Chapter 5

Functions & Relations
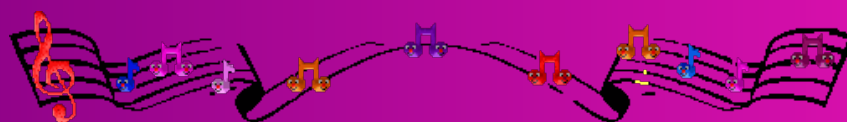
5.1 Representing Relations

How are we Related !!!!

Legend

——	Direct descendant
- - - -	Marriage
◯	Female
▢	Male
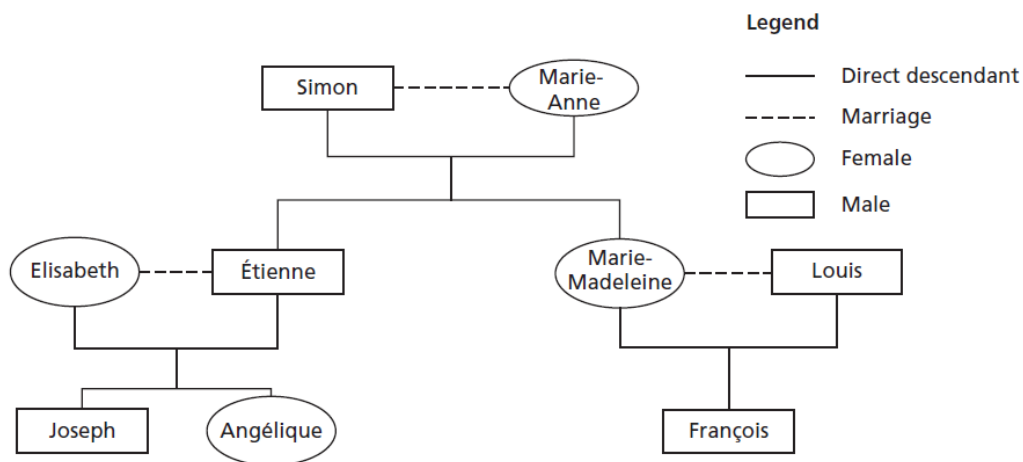
- **How is Joseph related to Simon?**

- **How are Angelique and Francois related?**

- **How does the family tree show these relations?**

Terms

A <u>set</u> is a collection of distinct objects usually denoted in brackets { }

ex)   Set of fruit is {Apples, Grapes, Blueberry, Kiwi}

Set of color is   {Red, Green, Blue}

An <u>element</u> is one object in a set

ex) Apple is an element of the set fruit

A r<u>elation</u> associates the elements of one set with the elements of another set

You can use Arrow diagrams, Tables, Tables of values of input output and ordered pairs

Ex1) Arrow Diagrams
you draw arrows to show how set 1 is related to group 2

Never repeat the name...just draw extra arrows

Fruit   Color

Apple
Blueberry   Blue
Cherry   Green
Kiwi   Red

Domain   Range
x   y
Input   Output
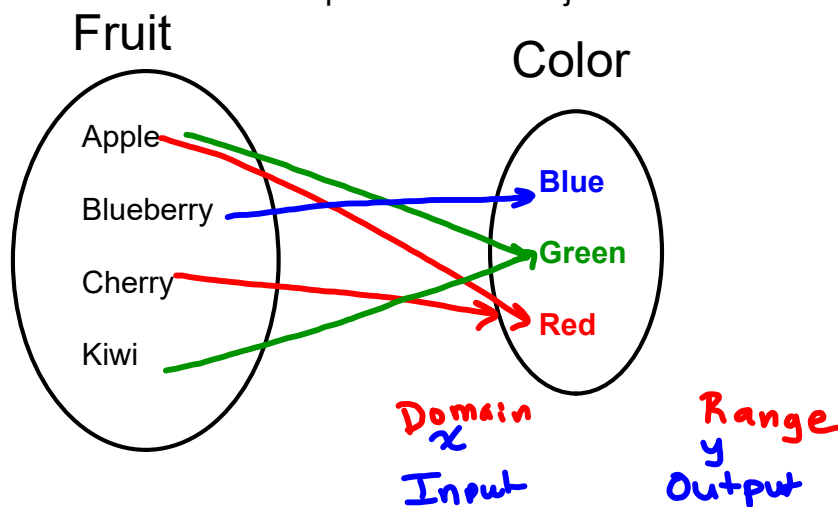
Ex2) Tables

