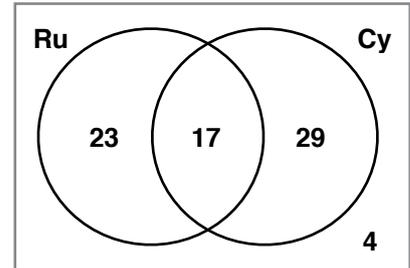


Mutually Exclusive (the OR rule)

Starter

1. **(Review of last lesson)** The Venn diagram shows the members of a sports club with Ru = runners and Cy = cyclists.
- A member of the club is chosen at random. Find the probability they cycle but don't run.
 - A runner is chosen at random. Find the probability they don't cycle.
 - A cyclist is chosen at random. Find the probability they also run.



- N.B.** Multiples — the multiples of 6 are 6, 12, 18, 24,... (all the numbers in the 6 times table).
2. A number between 1 and 30 inclusive is chosen at random. What is the probability that the number is:
- | | | |
|---------------------|----------------------|----------------------------|
| (a) a multiple of 7 | (b) a multiple of 11 | (c) a multiple of 7 or 11. |
| (d) a multiple of 3 | (e) a multiple of 5 | (f) a multiple of 3 or 5. |
3. Discuss in pairs. What is the difference between the calculations for 2(c) and 2(f)?

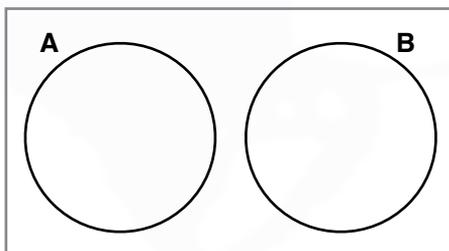
Notes

Mutually exclusive outcomes/events cannot occur at the same time
(Mutually exclusive - usually connected with multiple outcomes from single events).

Mutually exclusive events

Dice: even vs. odd
Coin: heads vs. tails
Homework: hand in vs. not hand in

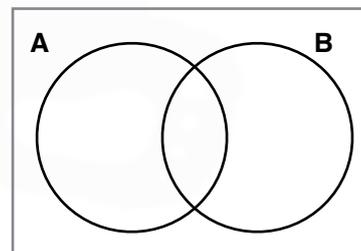
Mutually exclusive = no intersection



Non-mutually exclusive events

Dice even vs. prime
Cards - black vs. picture card

Non-mutually exclusive = intersection



For mutually exclusive events

$$P(A \cap B) = 0 \quad \text{i.e. there is no overlap}$$

So $P(A \cup B) = P(A) + P(B)$ i.e. simply add the probabilities

For non-mutually exclusive events

$$P(A \cap B) \neq 0 \quad \text{i.e. there is an overlap}$$

So $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ i.e. subtract the overlap

N.B. In practice, when in doubt write out all the outcomes so that you do not count one of them twice.

E.g. 1 A number between 1 and 20 inclusive is chosen at random. What is the probability that the number is:

- (a) a multiple of 4 (b) a multiple of 6 (c) a multiple of 4 or 6.

Video: [Mutually exclusive](#)

[Solutions to Starter and E.g.s](#)

Exercise

9-1 class textbook: p250 M8.9 Qu 1-11
A*-G class textbook: p210 M8.5 Qu 1-10
9-1 homework book: p60 M8.9 Qu 1-8
A*-G homework book: p60 M8.5 Qu 1-8

Summary

Mutually exclusive outcomes/events cannot occur at the same time.

For mutually exclusive events: $P(A \cap B) = 0$ i.e. there is no overlap
So $P(A \cup B) = P(A) + P(B)$ i.e. simply add the probabilities

For non-mutually exclusive events: $P(A \cap B) \neq 0$ i.e. there is overlap
So $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ i.e. subtract the overlap

[Homework book answers \(only available during a lockdown\)](#)