}$
Simplify	$x = 12$

Functions

Definitions

A relation is a set of Ordered Pairs.

The domain of a relation is the set of inputs.

The range of a relation is the set of outputs.

A relation that has exactly one value in the range for each value in the domain is called a function.

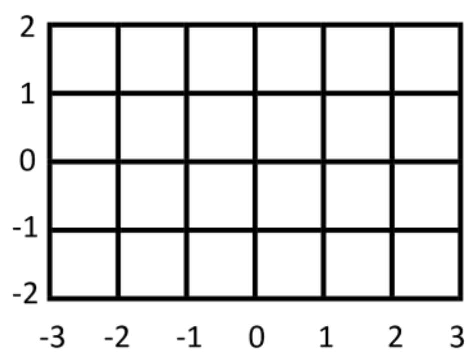
Vertical-Line Test

If any vertical line passes through More than one point of the graph, then for some value of x there is more than one value of y. Therefore, the relation is not a function.

Example 4

Find the domain and range of the relation below. Then, use the vertical-line test to determine whether the relation is a function.

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



Domain: $\{3, -2, 0, -3\}$

Range: $\{0, 1, -1, 2\}$

Vertical-line test: Fails, it is not a function

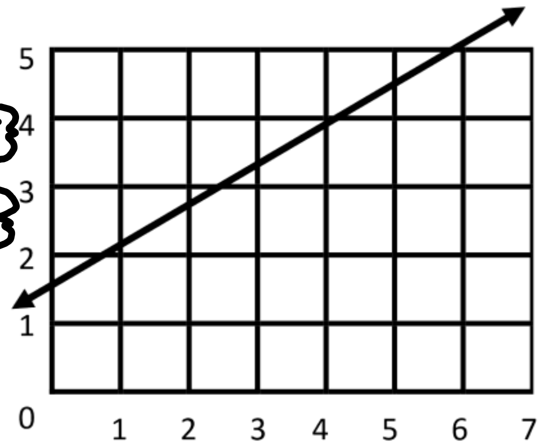
Example 5

Find the domain and range of the relation below. Then, use the vertical-line test to determine whether the relation is a function.

Domain: {all real numbers}

Range: {all real numbers}

Vertical-line test: pass,
it is a function.



Function Notation

To write a function in function notation, replace the dependent variable with $f(x)$ to indicate the outputs. This is read as "f of x" or "f is a function of x." f can be replaced with any other letter as long as it is written with a pair of parentheses around the independent variable.

Example 6

Evaluate $f(x) = -3x - 10$ for $x = -6$.

Original Function	$f(x) = -3x - 10$
Substitute -6 for x	$f(-6) = (-3 \cdot -6) - 10$
Simplify	$f(-6) = 18 - 10$
Answer	$f(-6) = 8$

Direct Variation

A function in the form $y = kx$, where $k \neq 0$, is a direct variation.

The constant of variation for direct variation k is the coefficient of x. The variables y and x are said to vary directly with each other.

Example 7

Write an equation of the direct variation that includes the point $(4, -3)$.

Function Form of Direct Variation	$y = kx$
Substitute 4 for x and -3 for y	$-3 = k(4)$
Divide each side by 4	$\frac{-3}{4} = \frac{\cancel{4}k}{\cancel{4}}$
Solve for k	$-\frac{3}{4} = k$
Write an equation by substituting	$y = \frac{-3}{4}x$

Indirect/Inverse Variation

An equation in the form $xy = k$ or $y = \frac{k}{x}$, where $k \neq 0$, is an indirect/inverse variation.

The constant of variation for indirect/inverse variation is k, the product $x \cdot y$ for an ordered pair (x, y).

Example 8

Suppose y varies indirectly with x and $y = 7$ when $x = 5$. Write an equation for the indirect variation.

General form of an indirect variation	$xy = k$
Substitute 5 for x and 7 for y	$5(7) = k$
Multiply to solve for k	$35 = k$
Write an equation by substituting	$xy = 35$

Example 9

Determine whether the data in each table represents a direct variation or an inverse variation. Write an equation to model the data in each table.

Recall that both direct and inverse variation have a constant k. If the constant is a ratio of y to x, then it is direct variation. If the constant is the product of x and y, then it is inverse variation.