Fruit	Color
Apple	Red
Apple	Green
Blueberry	Blue
Cherry	Red
Kiwi	Green

Ex 3) Ordered Pairs --> Place in brackets since it is a set

{ (Apple, Red) , (Apple, Green), (Blueberry, Blue), (Cherry, Red), (Kiwi, Green) }

Ex 2)

Table of Values
$$Y = 3x + 1$$

Show work for first three value

x	y
0	1
1	4
2	7
3	10

+3
+3

$x = 0$

$y = 3x + 1$
$y = 3(0) + 1$
$y = 0 + 1$

$\boxed{y = 1}$

$x = 1$

$y = 3x + 1$
$= 3(1) + 1$
$= 3 + 1$
$= 4$

$x = 2$

$y = 3x + 1$
$= 3(2) + 1$
$= 6 + 1$
$= 7$

Ordered Pairs (x,y)
$$\{(0,1), (1,4), (2,7), (3,10)\}$$

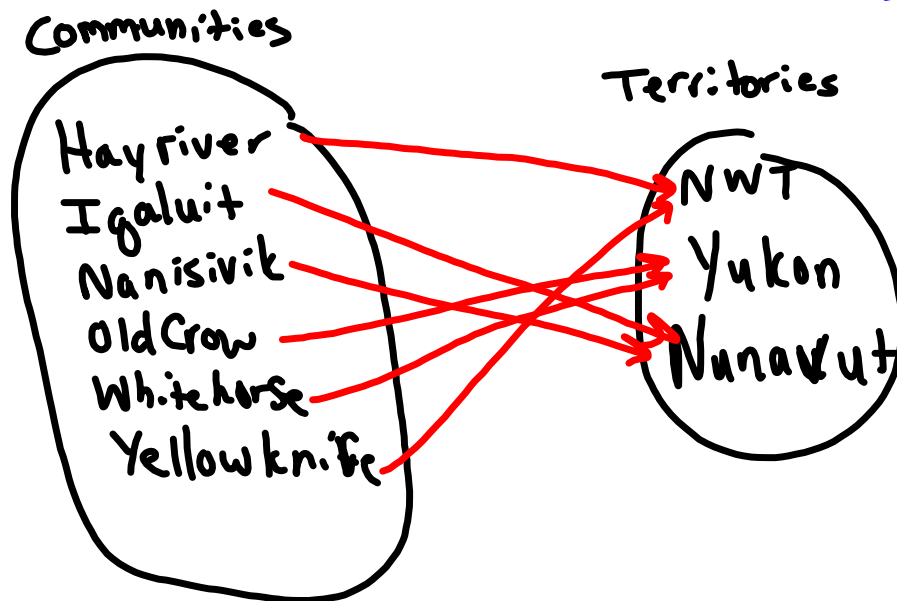*Northern communities* can be associated
with the *territories* they are in.

x y (x,y)

You Try !!

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

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

{ (Hayriver, NWT), (Igaluit, Nunavut),
(Nanisivik, Nunavut), (Old Crow, Yukon),
(Whitehorse, Yukon), (Yellowknife, NWT) }

Communities   Territories

Hay river
Igaluit
Nanisivik   NWT
Old Crow   Yukon
Whitehorse   Nunavut
Yellowknife

i) solutions

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

$$\left\{ \begin{array}{l} \text{(Hay River, NWT) , (Iqaluit, Nunavut) , (Nanisivik, Nunavut) ,} \\ \text{(Old Crow, Yukon), (Whitehorse, Yukon) , (Yellowknife , NWT)} \end{array} \right\}$$

