Objectives:

- Understand what is meant by "relation"
- Find the Domain and the Range of a relation.
- Graph a relation that is defined by an equation.

What is a Relationship?

What is a Relation?

how two things are linked

We often see relationships between two variables.

For Example:

Someone's level of education is linked to annual income.

Engine size is linked to gas milage.

Definition:

When the elements of one set are linked to elements in a second set, we have a RELATION. If x and y are two elements in these sets and if a relation exists between x and y, then we say that

x corresponds to y

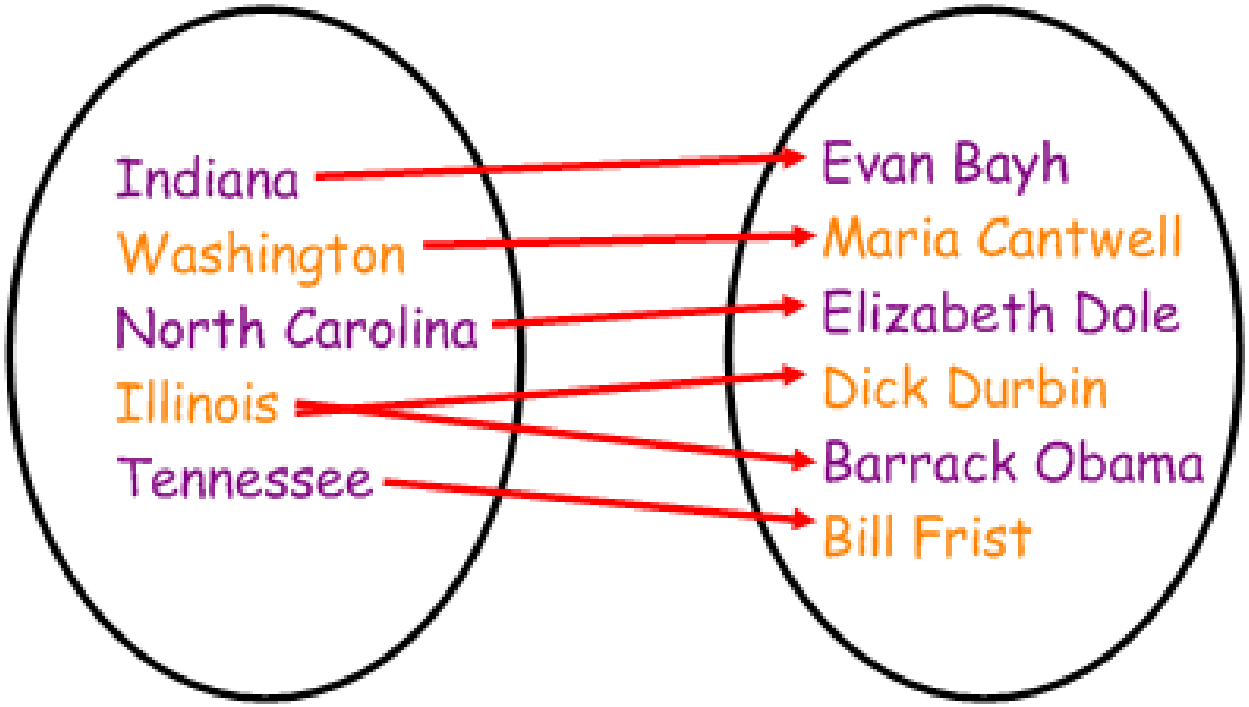
or

y depends on x,

and we write $x \longrightarrow y$. We may also write a relation where y depends on x as an ordered pair (x, y).

Mapping

Consider the data below. It shows the relationship between states and randomly selected Senators from 2005. We could say the relation (or relationship) is "is represented by".



