 Year 11 Mathematics Standard (Rhombus)

Unit title

Relative Frequency and Probability (MS-S2)

Duration

3 weeks

Rationale

Statistical analysis involves the collection, exploration, display, analysis and interpretation of data to identify and communicate key information.

Knowledge of statistical analysis enables the careful interpretation of situations and raises awareness of contributing factors when presented with information by third parties, including the possible misrepresentation of information.

Study of statistics is important in developing students’ understanding of the contribution that statistical thinking makes to decision-making in society and in the professional and personal lives of individuals.

Topic focus

The principal focus of this subtopic is to draw conclusions related to the chance that an event will occur.

Students develop awareness of the broad range of applications of probability concepts in everyday life and their use in decision-making.

Within this subtopic, schools have the opportunity to identify areas of Stage 5 content which may need to be reviewed to meet the needs of students.

Prior knowledge required

Mandatory – Stage 4 Fractions, Decimals and Percentages

Preferable – Stage 4 Statistics and Probability, Stage 5.1 and 5.2 Single Variable Data Analysis

Language considerations

* Complement
* Event
* Expected frequency
* Experiment
* Multi-stage
* Outcome
* Probability
* Relative frequency
* Sample
* Sample space
* Simulation
* Theoretical probability
* Tree Diagram

Outcomes

A student:

* MS11-8 solves probability problems involving multistage events
* MS11-9 uses appropriate technology to investigate, organise and interpret information in a range of contexts
* MS11-10 justifies a response to a given problem using appropriate mathematical terminology and/or calculations

Assessment (including formative and summative)

* Formative – classroom discussion for revising prior learning
* Summative – formal assessment task, incorporating previous unit of work on Data Representation

| Outcomes and content | Teaching and learning strategies and evidence of learning | Resources |
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| Review, understand and use the language associated with theoretical probability and relative frequency* Cconstruct a sample space for an experiment and use it to determine the number of outcomes (ACMEM154)
* Review probability as a measure of the ‘likely chance of occurrence’ of an event (ACMMM052)
* Review the probability scale:
	+ for each event , with  if  is an impossibility and  if  is a certainty (ACMMM053)
 | Teaching strategies:* Create a scale on the board or using a piece of string hung across the classroom going from 0 to 1. Give students a post-it note and have them place a probability word (pre-prepared or made up by the students) in an appropriate place in the scale. The activity could be extended to include fractions/decimals/percentages that the students put on the scale too.

Student activities:* Students could underline the probability words in a series of sentences about probability.
* Students could write sentences using probability words, such as impossible, certain, likely, or unlikely.
* Give students a blank page of circles and have them create a spinner that suits given parameters.
	+ For example, a spinner has three colours – red, yellow and blue. It is very likely that the spinner will land on red. It is equally likely that the spinner will land on yellow and blue.
 | [Probability Washing Line](http://www.transum.org/Maths/Activity/Probability/Discuss.asp) (Transum) |
| Determine the probabilities associated with simple games and experiments* Use the following definition of probability of an event where outcomes are equally likely:
* Calculate the probability of the complement of an event using the following relationship:
 | Teaching strategies:* Students could be familiarised with complementary events using concrete materials.
	+ Students have a pack of playing cards and are asked to find the complement to drawing a red card. The red cards are put in a pile and the remaining pile is the complement to drawing a red card (which is drawing a black card). The teacher could then complete with other pairs of complementary events (such as drawing a 7 or drawing an even number).
* Students play Beano:
	+ Each student has a game board and 12 cubes/beans/counters. They place the twelves cubes above the numbers they predict will be rolled (two dice will be rolled and the faces added). When the dice are rolled, if there is a cube above the sum then the student takes it away. Whoever clears the board first wins. Having played it once, students calculate the probabilities of different outcomes and develop a winning strategy for the next round of play.

Student activities:* Students play Greedy Pig:
	+ The aim of the game is to get the highest score after 10 rounds. Students start by standing up. Each time the die is rolled, you must add the number on the die to the sum of your previous rolls. A player can 'sit down' at any time. When a player sits, they keep all the points they have earned in the round, but are not able to earn more points until the next round. When a one is rolled, all 'standing' players lose the points they have accumulated in the current round. The player with the most points at the end of 10 rounds wins.
* Students could create their own game/experiment and record the probabilities of the different outcomes. They could be asked to make the game fair or biased and justify how they achieved this.
 | N/A |
| Solve problems involving simulations or trials of experiments in a variety of contexts AAM* Perform simulations of experiments using technology (ACMEM150)
* Use relative frequency as an estimate of probability (ACMEM152)
* Recognise that an increasing number of trials produces relative frequencies that gradually become closer in value to the theoretical probability
* Identify factors that could complicate the simulation of real-world events (ACMEM153)
 | Teaching strategies:* The following steps are involved in creating a simulation of an experiment using digital technology:
	+ List the possible outcomes.
	+ Assign a number to each of the possible outcomes.
	+ Use a random number generator to choose a random number. Note the simulated outcome and repeat as many times as you mean to conduct the simulation.
* To demonstrate that an increasing number of trials produces relative frequencies that become closer to theoretical probability:
	+ Have students conduct an experiment individually, either physically or using digital technology, such as rolling a die and recording the face.
	+ Have students calculate the relative frequency of their results and compare to the theoretical probability.
	+ Combine results of students and recalculate relative frequency and compare to theoretical probability. Students should find that these last results are closer to theoretical probability than when they did the experiment on their own.

Student activities:* Students create their own experiment with 6 possible outcomes, such as a bag containing counters of 6 different colours. They use the probability and dice rolling application to conduct a simulation and record their results.
 | [Random Number Generator](https://www.random.org/integers/)[Probability Simulations Examples](https://www.mathmammoth.com/lessons/probability_simulations.php) |

Reflection and evaluation