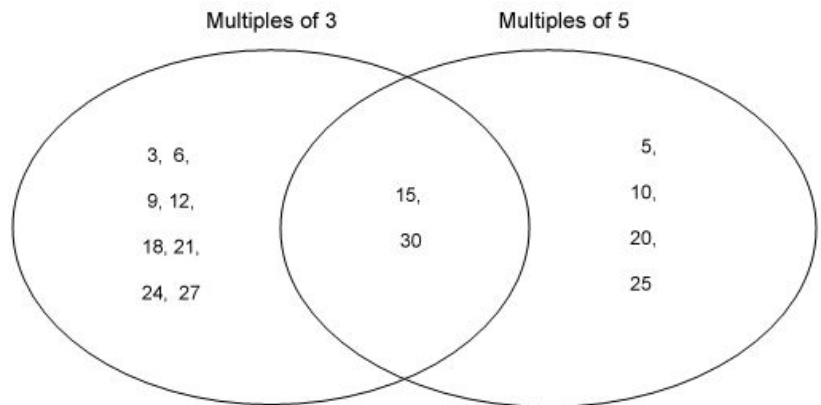
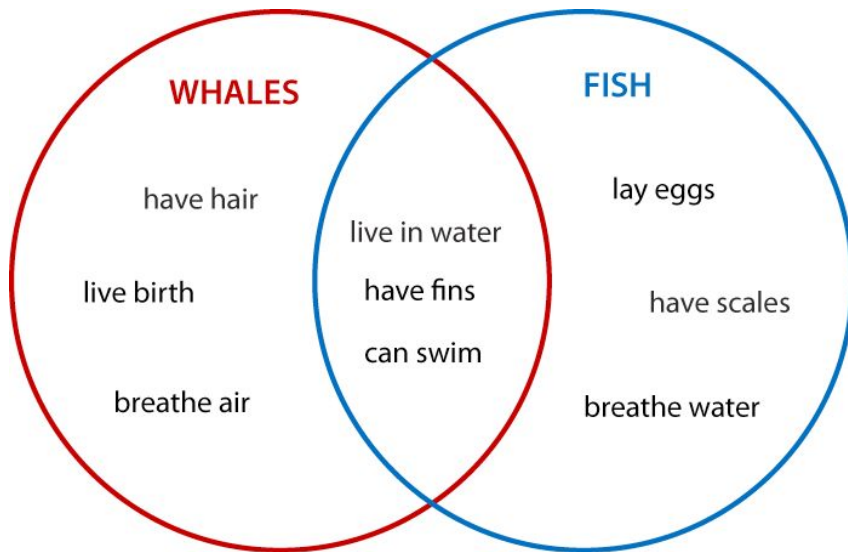


# VENN DIAGRAMS - DEFINITIONS

A **Venn Diagram** is a diagram that represents all possible logical relations between a finite collection of different sets.

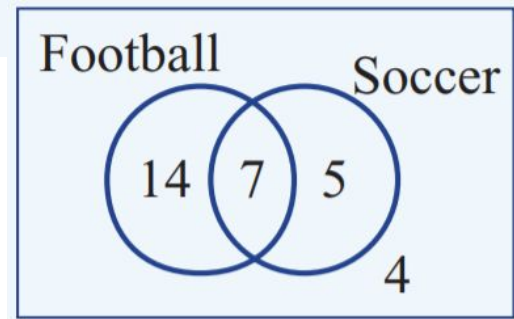
examples:



# VENN DIAGRAMS - EXAMPLE OF USE

A survey of 30 people found that 21 like Australian Rules football and 12 like soccer. Also, 7 people like both football and soccer and 4 like neither football nor soccer.

