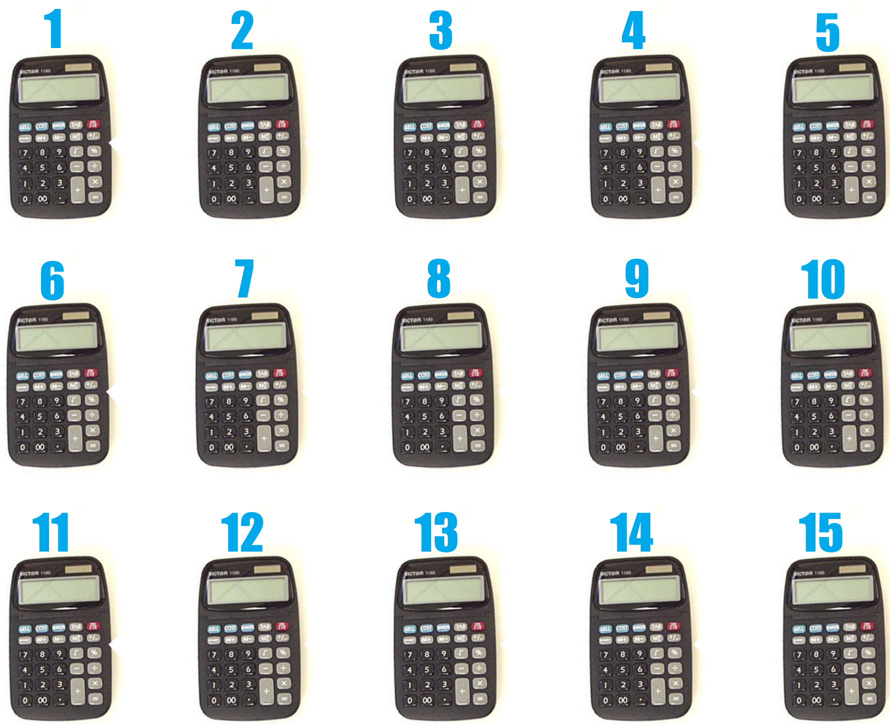
PRINCIPLES - LESSON 6C
RELATIONS

Below is a set of calculators.



In math, a set is simply a group of things.

SETS

Just as we can have a set of calculators, we can have a set of numbers.

To show that numbers are in a set, we enclose them in braces.

Examples of sets:

$$\{1, 2, 5\} \qquad \{-3, 4, 18, 21, 100\}$$

$$\{a, d, x, z, b\}$$

RELATIONS

A relation is a special kind of set. A relation is a set of ordered pairs.

Examples of relations:

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

$$\{(-6,2),(7,4),(-8,0)\}$$

If you have a set (enclosed in braces) and ordered pairs (points) live inside that set, then you have a relation.

FOUR WAYS TO EXPRESS A RELATION

There are four different ways to let others know exactly which ordered pairs are in a given relation.

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

List the ordered pairs in braces.

Make a table.

Make a mapping.

Make a graph.

FOUR WAYS TO EXPRESS A RELATION

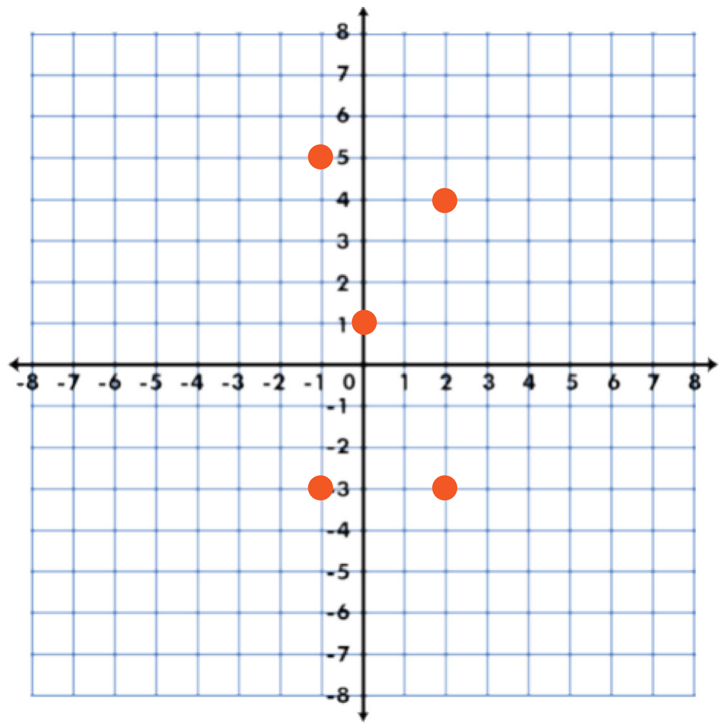
ex1) **Create a table, a graph, and a mapping for the relation below.**