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

ii)

is located in

Hay River
Iqaluit
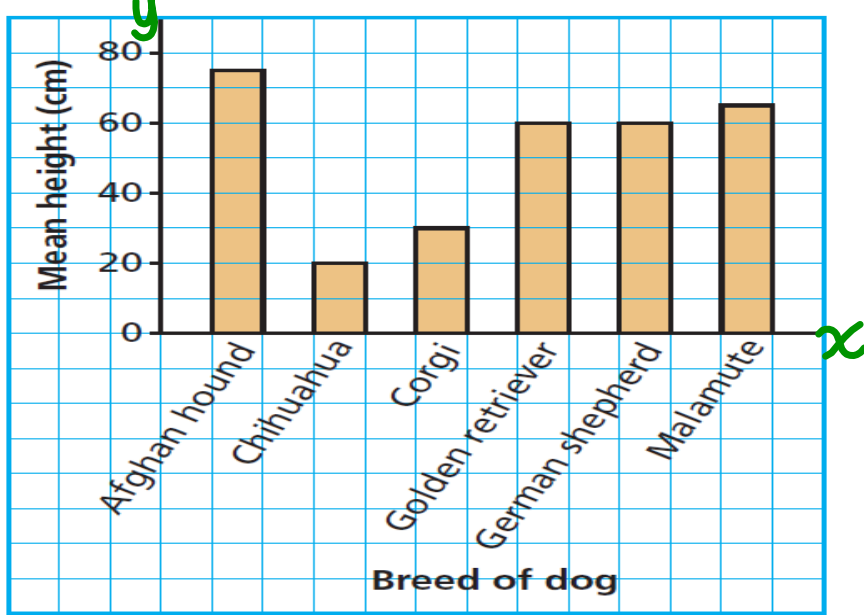Nanisivik
Old Crow
Whitehorse
Yellowknife

Nunavut
NWT
Yukon
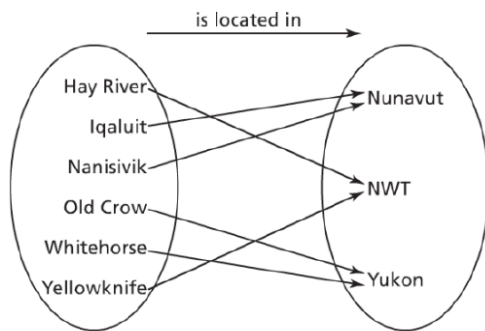
Representing a Relation Given as a Bar Graph

Different breeds of dogs can be associated with their mean heights. Consider the relation represented by this graph. *height*
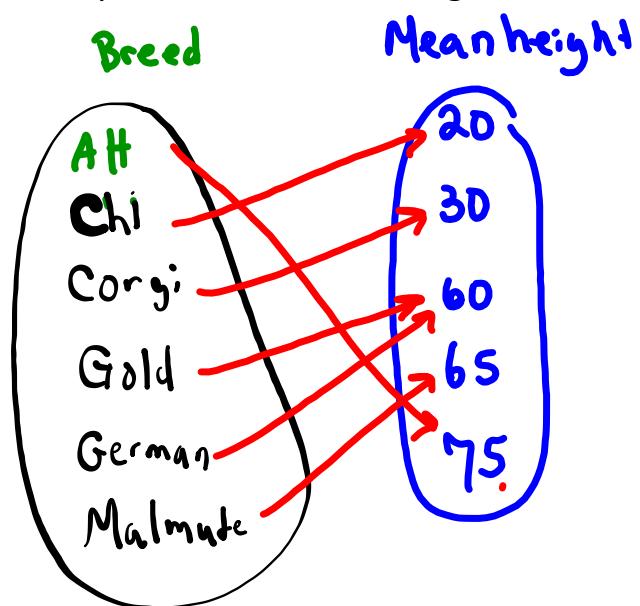
Mean Heights of Different Breeds of Dogs

y

Mean height (cm)

80
60
40
20
0

Afghan hound   Chihuahua   Corgi   Golden retriever   German shepherd   Malamute

x

Breed of dog

Represent the relation:

a) as a table

x Breed of Dog	*y* Mean height
A H	75
Chi	20
Corgi	30
Gdd	60
German	60
Malmuk	65

b) as an arrow diagram

Breed   Mean height

A H
Chi
Corgi
Gold
German
Malmute

20
30
60
65
75

Solutions

a) as a table
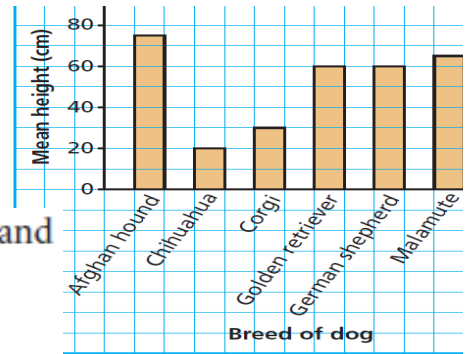
In the table, write the breeds of dogs in the first column and the mean heights in centimetres in the second column.

