# 4. Diagrams

## a. Sample Space Diagrams

These are used to represent Probability. **(See Book 3, pp 67-68)**

## b. Pictograms

In Pictograms pictures represent a certain number of items.

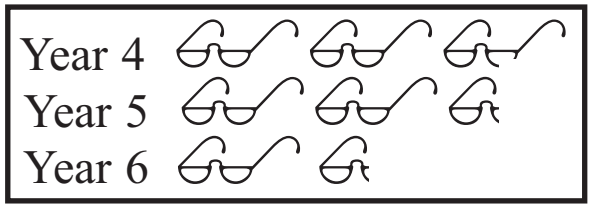
Example:

Forest School Surveyed how many children wear glasses in years 4, 5 and 6.

a) How many children wear glasses in Year 5?

b) How many children wear glasses altogether?

 stands for 6 children  stands for 3 children



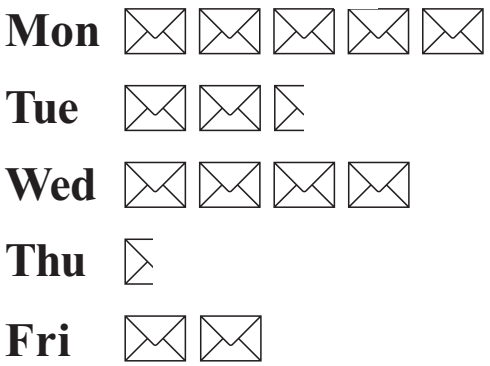

Answers:

a) **15 children** in Year 5 wear glasses.

b) **42 children** wear glasses.

**Exercise 18: 4a** Answer the following:

 **- 10 Letters**  **- 5 Letters**




1) A business monitored the number of letters it received in one week.

a) How many letters came on Monday? .....

b) On what day was the least number of letters delivered?

.....

c) What was the total number of letters for the week? .....

## c. Sets and Venn Diagrams

A **Set** is a Collection of things that belong together. Things that belong to a Set are called **Members** or **Elements**.
**Curly Brackets** or **Braces** are drawn round a Set - { }
**Commas** are used to separate Members from each other.
A **Capital Letter** can stand for a Set. eg. F for fruit.

Example: **P = Prime Numbers under fifteen.**
**P = { 2, 3, 5, 7, 11, 13}**

$\in$ is a Symbol that means **'is a Member of'**
$\notin$ is a symbol that means **'is <u>not</u> a Member of'**

Examples: **2** is a Member of the set of Prime Numbers
is written **2** $\in$ **{Prime Numbers}**

**4** is **not** a Member of the Set of Prime Numbers
is written **4** $\notin$ **{Prime Numbers}**

## Exercise 18: 4b

Answer the following $\in$ and $\notin$:

2) Set **A** = {Fruit} Set **B** = {Vegetables} Set **C** = {Meat}

a) Apple ..... {Fruit} b) Pea ..... {Fruit} c) Lamb ..... {Meat}

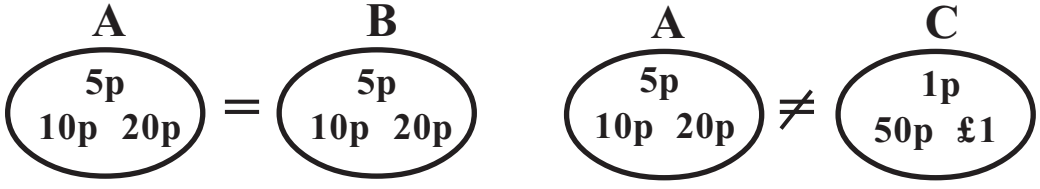
d) Pear ..... {Vegetable} e) Beef ..... {Fruit} f) Pork ..... {Meat}

There are **different types of Sets**
An **Empty Set** or **Null Set** is a Set with no Members and is shown by: **{ }** - Empty Brackets **<u>or</u>** this Symbol $\varnothing$

**Infinite Sets** are endless or $\infty$ eg. The 5× table $\infty$ {5, 10, 15, 20}

**Equal or Identical Sets** have exactly the same Members.
Example: Sets **A** = {5p, 10p, 20p} and **B** = {5p, 10p, 20p}
These Sets are Equal to each other so $\mathbf{A = B}$

If **C** = {1p, 50p, £1} A and C are not Equal so $\mathbf{A \neq C}$
It can be shown by drawing a ring round the Members of a a Set. This is called a **Venn Diagram**.




