# Unit 3:

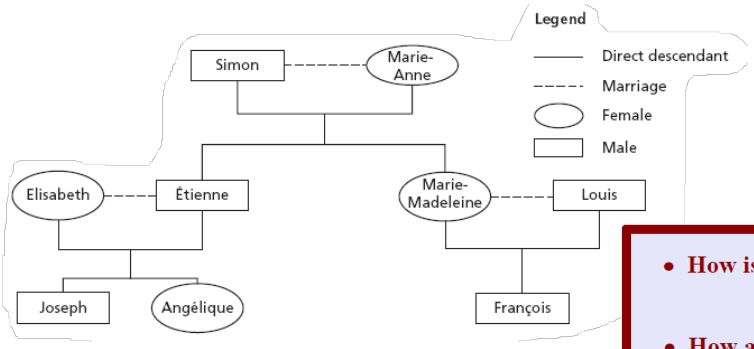
# Relations and Functions

# Representing Relations

**LESSON FOCUS** Represent relations in different ways.

## Make Connections

This family tree shows relations within a family.




- How is Joseph related to Simon?
- How are Angelique and Francois related?
- How does the family tree show these relations?

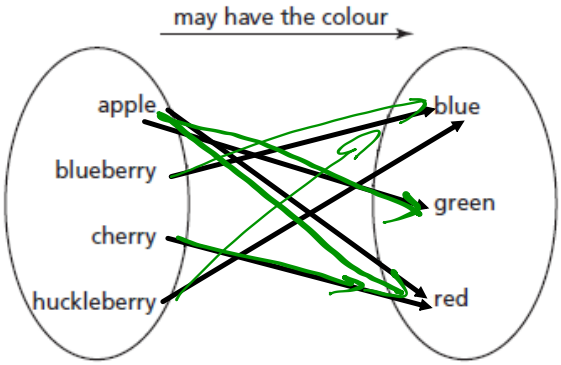
Here are some other ways to represent this relation:

- a table

| Fruit | Colour |
|---|---|
| apple | red |
| apple | green |
| blueberry | blue |
| cherry | red |
| huckleberry | blue |

The heading of each column describes each set.

- an **arrow diagram**




The two ovals represent the sets. Each arrow associates an element of the first set with an element of the second set.

The order of the words in the ordered pairs, the columns in the table, and the ovals in the arrow diagram is important. It makes sense to say, "an apple may have the colour red," but it makes no sense to say, "red may have the colour apple." That is, a relation has direction from one set to the other set.

5.1 Representing Relations

# Terminology

A *set* is a collection of distinct objects.

**Set of Fruit**

| Fruit |
| --- |
| apple |
| blueberry |
| cherry |
| huckleberry |

elements

**Set of Colours**

| Colour |
| --- |
| red |
| green |
| blue |

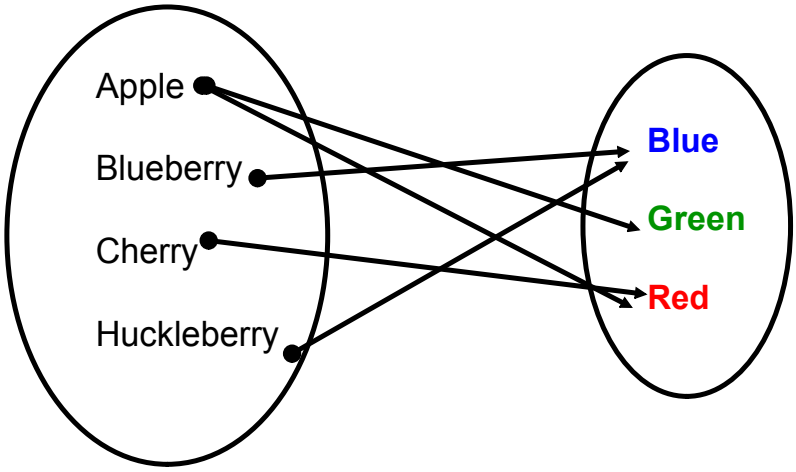
**An *element* of a set is one object in the set.**

| Set of Fruit |
| --- |
| Fruit |
| apple |
| blueberry |
| cherry |
| huckleberry |

***Apple* is an element of the set of Fruit**

A ***relation*** associates the elements of one set with the elements of another set

## Arrow Diagram



# Some other ways to display the relation :

## Use a table

| Fruit | Colour |
|---|---|
| apple | red |
| apple | green |
| blueberry | blue |
| cherry | red |
| huckleberry | blue |