Breed of Dog	Mean Height (cm)
Afghan hound	75
Chihuahua	20
Corgi	30
Golden retriever	60
German shepherd	60
Malamute	65

b) as an arrow diagram

b) In the arrow diagram, write the breeds of dogs in the first set and the mean heights in centimetres in the second set.

has a mean height (cm) of

Afghan hound
Chihuahua
Corgi
Golden retriever
German shepherd
Malamute

20
30
60
65
75
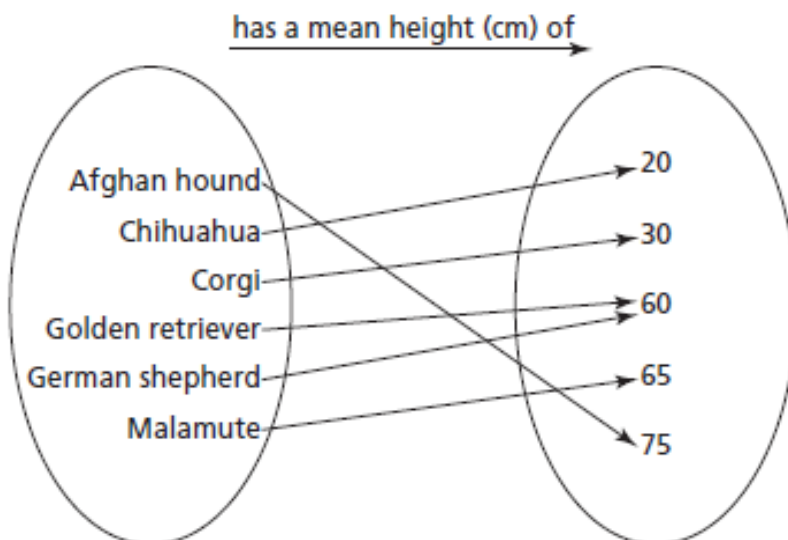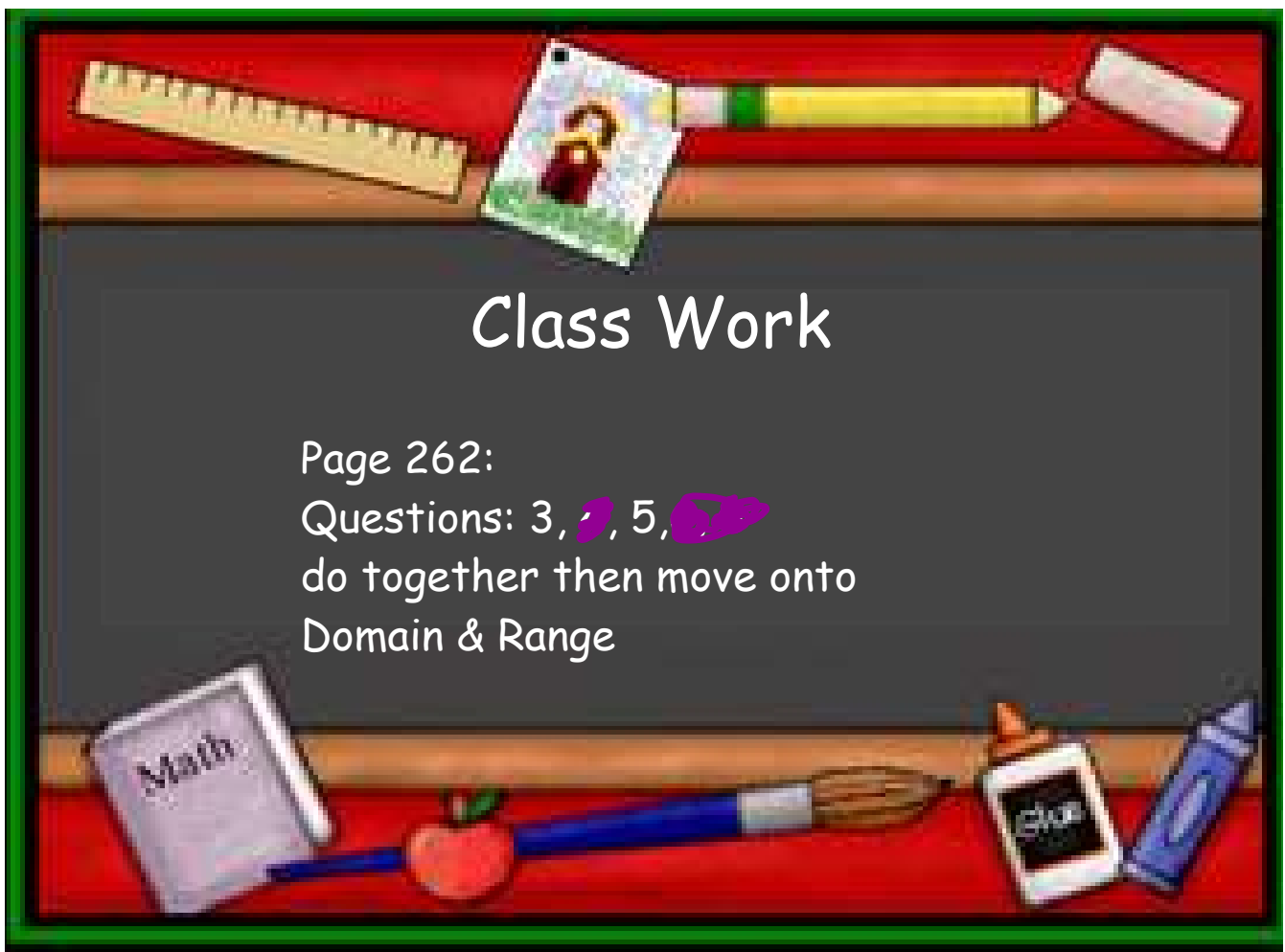
Class Work