A and B are Equal or Identical. A and C are **not** Equal or Identical.

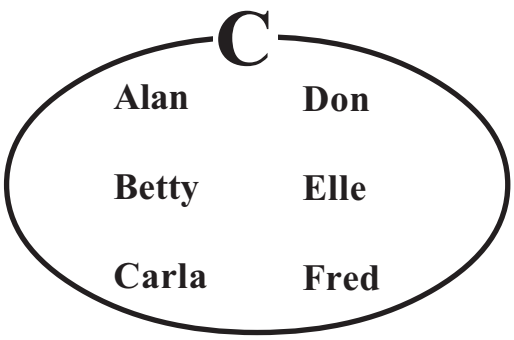
**Subsets** are smaller Sets that are also part of a Main Set.
Example: **C** = a Set of children.

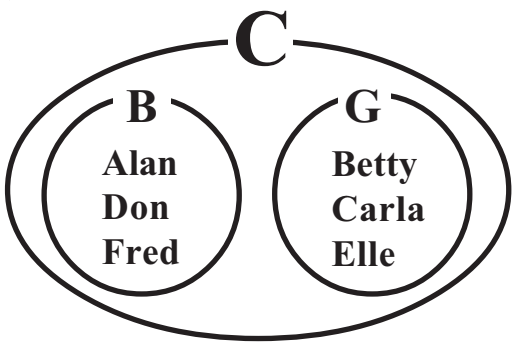
**C** = {Alan, Betty, Carla, Don, Elle, Fred}

Divided into Subsets of Girls and Boys it would be:

**G** = {Betty, Carla, Elle} and **B** = {Alan, Don, Fred,}

$\subset$ means **'Subset of'** and $\not\subset$ means **'not a Subset of'**




So $\mathbf{B} \subset \mathbf{C}$ and $\mathbf{G} \subset \mathbf{C}$ but $\mathbf{B} \not\subset \mathbf{G}$

B is a Subset of C  G is a Subset of C  B is **not** a Subset of G

## Exercise 18: 4c  Answer the following:

3) Below are a Series of Sets

**D** = {2, 3, 4, 5, 6, 7, 8} Digits from 2 to 8  **R** = {6, 8} Rectangular Numbers  **T** = {3, 6} Triangular Numbers  **N** = { } Null Set

**F** = {2, 4, 6, 8} Factors of 8  **O** = {9, 11, 13, 15} Odd Numbers over 8  **E** = {2, 4, 6, 8} Even Numbers up to 8

Define the Relationship between the Sets using Symbols

a) E ..... F  b) R ..... N  c) T ..... F  d) T ..... D  e) R ..... T

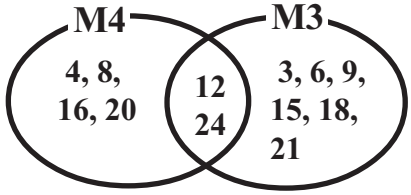
f) If **F** = {2, 4, 6, 8, 10 etc} continued forever it would be an ..... set.

When sets overlap each other it is called an **Intersection**.

**Symbols** - $\cap$ means Intersects; $\cup$ means does not Intersect.

Example:

Multiples of **3** and **4** were Grouped in Sets. Draw a Venn Diagram to show the Intersection.

