

## 1.1(a) Functions

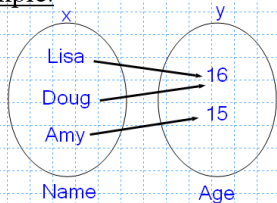
### Definitions:

1. A **relation** is a set of ordered pairs.
2. The **domain** of a relation is the set of all x-coordinates of the relation.
3. The **range** of a relation is the set of all y-coordinates.
4. A **function** is a relation in which each element from the domain corresponds to exactly one element of the range.

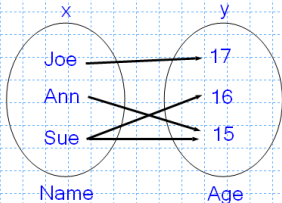
Example:  $S = \{(1, 3), (-5, 4), (7, 3)\}$

- a) What is the domain of S?  $\{1, -5, 7\}$
- b) What is the range of S?  $\{3, 4\}$
- c) Is S a function? yes every  $x$  is paired with one  $y$ .

(OK to have  $y$ -values repeat)  
Not  $x$ !

Example:

function



not a function

sue can't be  
15 & 16 !!

Now let's look at equations:

An equation in two variables,  $x$  and  $y$ , will generate a set of ordered pairs (i.e. a relation). The variable representing the domain is  $x$  (also called the independent variable) and the variable representing the range is  $y$  (the dependent variable).

\* **An equation is a function of  $x$**  if it can be uniquely solved for  $x$  (this means that if you solve for  $y$ , you only get one answer).

Example: Which of the following equations represents  $y$  as a function of  $x$ ?

Solve for  $y$ :

a)  $2x^2 - y + 1 = 0$

$$2x^2 + 1 = y$$

A function of  $x$ .

$$b) x + y^2 - 6 = 0$$

$$y^2 = -x + 6$$

$$y = \pm \sqrt{-x + 6}$$

2 equations, so  
so  $y$  is not a  
function of  $x$ .

Function Notation:  $y = f(x)$

"f of x"

Example: Find the following if  $f(x) = x^2 - 4x$

$$a) f(3) = 3^2 - 4(3) = -3$$

$$b) f(a) = a^2 + 4a$$

$$\begin{aligned}
 c) f(x+h) &= (x+h)^2 - 4(x+h) \\
 &= (x+h)(x+h) - 4x - 4h \\
 &= x^2 + 2xh + h^2 - 4x - 4h
 \end{aligned}$$

Example: Find the following if

$$f(x) = \begin{cases} x+1, & \text{if } x \geq 0 \\ -x, & \text{if } x < 0 \end{cases}$$

$x$  will fall into one of these domains.

a)  $f(2)$  since  $2 \geq 0$ , use the top equation  
 $= 2 + 1 = 3$

b)  $f(-5)$  since  $-5 < 0$ , use the bottom eqn.  
 $= -(-5) = 5$

c)  $f(0)$  Since  $0 \leq 0$ , use the top equation  
 $= 0 + 1 = 1$