UNIT 2: Probability

Return to overview

SPECIFICATION REFERENCES

3.1 Understand and use mutually exclusive and independent events when calculating probabilities
Link to discrete and continuous distributions

3.2 Understand and use conditional probability, including the use of tree diagrams, Venn diagrams, two-way tables

Understand and use the conditional probability formula $\mathrm{P}(A \mid B) = \dfrac{\mathrm{P}(A \cap B)}{\mathrm{P}(B)}$

3.3 Modelling with probability, including critiquing assumptions made and the likely effect of more realistic assumptions

PRIOR KNOWLEDGE

AS Mathematics – Statistics content

3.1 Mutually exclusive and independent events (See Unit 3 of the SoW)

KEYWORDS

Sample space, exclusive event, complementary event, discrete random variable, continuous random variable, mathematical modelling, independent, mutually exclusive, Venn diagram, tree diagram, set notation, conditional probability, two-way tables, critiquing assumptions.

2a. Using set notation for probability; Conditional probability (3.1) (3.2)

Teaching time
5 hours

OBJECTIVES

By the end of the sub-unit, students should:

- understand and be able to use probability formulae using set notation;
- be able to use tree diagrams, Venn diagrams and two-way tables;
- understand and be able to use the conditional probability formula $\mathrm{P}(A \mid B) = \dfrac{\mathrm{P}(A \cap B)}{\mathrm{P}(B)}$.

TEACHING POINTS

Begin by recapping the use of tree diagrams and Venn diagrams, focusing on the use of set notation for probabilities. Introduce the use of two-way tables to find probabilities and use worded questions which are solved most efficiently by forming a two-way table.

Students need to be familiar with and be able to use

$\mathrm{P}(A') = 1 - \mathrm{P}(A)$,

the addition rule: $\mathrm{P}(A \cup B) = \mathrm{P}(A) + \mathrm{P}(B) - \mathrm{P}(A \cap B)$ and

the conditional probability formula $\mathrm{P}(A \cap B) = \mathrm{P}(A)\mathrm{P}(B \mid A)$.

Use worded questions where students have to form the set notation as well as questions where the information is already given using set notation.

Ensure the teaching of this section is combined with questions to recap the properties of mutually exclusive and independent events. Make sure these are now answered using set notation too.

OPPORTUNITIES FOR PROBLEM SOLVING/MODELLING

With a wider probability section in the A Level content there is more scope for using real-life scenarios for probabilities. Ensure that questions are posed where it is not obvious which formulae need to be used.

COMMON MISCONCEPTIONS/EXAMINER REPORT QUOTES

Mistakes tend to involve the use of the conditional probability formula. For example wrongly assuming independence and putting $\mathrm{P}(A) \times \mathrm{P}(B)$ rather than $\mathrm{P}(A \cap B)$ as the numerator or the incorrect probability in the denominator.

2b. Questioning assumptions in probability (3.3)

Teaching time
2 hours

OBJECTIVES

By the end of the sub-unit, students should:

- be able to model with probability;
- be able to critique assumptions made and the likely effect of more realistic assumptions.

TEACHING POINTS

Students should know that probability can be used to predict how likely experiments are to have given outcomes. They should be able to determine all of the outcomes of an experiment (and know that these are called the sample space) and be able to determine the probability of each outcome of a given sample space. Students should also have an awareness of wider modelling where outcomes cannot be determined.

Students should be able to question and critique any assumptions made in any given scenario. For example, assumptions about independence a reasonable assumption or whether a coin or dice is fair or biased. They should be able to look at the effect of these assumptions and have an awareness of assumptions that may be more realistic.

OPPORTUNITIES FOR PROBLEM SOLVING/MODELLING

This sub-unit provides an opportunity for looking at real-life probability models and also for debating assumptions.

COMMON MISCONCEPTIONS/ EXAMINER REPORT QUOTES

Students should be careful not to make assumptions for which there is no basis. For example assuming two events are independent without having evidence or reasons for such an assumption.