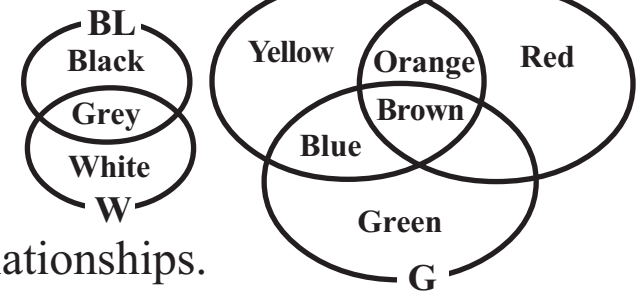



**so M4 $\cap$ M3**

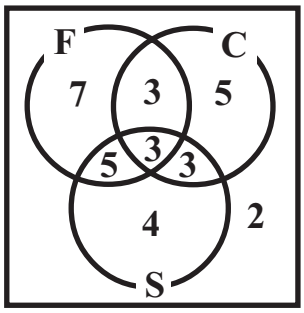
Also **M4** $\cap$ **M3** = {12, 24} (12 and 24 do Intersect)  **M4** $\cup$ **M3** = {4, 8, 16, 20, 3, 6, 9, 15, 18, 21} (4, 8, 16, 20, 3, 6, 9, 15, 18, 21 do not Intersect)

## Exercise 18: 4d

4) The diagram shows colour Relationships. Use the Symbols ∩ and ∪ to define Relationships.




a) R ..... Y  b) BL ..... Y  c) BL ..... W  d) R ..... Y ..... G




5) Some children were asked whether they liked Films, Cartoons or Soaps.

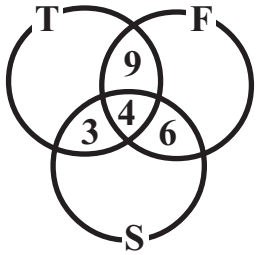
a) What number liked all three? .....

b) How many liked soaps and films? .....

c) How many liked films? .....

d) There are ..... children altogether.

6) A sports club Surveyed its members to see what activities they liked. **28** liked tennis, **20** liked squash and **27** liked football. Complete the Diagram.




How many like: a) tennis and squash? ..... b) football and squash? .....

c) all three activities? ..... d) football but not squash? .....

How many don't like: e) squash? ..... f) tennis? .....

g) tennis or squash but do like football? .....

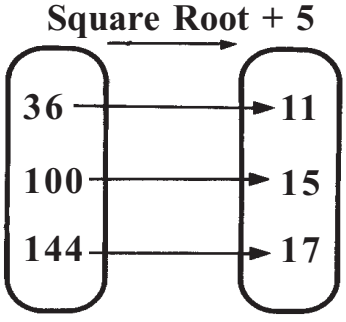
h) How many people were Surveyed altogether? .....

# d. Mappings

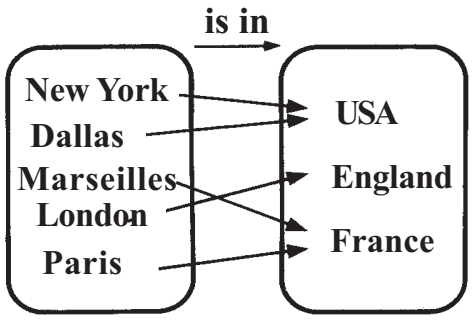
A Mapping (or Function) is a Connection between two Sets. Each first Set Member links with a second Set Member.

Examples:

Note that Members of the first Set have only one partner but the second Set can have more.




Map the numbers




Map cities to country

Mappings make use of the Four Rules of Number. They can have two Operations. Test them out using: + − × ÷
See also Mappings in Algebra. **(Book 6, pp.50-51)**

## Exercise 18: 4e Do the following Mappings:

7) Draw in the arrows for these Mappings:

a) **Divides exactly into**

| | |
|---|---|
| 4 | 12 |
| 5 | 15 |
| 6 | 20 |
| 8 | 24 |

b) **is a multiple of**

| | |
|---|---|
| 60 | 5 |
| 72 | 6 |
| 80 | 10 |
| 95 | 24 |

Write in the Mapping Rule above each Mapping:

c) .....

| | |
|---|---|
| 12 | 1 |
| 15 | 2 |
| 24 | 5 |
| 30 | 7 |

d) .....

| | |
|---|---|
| 3 | 14 |
| 7 | 22 |
| 10 | 28 |
| 20 | 48 |

Discover the Mapping Rule and write in the missing number:

e)

| | |
|---|---|
| 3 | 4 |
| 6 | 8 |
| 9 | 12 |
| 15 | ..... |

f)