Page 262:
Questions: 3, 4, 5, 6, 7
do together then move onto
Domain & Range

3. For each table below:
   i) Describe the relation in words.
   ii) Represent the relation:
      ▪ as a set of ordered pairs
      ▪ as an arrow diagram

a)

Coin	Value ($)
penny	0.01
nickel	0.05
dime	0.10
quarter	0.25
loonie	1.00
toonie	2.00

b)

Sport	Equipment
badminton	shuttlecock
badminton	racquet
hockey	puck
hockey	stick
tennis	ball
tennis	racquet
soccer	ball

5.1 Representing Relations

a)

Coin	Value ($)
penny	0.01
nickel	0.05
dime	0.10
quarter	0.25
loonie	1.00
toonie	2.00

3. a) i) The relation shows the association "has a value, in dollars, of" from a set of coins to a set of numbers.
   ii) As a set of ordered pairs:
       {(penny, 0.01), (nickel, 0.05), (dime, 0.10), (quarter, 0.25), (loonie, 1.00), (toonie, 2.00)}
       As an arrow diagram:

coin ——— has a value ($) of ——→ **value**

dime — 0.01
loonie — 0.05
nickel — 0.10
penny — 0.25
quarter — 1.00
toonie — 2.00
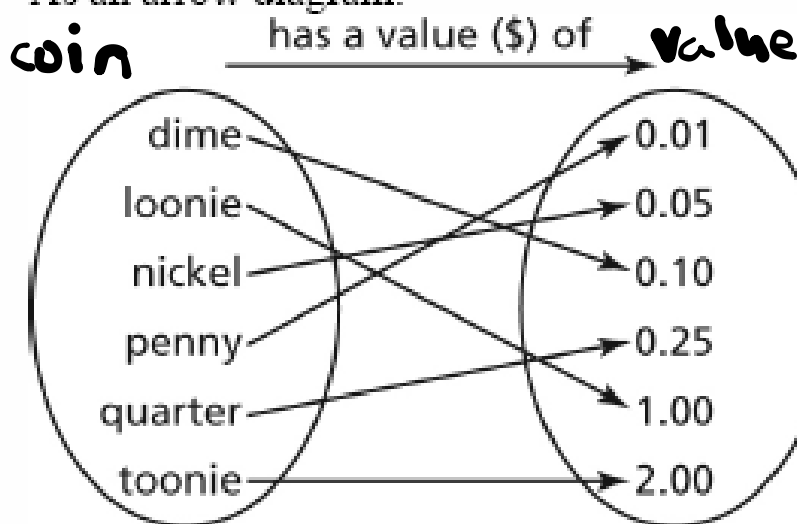
b) i) The r
       a" fro
   ii) As a s
       {(bad
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ba

b)

