PROBABILITY

GRADE 10 & 11 CONCEPTS

- Sample space (S) \rightarrow set of all possible outcomes.
- An event (E) \rightarrow a subset in the sample space.
- Probability (P) \rightarrow the probability of an event occurring $P(E) = \frac{n(E)}{n(S)} = \frac{number \ of \ possible \ outcomes}{total \ number \ of \ likely \ outcomes}$
- $0 \le P(E) \le 1$, which means the probability cannot be negative or greater than 1.
- If event A is *impossible*, the P(A) = 0.
- If event A is *certain*, then P(A) = 1.
- $(A \cap B) \rightarrow$ intersection (A *and* B): the outcomes occur in *both* events A *and* B.
- $(A \cup B) \rightarrow$ union of (A or B): the outcomes occur in event A or B.
- Valid for any two events A and B, the ADDITION rule:

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

• MUTUALLY EXCLUSIVE EVENTS

 ✓ If A happens, B cannot happen and if B happens, A cannot happen



✓ Therefore....

P(A and B) = 0 so that the Addition rule becomes...

$$P(A \text{ or } B) = P(A) + P(B)$$



Here, A and B are **INCLUSIVE** events

• INDEPENDENT EVENTS

- ✓ The outcome of the 2^{nd} event is NOT affected by the outcomes of the 1^{st} event.
- ✓ $P(A \text{ and } B) = P(A) \times P(B)$ so that the Addition rule becomes...

$$P(A \text{ or } B) = P(A) + P(B) - P(A) \times P(B)$$

• DEPENDENT EVENTS

✓ Outcomes of the 1^{st} event influence the outcomes of the 2^{nd} event.

 $\checkmark P(A \text{ and } B) \neq P(A) \times P(B)$

• COMPLEMENTARY EVENTS

- \checkmark A' is the *complement* of A.
- ✓ A' is everything in the sample space that is NOT A.
- P(A') is the same as P(not A)

$$\checkmark P(A') = 1 - P(A)$$



TOOLS for probability:

*Venn diagrams *Tree diagrams, and *Contingency (two-way) tables