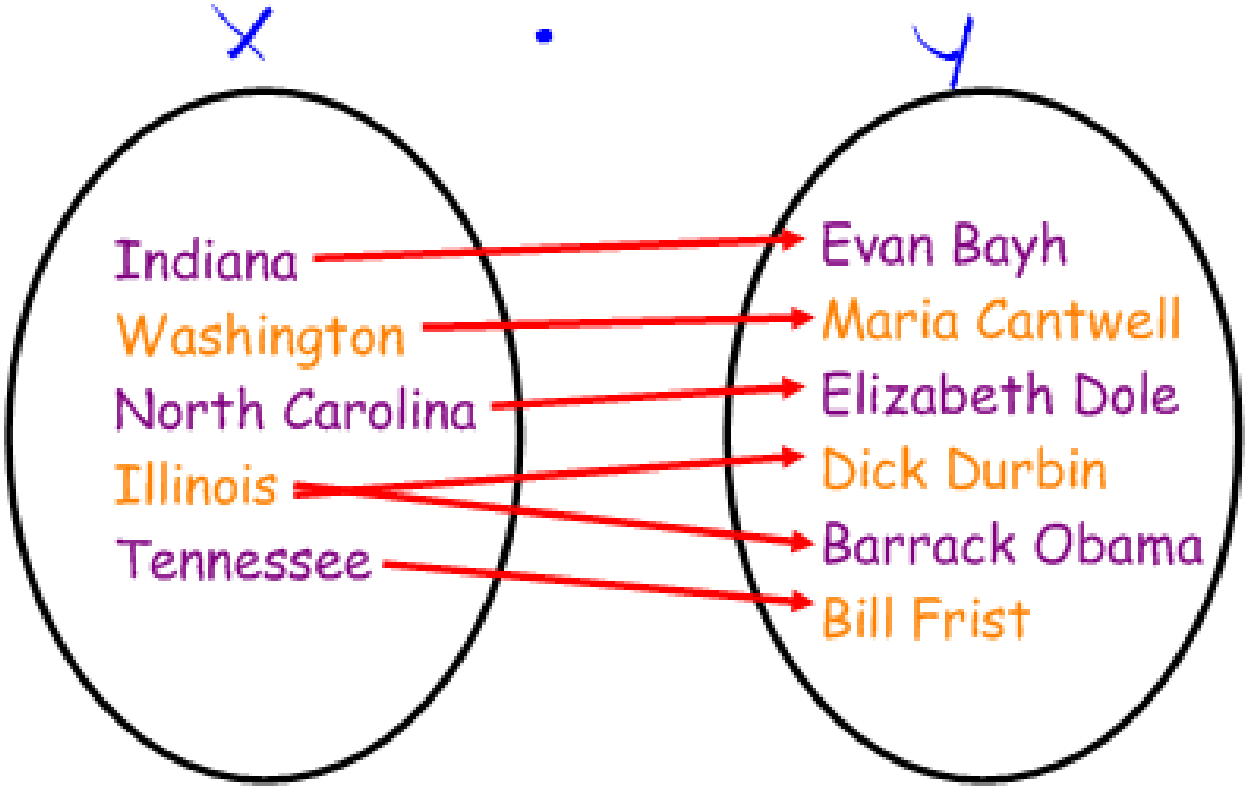
Write as ordered pairs:

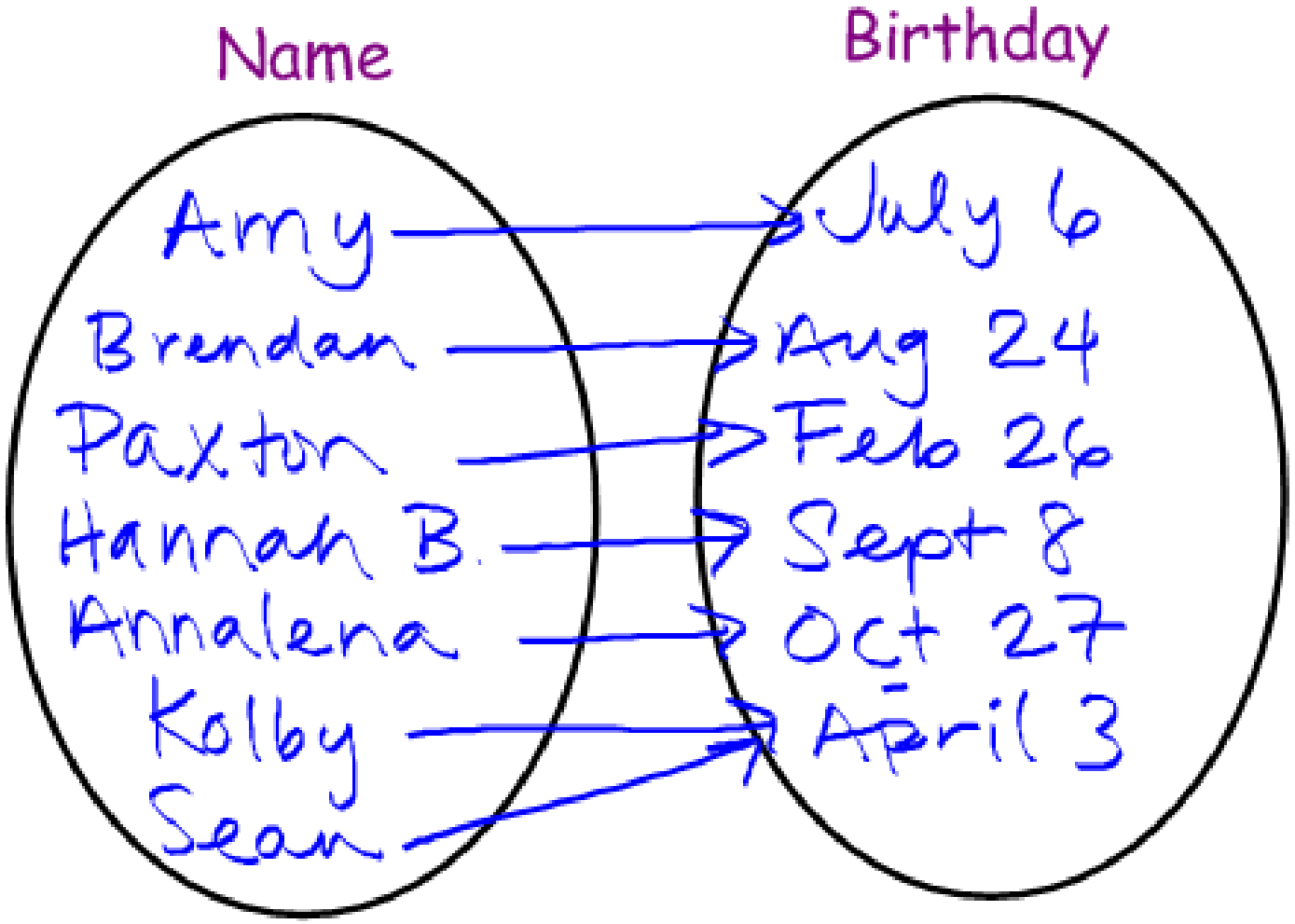
(Indiana, Evan Bayh)

(WA, Maria Cantwell)

(NC, Eliz. Dole)