(x, y)

**Use a set of *ordered pairs* to display a relation.**

{ (apple,red) , (apple, green) , (blueberry, blue) ,
(cherry, red) , (huckleberry, blue) }

# Representing Relations

**Here are some of the most common means of describing mathematical relations:**

(1) Verbally
(2) Ordered Pairs
(3) Table of Values
(4) Arrow Diagram
(5) Graph
(6) Equation

## Example 1 Representing a Relation Given as a Table

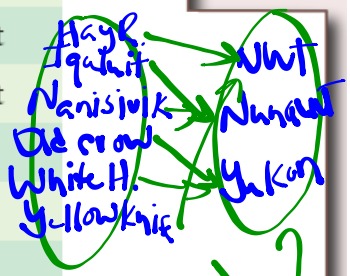
Northern communities can be associated with the territories they are in. Consider the relation represented by this table.

a) Describe this relation in words.

b) Represent this relation:
   i) as a set of ordered pairs
   ii) as an arrow diagram

| Community | Territory |
|---|---|
| Hay River | NWT |
| Iqaluit | Nunavut |
| Nanisivik | Nunavut |
| Old Crow | Yukon |
| Whitehorse | Yukon |
| Yellowknife | NWT |

belongs to the territory




b) i) {(Hay River, NWT); (Iqaluit, Nunavut); (Nanisivik, Nunavut); (Old Crow, Yukon); (Whitehorse, Yukon); (Yellowknife, NWT)}

# SOLUTIONS...

a)

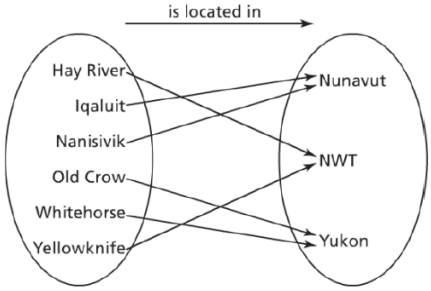
| Community | Territory |
|---|---|
| Hay River | NWT |
| Iqaluit | Nunavut |
| Nanisivik | Nunavut |
| Old Crow | Yukon |
| Whitehorse | Yukon |
| Yellowknife | NWT |

b) i)

The communities are the first ordered pairs.
The territories are the second ordered pairs.

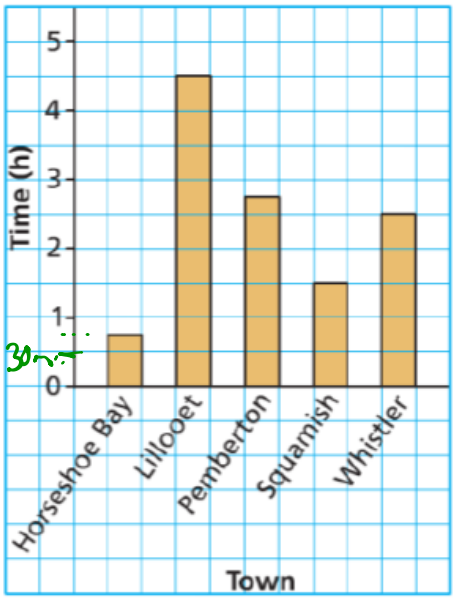
{ (Hay River, NWT) , (Iqaluit, Nunavut) , (Nanisivik, Nunavut) , (Old Crow, Yukon), (Whitehorse, Yukon) , (Yellowknife , NWT) }

ii)



# You Try !!

Different towns in British Columbia can be associated with the average time, in hours, that it takes to drive to Vancouver.




Represent the relation as a *table*.

Table

| Community | Time (h) to Vancouver |
|---|---|
| HS Bay | 45 min → 3/4 |
| Lillooet | 4.5 |
| Pemberton | 2.75 |
| Squamish | 1.5 |
| Whistler | 2.5 |

time (h) to Van.

HS Bay
Lillooet
Pemberton
Squamish
Whistler

0.75
1.5
2.5
2.75
4.5

{(HS Bay, 0.75) etc.}

**solution:**

| Town | Average Time (h) |
|---|---|
| Horseshoe Bay | 0.75 |
| Lillooet | 4.5 |
| Pemberton | 2.75 |
| Squamish | 1.5 |
| Whistler | 2.5 |

## Practice problems:

Page 262-263
#4, 5, 7, 13, 14

## Attachments

Worksheet - Function Notation.pdf