Table 1

x	y
2	5
4	10
10	25

Table 1 Values of k

~~x/y~~ y/x	$x \cdot y$
5/2	10
10/4 = 5/2	40
25/10 = 5/2	250

y/x is constant, so
y varies directly with x
$k = 5/2$
$y = \frac{5}{2}x$

Table 2

x	y
5	20
10	10
25	4

Table 2 Values of k

~~x/y~~ y/x	$x \cdot y$
$20/5 = 4$	100
$10/10 = 1$	100
$4/25$	100

Since xy is constant, y varies indirectly with x

$xy = 100$ or $y = \frac{100}{x}$

Classwork

Problem 1

Solve $2(8 + p) = 22$.

$$2(8+p) = 22$$
$$\cancel{16} + 2p = 22$$
$$-\cancel{16} \quad -16$$
$$2p = 6$$

$$\frac{\cancel{2}p}{\cancel{2}} = \frac{6}{2}$$
$$p = 3$$

Problem 2

Solve $\frac{a}{2} + \frac{1}{5} = 17$.

$$\left(\frac{a}{2} + \frac{1}{5} = 17\right) 10$$
$$5a + \cancel{2} = 170$$
$$-\cancel{2} \quad -2$$

$$\frac{\cancel{5}a}{\cancel{5}} = \frac{168}{5}$$
$$a = 168/5$$

Problem 3

Solve $-36 + 2w = -8w + w$.

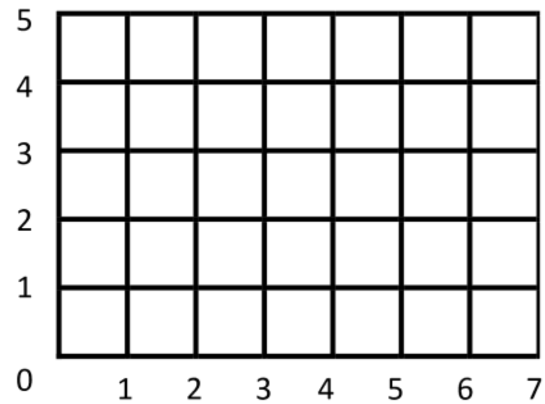
$$-36 + 2w = -\cancel{7w}$$
$$+7w \quad +\cancel{7w}$$
$$\cancel{-36} + 9w = 0$$
$$\cancel{+36} \quad +36$$

$$\frac{\cancel{9}w}{\cancel{9}} = \frac{36}{9}$$
$$w = 4$$

Problem 4

Find the domain and range of the relation below. Then, use the vertical-line test to determine whether the relation is a function.

$\{(2, 5), (3, 1), (4, 5), (5, 0)\}$



Domain: {2, 3, 4, 5}

Range: {5, 1, 0}

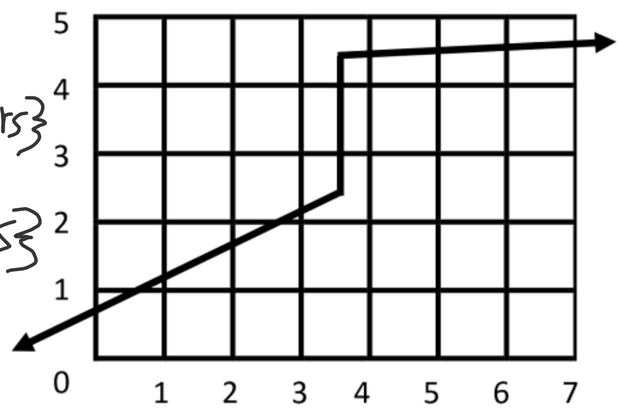
Vertical-line test:

Pass,

it is a function

Problem 5

Find the domain and range of the relation below. Then, use the vertical-line test to determine whether the relation is a function.



Domain: {all real numbers}

Range: {all real numbers}

Vertical-line test:

Fails

it is not a function

Problem 6

Evaluate $h(a) = -3a + 5$ for $\cancel{x}$ a $= -4, 1,$ and 3.

$h(-4) = -3(-4) + 5$
$h(-4) = 12 + 5 = 17$

$h(1) = -3(1) + 5$
$h(1) = -3 + 5 = 2$

$h(3) = -3(3) + 5$
$h(3) = -9 + 5 = -4$

Problem 7

Write an equation of the direct variation that includes the point $(-6, 8)$.

$y = kx$
$8 = k(-6)$
$\frac{8}{-6} = \frac{\cancel{-6}k}{\cancel{-6}}$
$-\frac{4}{3} = k \longrightarrow y = -\frac{4}{3}x$

Problem 8

Suppose y varies inversely with x and $y = 6$ when $x = \frac{1}{3}$. Write an equation for the inverse variation.

$x \cdot y = k$

$\left(\frac{1}{3}\right)6 = k$

$2 = k \longrightarrow xy = 2$ or $y = \frac{2}{x}$

Problem 9

Determine whether the data in each table represents a direct variation or an indirect variation. Write an equation to model the data in each table.

Table 1

x	y
3	24
9	8
12	6

y/x	xy
$24/3 = 8$	72
$8/9$	72
$6/12 = 1/2$	72

$xy = k$, indirect variation

$k = 72$

$xy = 72$ or $y = \frac{72}{x}$

Table 2

x	y
3	12
5	20
8	32

y/x	xy
$12/3 = 4$	36
$20/5 = 4$	100
$32/8 = 4$	256

$y = kx$, direct variation.

$k = 4$

$y = 4x$