⋮



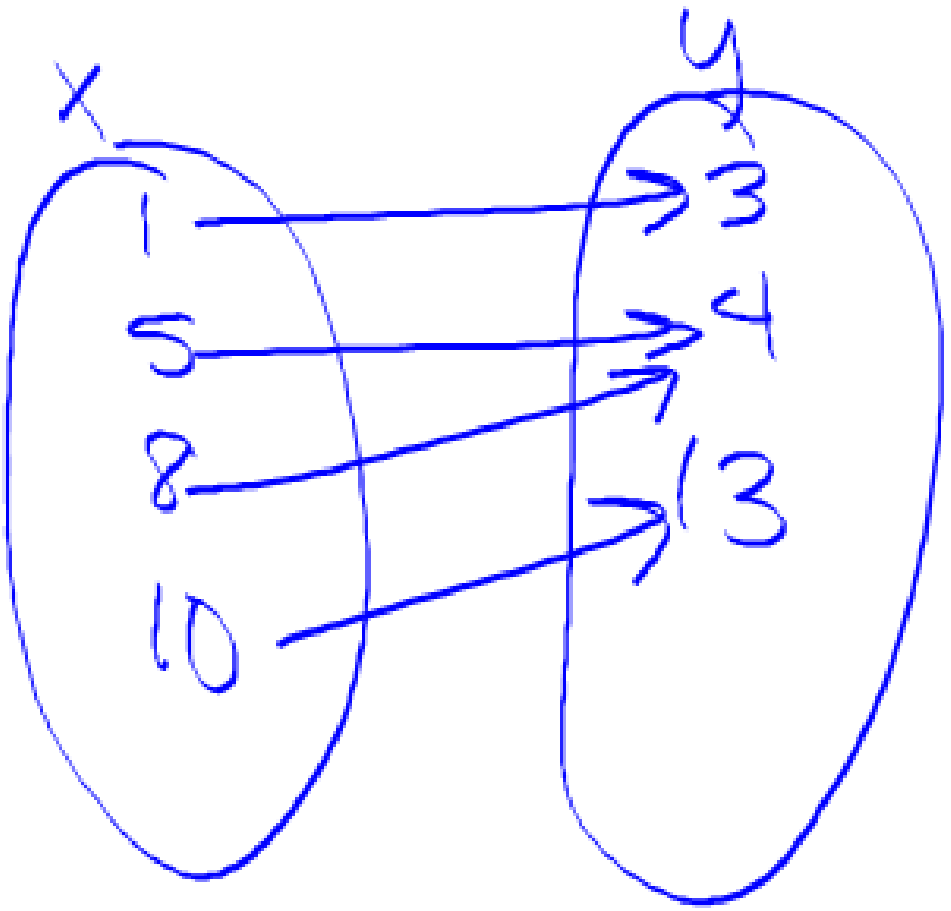


Can we have a person with more than one birthday?

Can we have a day where more than one person was born?

Represent this relation (ordered pairs) as a Mapping:

{(1, 3), (5,4), (8,4), (10, 13)}



Domain and Range:

In a relation, we say that y depends on x and could write the relation as a set of ordered pairs (x, y).

We can think of the set of all x as the INPUTS of the realtions.
The set of all y can be thought of as the OUTPUTS of the relations.

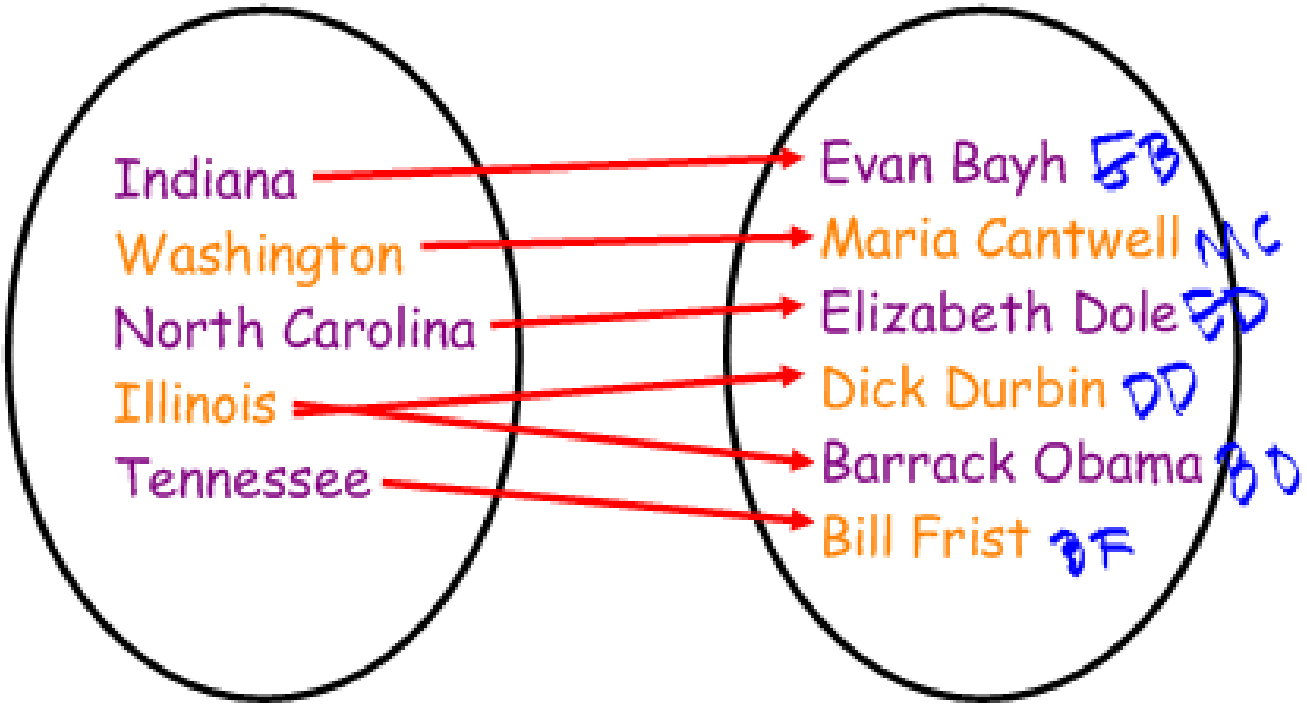
We use this interpretation of a relations to define DOMAIN and RANGE. These will be written as sets.

