VCE Mathematical Methods Unit 1

Unit 1 Area of Study 4: Data analysis, probability and statistics

Example of learning activity: Experiments, simulation and probability

Introduction

This learning activity investigates probabilities obtained from experiments and simulations.

Part 1

1. Using two coins select one of the following outcomes: HH, HT, TT.
2. Toss the two coins simultaneously 120 times and graph the distribution of outcomes. How many times did your outcome occur?
3. Use technology to run a simulation of the experiment, repeat it 100 times. Discuss any similarities and differences in the shape of these distributions. For each run of the simulation, record the number of times the selected outcome occurs.
4. Plot the distribution of the number of times the selected outcome occurs across the 100 runs of the simulation, and describe this distribution.

Part 2

Consider two standard packs of 52 playing cards. Two people each have one complete pack. They randomise the order of the cards by thoroughly shuffling each pack.

The two people then turn up the top card of their pack and lay it on a table at the same time. The cards are compared, and it is noted if the pair of cards are an exact match or not.

This procedure is repeated until all pairs of cards have been similarly compared.

1. Students work in pairs to carry out this experiment 10 times, noting how many matching pairs of cards occur. The distribution of class results can be formed and discussed.
2. Use technology to implement a simulation of this experiment. Students run the simulation 100 times, 200 times, 300 times and so on until they have run the simulation 1000 times, in each case graphing the distribution of the proportion of times (zero, one, two, three …) matching pairs of cards occur. In the long run, what is the most likely number of matching pairs of cards?
3. Form an estimate of the probability that no matching pairs of cards occur.

Areas of study

The following content from the areas of study is addressed through this task.

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| **Unit 1** | |
| **Area of study** | **Content dot points** |
| Functions, relations and graphs | – |
| Algebra, number and structure | – |
| Calculus | – |
| Data analysis, probability and statistics | 1, 2 |

Outcomes

The following outcomes, key knowledge and key skills are addressed through this task.

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| **Unit 1** | | |
| **Outcome** | **Key knowledge dot points** | **Key skills dot point(s)** |
| 1 | 9, 10 | 16 |
| 2 | 1, 5 | 2, 5, 6 |
| 3 | 1, 3, 5 | 1, 4, 10, 12, 13 |