

## Summary

### HL Probability

| Subject                                      | Year | Start date      | Duration |
|--|------|-----------------|----------|
| Mathematics: applications and interpretation | IB1  | Week 4, January | 8 weeks  |

#### Course Part

#### Description

In this unit you will learn how to use sophisticated probability techniques to solve real life problems.

## Inquiry & Purpose

### Inquiry / Higher Order Questions

| Type         | Inquiry Questions  |
|--------------|--|
| Skills-based | What are the limitations of discrete distributions?  |
| Skills-based | How is the normal distribution model flawed when considering negative values in real life scenarios? |

## Curriculum

### Aims

Develop logical and creative thinking, and patience and persistence in problem solving to instil confidence in using mathematics

### Objectives

**Knowledge and understanding: Recall, select and use their knowledge of mathematical facts, concepts and techniques in a variety of familiar and unfamiliar contexts.**

**Technology: Use technology accurately, appropriately and efficiently both to explore new ideas and to solve problems.**

### Syllabus Content

#### Topic 4: Statistics and probability

SL Content

SL 4.5

Concepts of trial, outcome, equally likely outcomes, relative frequency, sample space ( $U$ ) and event.

The probability of an event  $A$  is  $P(A) = \frac{n(A)}{n(U)}$

The complementary events  $A$  and  $A'$  (not  $A$ ).

Expected number of occurrences.

SL 4.6

Use of Venn diagrams, tree diagrams, sample space diagrams and tables of outcomes to calculate probabilities.

Combined events:  $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Mutually exclusive events:  $P(A \cap B) = 0$ .

Conditional probability:  $P(A|B) = \frac{P(A \cap B)}{P(B)}$

Independent events:  $P(A \cap B) = P(A)P(B)$ .

SL 4.7

Concept of discrete random variables and their probability distributions.

Expected value (mean),  $E(X)$  for discrete data.

Applications.

SL 4.8

Binomial distribution.

Mean and variance of the binomial distribution.

SL 4.9

The normal distribution and curve.

Properties of the normal distribution.

Diagrammatic representation.

Normal probability calculations.

Inverse normal calculations

AHL Content

AHL 4.15

A linear combination of  $n$  independent normal random variables is normally distributed. In particular,

$$X \sim N(\mu, \sigma^2) \Rightarrow \bar{X} \sim N\left(\mu, \frac{\sigma^2}{n}\right)$$

Central limit theorem.


AHL 4.17


IB DP HL Applications and Interpretations HL (IB1)


Poisson distribution, its mean and variance.


Sum of two independent Poisson distributions has a Poisson distribution.


 **ATL Skills**


 Approaches to Learning


 Thinking

 **Developing IB Learners**

 Learner Profile

 Inquirers

 Knowledgeable

 Thinkers