X Y

State the DOMAIN and the RANGE:

Domain: {IN, WA, NC, IL, TN}

Range: {E.B., M.C., E.D., D.D., B.O., B.F.}



State the DOMAIN and RANGE of this relation:

{(1, 3), (5,4), (8,4), (10, 13)}

Domain: $\{1, 5, 8, 10\}$

Range: $\{3, 4, 13\}$

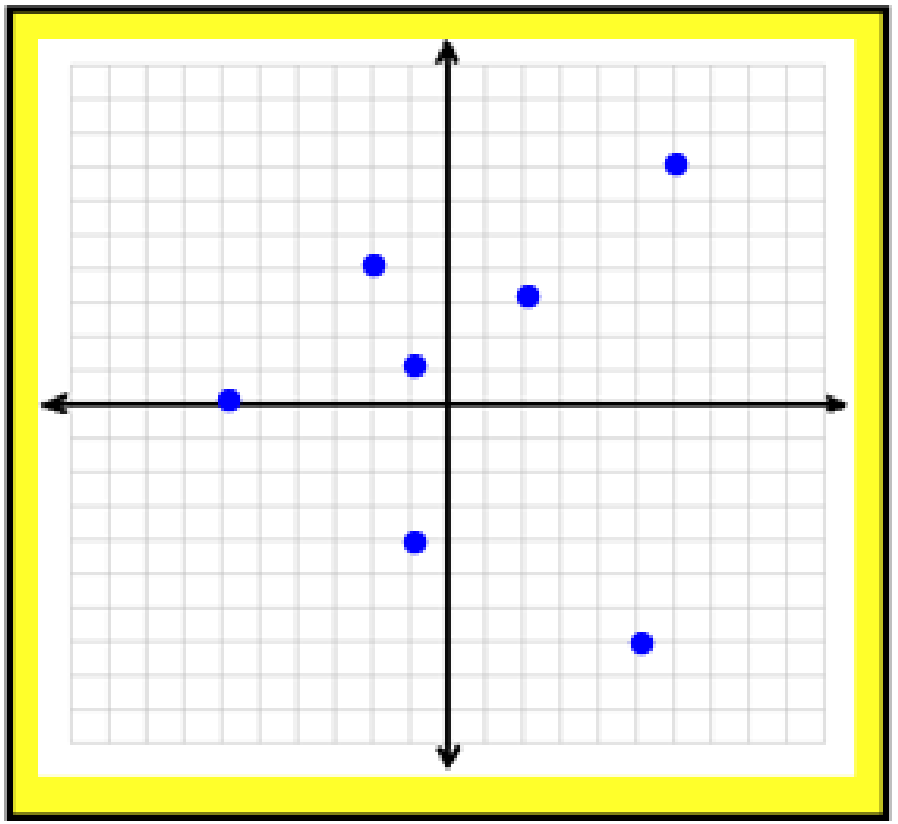
Relations can also be represented by graphs (with ordered pairs). The set of all x-coordinates represent the DOMAIN of the realtions and the set of all y-coordinates represents the RANGE of the relation.