Sport	Equipment
badminton	shuttlecock
badminton	racquet
hockey	puck
hockey	stick
tennis	ball
tennis	racquet
soccer	ball

b) i) The relation shows the association "is played with a" from a set of sports to a set of equipment.
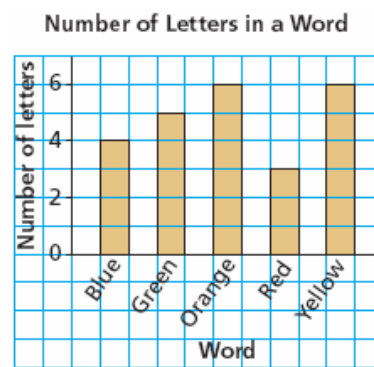
ii) As a set of ordered pairs:
{(badminton, racquet), (badminton, shuttlecock), (hockey, puck), (hockey, stick), (tennis, ball), (tennis, racquet), (soccer, ball)}

As an arrow diagram:

Sport ——— is played with a ———→ Equi

badminton
hockey
soccer
tennis

ball
puck
racquet
shuttlecock
stick
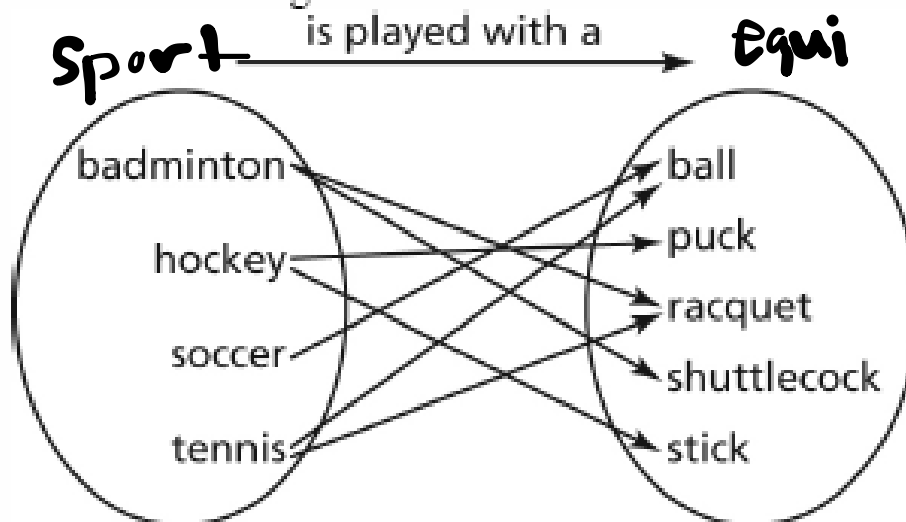
4. Consider the relation represented by this graph.
Represent the relation:
a) as a table
b) as an arrow diagram

Number of Letters in a Word

5. This table shows some of Manitoba's
francophone artists and the medium
they use.
   a) Describe the relation in words.
   b) Represent this relation:
      i) as a set of ordered pairs
      ii) as an arrow diagram

| Artist	Medium
Gaëtanne Sylvester	sculpture
Hubert Théroux	painting
Huguette Gauthier	stained glass
James Culleton	painting
Nathalie Dupont	photography
Simone Hébert Allard	photography

5.1 Representing Relations

6. **a)** Describe the relation represented by this bar graph.

   b) Represent the relation as a set of ordered pairs.

   c) Represent the relation in a different way.