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

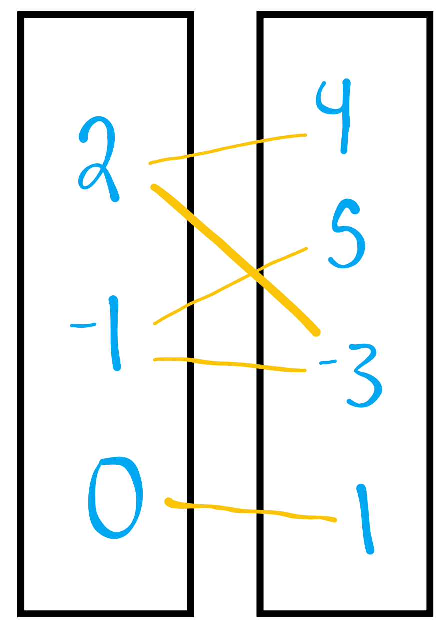
TABLE

x	y
2	4
-1	5
2	-3
0	1
-1	-3

GRAPH



MAPPING



FOUR WAYS TO EXPRESS A RELATION

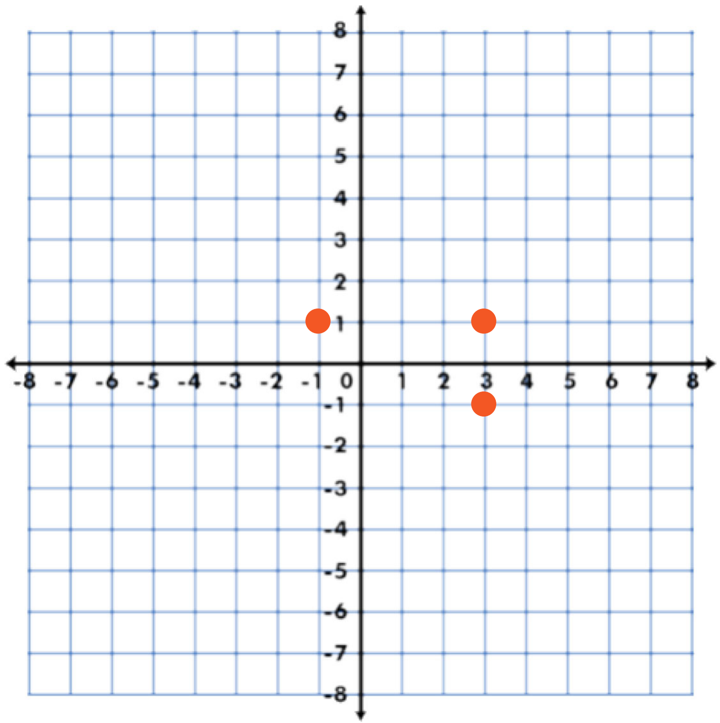
ex2) Create a table, a graph, and a mapping for the relation below.

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

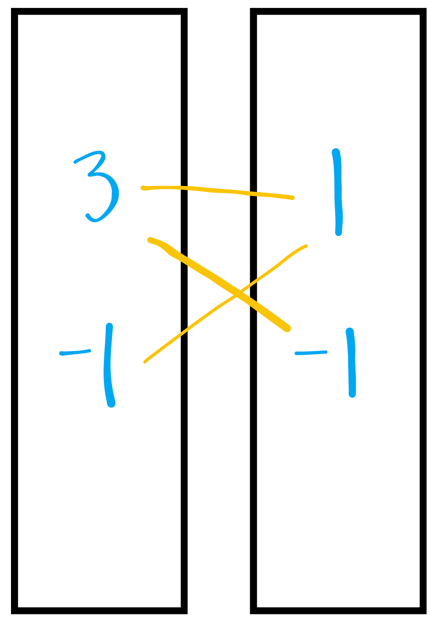
TABLE

x	y
3	1
3	-1
-1	1

GRAPH



MAPPING



THE SETS OF X AND Y-COORDINATES

We often separate a relation into its x and y-coordinates.

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

ex3) The set of x-coordinates (inputs) is called the DOMAIN.

$D = \{2, -1, 0\}$

There is no need to list the same elements more than once in a set

ex4) The set of y-coordinates (inputs) is called the RANGE.

$R = \{4, 5, -3, 1\}$

COMPARE THESE SOLUTIONS

Solve.

ex5) $x + 5 = 7$

$\boxed{x = 2}$

The solution to this equation is a single number.

ex6) $x + y = 7$

There are an infinite number of solutions!

$\boxed{\begin{array}{c} x = 2 \\ y = 5 \\ (2, 5) \end{array}}$ $\boxed{\begin{array}{c} x = 4 \\ y = 3 \\ (4, 3) \end{array}}$ $\boxed{\begin{array}{c} x = 5 \\ y = 2 \\ (5, 2) \end{array}}$

$\boxed{\begin{array}{c} x = -1\frac{1}{2} \\ y = 8\frac{1}{2} \\ (-1\frac{1}{2}, 8\frac{1}{2}) \end{array}}$

The solution to this equation is a set of ordered pairs. In other words, the solution is a relation.

POINTS AS SOLUTIONS TO EQUATIONS

Complete each ordered pair so that it is a solution to the equation below.

$$x + y = 20$$

Substitute 14 in place of x and then find y.

Substitute -6 in place of y and then find x.

ex7) $(\underset{x}{14}, \underset{y}{\underline{6}})$

$x + y = 20$

$14 + y = 20$

$\boxed{y = 6}$

ex8) $(\underset{x}{\underline{26}}, \underset{y}{-6})$

$x + y = 20$

$x + -6 = 20$

$\boxed{x = 26}$

POINTS AS SOLUTIONS TO EQUATIONS

Complete the ordered pair so that it is a solution to the equation below.

$$3x + 4y = 24$$

ex9) $(\underset{x}{2}, \underset{y}{\underline{\frac{9}{2}}})$

$$3x + 4y = 24$$

$$3(2) + 4y = 24$$

$$6 + 4y = 24$$

$$4y = 18$$

$$y = \frac{18}{4} \rightarrow \boxed{y = \frac{9}{2}}$$

Always reduce!

POINTS AS SOLUTIONS TO EQUATIONS

Complete the ordered pair so that it is a solution to the equation below.

$$3x + 4y = 24$$

ex10) $\left(\underset{x}{\underline{\tfrac{28}{3}}}, \underset{y}{\underline{-1}}\right)$

$$3x + 4y = 24$$

$$3x + 4(-1) = 24$$

$$3x - 4 = 24$$

$$3x = 28$$

$$\boxed{x = \frac{28}{3}}$$