State the domain and range:

D: {-6, -2, -1, 2, 5, 6}

R: {0, 4, 1, -4, 3, -7, 7}

or {-7, -4, 0, 1, 3, 4, 7}

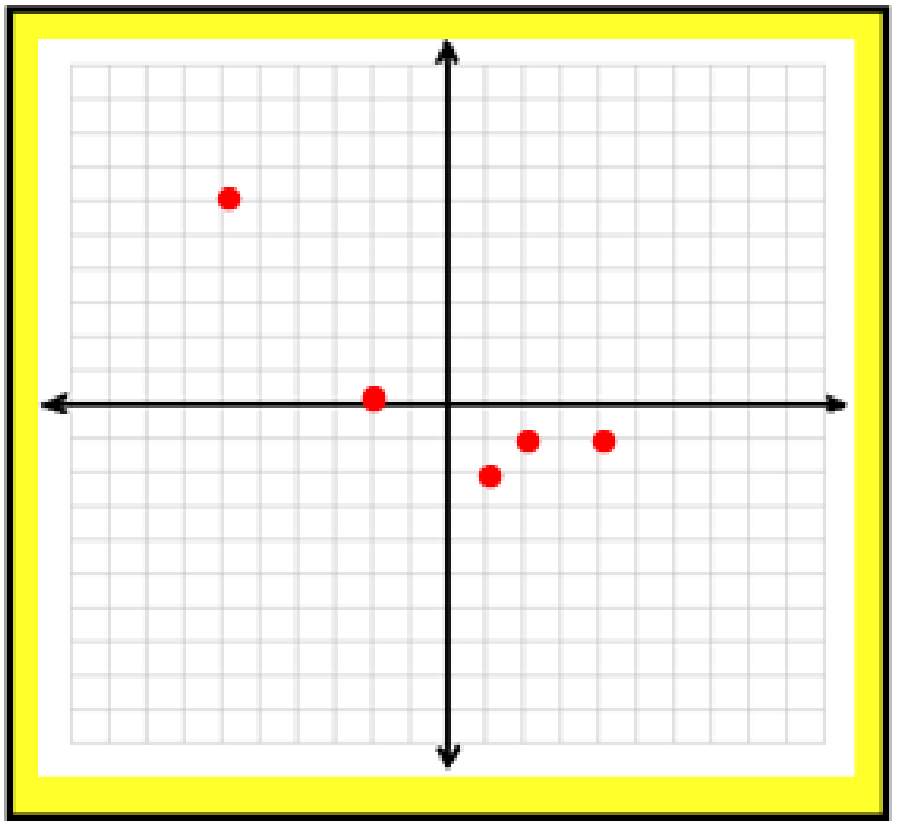


State the DOMAIN and RANGE:

$D: \{-6, -2, 1, 2, 4\}$

$R: \{6, 0, -2, -1\}$

$(-6, 6)$
$(-2, 0)$
$(1, -2)$
$(2, -1)$
$(4, -1)$



State the DOMAIN and RANGE:

Set

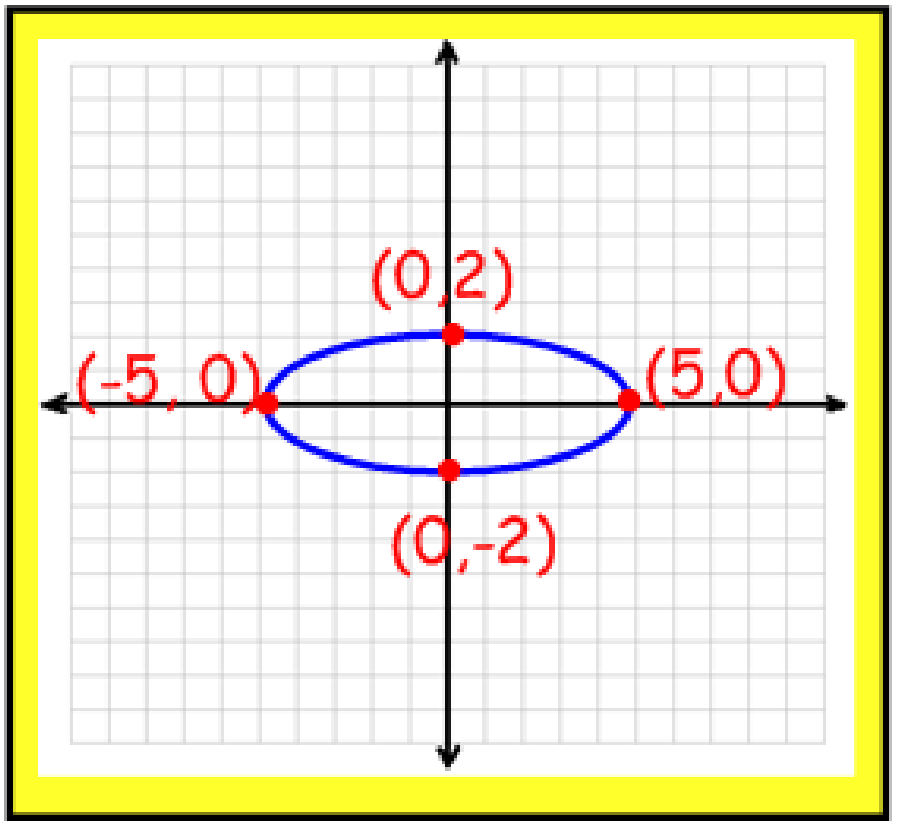
$D: \{x \mid -5 \le x \le 5\}$

$R: \{y \mid -2 \le y \le 2\}$

Interval

$D: [-5, 5]$

$R: [-2, 2]$



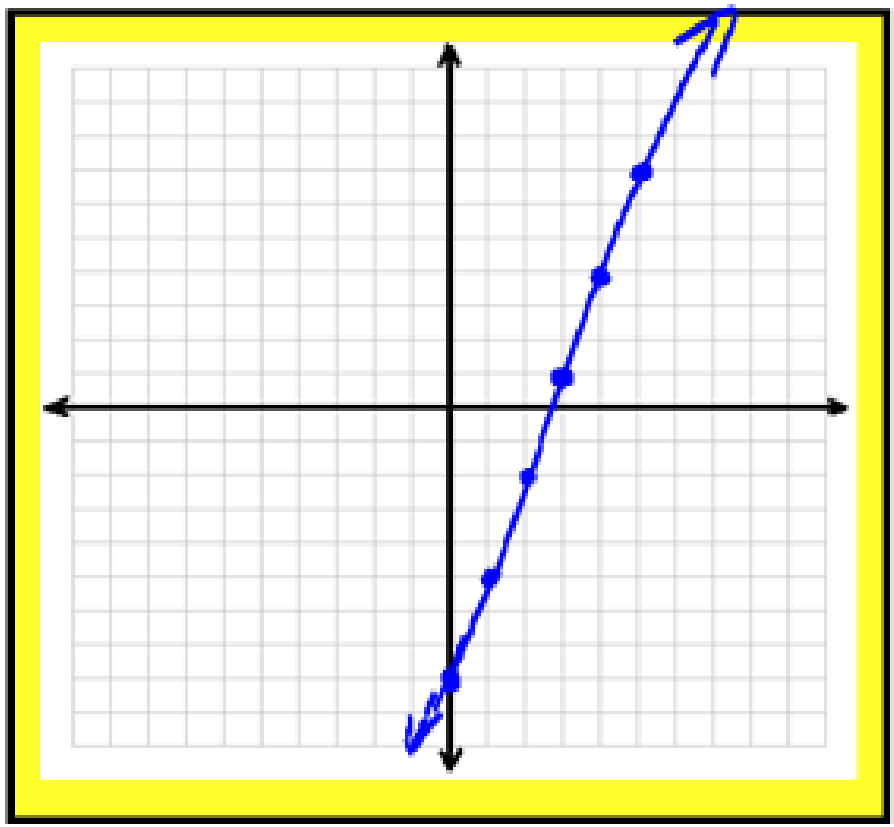
Another apprach to defining a relation is through equations. We can find how x and y are related through equations. We can also find the Domain and Range from equations. (It is helpful to graph them).

State the DOMAIN and RANGE: $y = 3x - 8$

Set Interval

D: $\mathbb{R}$ or $(-\infty, \infty)$

R: $\mathbb{R}$ or $(-\infty, \infty)$



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Can you?

Homework:

Pg. 153: 1-5 all, 9, 13, 17, 21, 23, 31, 33, 37, 39, 41, 53, 55

(18 prob)