**a** Construct a Venn diagram for the survey results.



**b** How many people:

**i** like football or soccer?

**ii** do not like soccer?

**iii** like only football?

**i** 26 like football or soccer or both

**ii**  $30 - 12 = 18$  don't like soccer

**iii** 14 like football but not soccer

**c** If one of the 30 people was randomly selected, find:

**i**  $P(\text{like football and soccer}) = \frac{7}{30}$

**ii**  $P(\text{like neither football nor soccer})$

$$= \frac{4}{30} = \frac{2}{15}$$

**iii**  $P(\text{like only soccer}) = \frac{5}{30} = \frac{1}{6}$

## TWO-WAYS TABLES - DEFINITIONS

Like Venn diagrams, **Two-ways tables** are useful ways to present events (i.e. list of all possible outcomes).

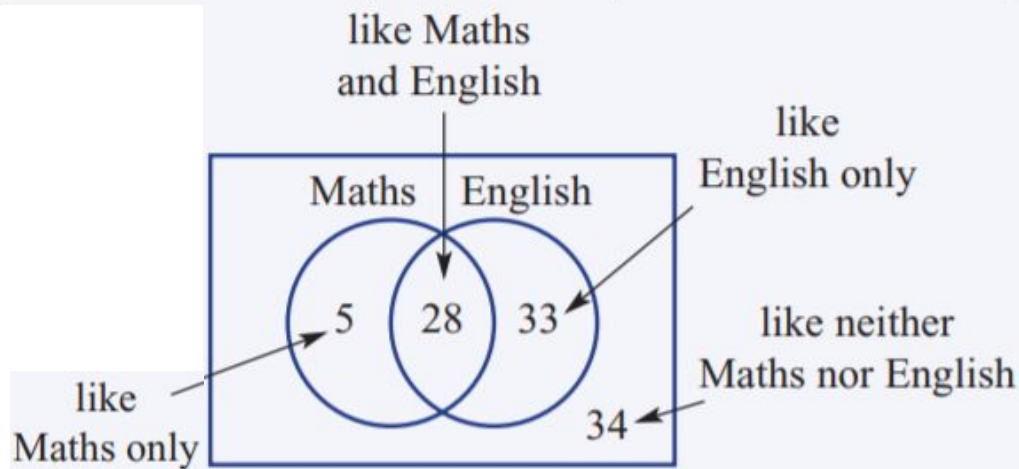
example

|                         | Like Skateboards | Do Not Like Skateboards | Totals |
|-------------------------|------------------|-------------------------|--------|
| Like Snowmobiles        | 80               | 25                      | 105    |
| Do not like Snowmobiles | 45               | 10                      | 55     |
| Totals                  | 125              | 35                      | 160    |

# VENN DIAGRAMS AND TWO-WAYS TABLES

The same information can be presented in a Venn diagram or a Two-ways table.

|                     | Like Maths | Do not like Maths | Total |
|---------------------|------------|-------------------|-------|
| Like English        | 28         | 33                | 61    |
| Do not like English | 5          | 34                | 39    |
| Total               | 33         | 67                | 100   |



Consider the two-way table below showing the eating and sleeping preferences of different animals at the zoo.

|                      | Eats meat | No meat | Total |
|----------------------|-----------|---------|-------|
| Sleeps during day    | 20        | 12      | 32    |
| Only sleeps at night | 40        | 28      | 68    |
| Total                | 60        | 40      | 100   |

**a** For a randomly selected animal, find:

**i**  $P(\text{sleeps only at night})$

**ii**  $P(\text{eats meat or sleeps during day})$

**b** If an animal is selected at random and it eats meat, what is the probability that it sleeps during the day?

**c** What is the probability that an animal that sleeps during the day does not eat meat?

**a i**  $P(\text{sleeps only at night})$

$$= \frac{68}{100}$$

$$= \frac{17}{25}$$

**ii**  $P(\text{eats meat or sleeps during day})$

$$= \frac{72}{100}$$

$$= \frac{18}{25}$$

**b**  $P(\text{sleeps during day, given that the animal eats meat})$

$$= \frac{20}{60}$$

$$= \frac{1}{3}$$

**c**  $P(\text{does not eat meat, given that animal sleeps during the day})$

$$= \frac{12}{32}$$

$$= \frac{3}{8}$$