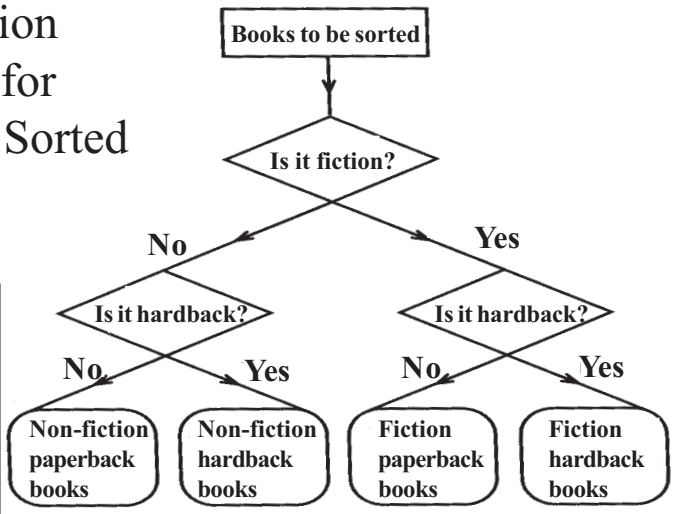
| | |
|---|---|
| 4 | 6 |
| 7 | 12 |
| 11 | 20 |
| 24 | ..... |

# e. *Flow Diagrams*

Flow Diagrams or Decision Trees provide a process for items to be Classified or Sorted into various Groups.

Example:

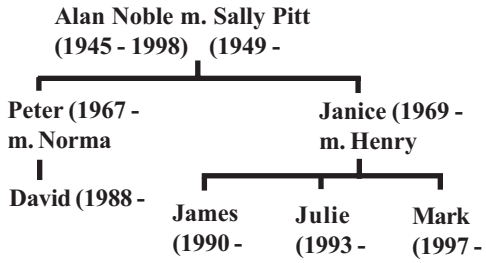
Make up a Decision Tree to help Stefan Sort out a pile of hardback and paperback books.



A Family Tree is another type of Flow Diagram.
Example:

This Family Tree shows three generations of the Noble family
Question: Who is Mark's Grandmother?

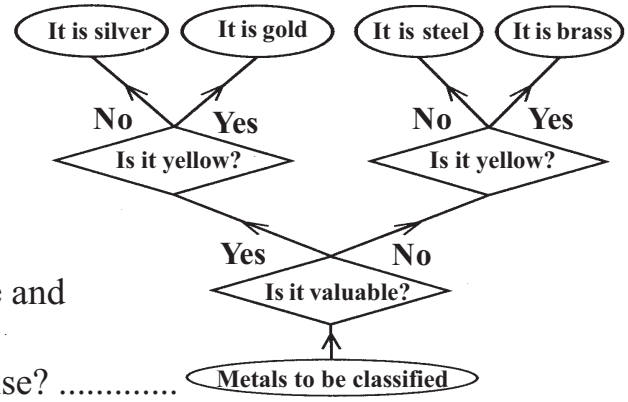
Answer: Sally Noble




## Exercise 18: 4f Answer the following:

8) Using the same Noble Family Tree (above) to answer:
a) How old was was David when his cousin Julie was born? ..... yrs.
b) Julie is Peter's ..... c) Mark is Sally's .....
d) How old was James when his grandfather died? ..... yrs.

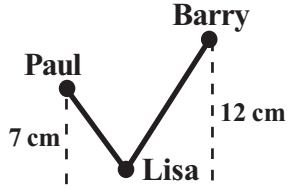
9) A Flow Diagram is drawn to classify four metals.
a) Which metal is valuable and is yellow? .....
b) Which metal is not valuable and not yellow? .....
c) Brass is valuable, true or false? .....




# f. Relational Diagrams

A Relational Diagram can help Solve a problem where things Relate to each other.
Example:

Paul is **7 cm** taller than Lisa who is **12 cm** shorter Barry. Who is the tallest?




Answer: Barry is the tallest.

## Exercise 18: 4g

10) a) **Six** years ago Pat was **3** years old. His father was **nine times** his age.
How old is his father now? .....
How old is Pat now? .....

b) In **3** years time John will be **twice** as old as his sister who is now **5**.
How old is John now?
..... years.