Typical Masses of Species of Salmon
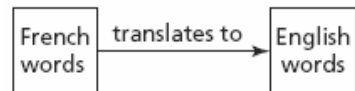

5.1 Representing Relations
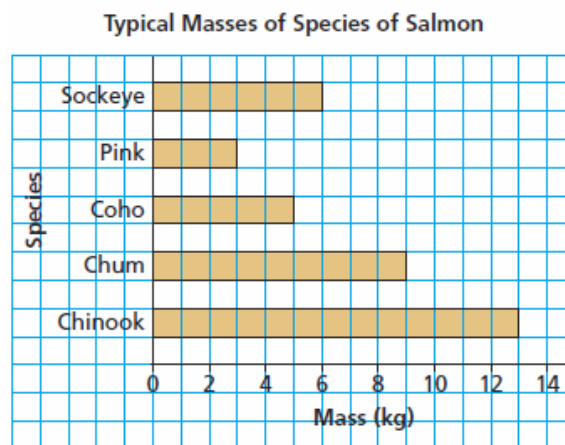
7. For a word game, words that begin with the letter Z can be difficult to find.

a) What does this arrow diagram represent?

b) Represent this relation in two different ways.

c) Create an arrow diagram for words beginning with the letter X, then represent the relation in two different ways.

5.1 Representing Relations
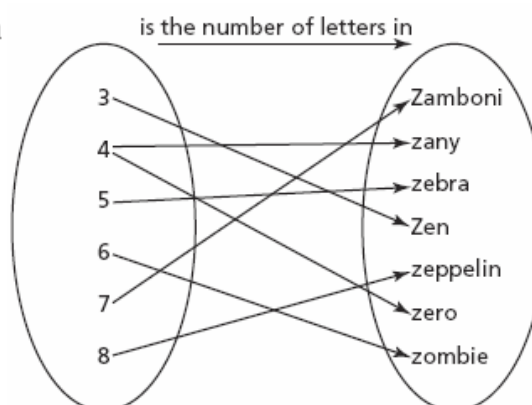
8. In the diagram below:
   a) Describe the relation in words.
   b) List two ordered pairs that belong to
      the relation.

| French words | translates to → | English words |

5.1 Representing Relations

9. A digital clock displays digits from 0 to 9 by lighting up different segments in two squares. For example, the digit 2 needs 5 segments to light up, as shown.

a) List the set of ordered pairs of the form:
   (digit, number of segments lit up)

b) Represent this relation in two different ways.

5.1 Representing Relations

10. Here are some Canadian hockey players and the year they were born.
Jennifer Botterill (1979); Jonathan Cheechoo (1980);
Roberto Luongo (1979); Jordin Tootoo (1983); Hayley Wickenheiser (1978)
For each association below, use these data to represent a relation
in different ways.
a) was born in
b) is the birth year of

5.1 Representing Relations

11. Choose five people in your class.
 a) Use the association "is older than" to write a relation. Represent the relation using a set of ordered pairs.
 b) Create your own association for these five people, then describe the relation in words. Represent this relation in different ways.

5.1 Representing Relations

12. Two dice are rolled and the numbers that show are recorded.
   a) Use each association below to create a relation as a set of ordered pairs.
      i) The sum of the numbers is even.
      ii) The difference between the numbers is a prime number.
   b) In part a, does the order of the numbers
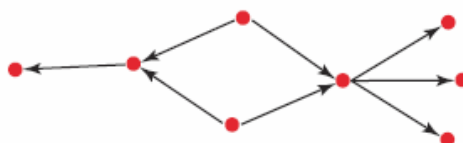   in each ordered pair matter? Explain.

5.1 Representing Relations

13. The association "is the parent of" is shown in the diagram. Each dot represents a person and each arrow maps a parent to her or his child. In this relation:
a) How many children are shown?
b) How many parents are shown?
c) How many grandparents are shown?
Justify your answers.

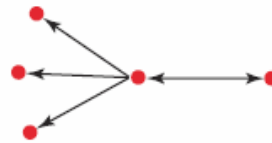5.1 Representing Relations

14. The association "is the sister of" is shown in the diagram. Each dot represents a person and each arrow maps a sister to a sibling.
In this relation:
a) How many females are shown?
b) How many males are shown?
Justify your answers.

5.1 Representing Relations

Reflect

Create a relation that you can describe in words. Show two different ways to represent your relation.

5.1 Representing Relations