Stage 6 Mathematics Life Skills

## MLS – S2 Probability

### Overview

| MLS-S2 Probability | Unit Duration |
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| A knowledge of statistics and probability helps students recognise and describe aspects of their world. With a working understanding of this topic, students develop their ability to predict and draw conclusions from what is happening around them.  | Teacher decision |

| Subtopic focus | Outcomes |
| --- | --- |
| The focus of this subtopic is on developing an understanding of the language and elements of chance and probability and applying this in real situations. Fraction concepts are reviewed first to help give students the skills to express probabilities mathematically. The knowledge, skills and understanding in this subtopic builds on Life Skills Years 7 – 10 outcomes and content for Statistics and Probability.  | A student:* explores mathematical concepts, reasoning and language to solve problems MALS6-1
* engages with mathematical symbols, diagrams, graphs and tables to represent information accurately MALS6-2
* explores probability in a range of contexts MALS6-10
* engages with mathematical skills and techniques, including terminology, to investigate, explain and organise information MALS6-13
* communicates mathematical ideas and relationships using a variety of strategies MALS6-14
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| Related Mathematics Standard outcomes | ****Related Numeracy CEC outcomes**** |
| MS11-1, MS11-2, MS11-8, MS11-9, MS11-10, MS1-12-1, MS1-12-2, MS1-12-9, MS1-12-10, MS2-12-1, MS2-12-2, MS2-12-9, MS2-12-10 | N6-1.1, N6-1.2, N6-1.3, N6-2.3, N6-3.1, N6-3.2 |

All outcomes referred to in this unit come from the [Stage 6 Mathematics Life Skills Syllabus](https://educationstandards.nsw.edu.au/wps/portal/nesa/11-12/stage-6-learning-areas/stage-6-mathematics/mathematics-life-skills-2017)
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### Adjustments

Examples of adjustments can be found on the NESA website under [Adjustments](https://www.educationstandards.nsw.edu.au/wps/portal/nesa/11-12/Diversity-in-learning/stage-6-special-education/adjustments).

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| Student’s name | Adjustments |
| e.g. John Smith | Requires learning material to be printed on blue paper. |
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### Unit of learning

| ContentStudents learn to: | Suggested teaching strategies and resources | Differentiation and modifications | Date and initial |
| --- | --- | --- | --- |
| S2.1: Fraction concepts and calculationsStudents:* recognise language related to fractions, for example:
* equal parts
* share
* divide
* whole
* quarter Literacy icon
* recognise that a fraction represents a number of equal parts out of a whole
* recognise the numerator as the number of equal fractional parts and the denominator as the number of equal parts the whole has been divided into, for example:
* $\frac{3}{4}$ means three out of four equal parts
* Recognise basic fractions, for example:
* halves
* quarters
* thirds Literacy icon
 | Introducing fractions * Teacher to facilitate a discussion drawing upon students prior understanding of what they believe fractions are. Teacher may like to ask the students to explain what they believe fractions are and where they have seen fractions being used before. Some response may include cutting their sandwich in half, slices of cake or pizza and they may link fractions to sales in stores.

 * Students to engage in the online Desmos learning activity [Recognising fractions](https://teacher.desmos.com/activitybuilder/custom/5fbb365aa192000d33b3fcb3). This activity is scaffolded and designed for students to independently uncover what fractions are and how they represent parts of wholes.
* Teacher to guide students through the nzmaths.co.nz website [Paper Folding Fractions](https://nzmaths.co.nz/resource/paper-folding-fractions) activity. In this activity students fold shapes to form halves, quarters and thirds.
* To summarise the basics of what fractions are, students may like to watch the short YouTube video [Math Antics – fractions are parts](https://www.youtube.com/watch?v=CA9XLJpQp3c).
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| * Recognise how many parts are needed to make a whole or 100%, for example:
* Four quarters = one whole
* Divide diagrams, objects, groups of objects or numbers into fractional parts, for example:
* Divide a group of objects into thirds
* Cut a cake in half
* Calculate a quarter of $20 Personal and social capability icon
 | Recognising how many parts form a whole* Students to engage in the online Desmos learning activity [Dividing into fractional parts](https://teacher.desmos.com/activitybuilder/custom/5fd004ebff3e643f9ae5bba0). This activity is scaffolded and designed for students to independently discover how to divide diagrams, objects, groups of objects or numbers into fractional parts.
* Students to watch the video [Imagining Fractions](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-3/targeted-teaching/imagining-fractions-1). In this video students are introduced to a problem where they need to calculate how many whole lemon slices are needed to recreate an image. Students to then brainstorm other ways of solving the problem and complete the associated worksheet.

**Resource:** imagining-fractions-worksheet.DOCX* Students use Minecraft to create a [fraction story](https://education.minecraft.net/blog/activity-of-the-week-gone-fishing) to demonstrate their understanding of how fractions are used in their everyday life and language.
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| * Represent fractions using a variety of strategies, including concrete materials, diagrams and numerals as appropriate
* Represent fractions for given situations, for example:
* Write the fraction $\frac{1}{4}$ when they eat a quarter of an apple
* Express 50c as $\frac{1}{2}$ of a dollar Personal and social capability icon
 | Representing fractions* Students are to complete the Fraction Roll activity. In this activity students roll two dice and use the numbers from the dice to create fractions. Students are to record their results on the Fraction Roll worksheet and complete a table containing different representations of the fractions. Teachers may choose to allow students to use manipulates such as different colour blocks or counters to also represent the fractions.

**Resource:** fraction-roll-worksheet.DOCX* Students to attempt the “Money in a cash register problem”. In this problem they are to make up a cash register that contains $300, one third of which needs to be coins. Teachers could adapt this task by coming up with different amounts and/or changing the restrictions. For example, the teacher may like to change it to one quarter coins and three quarters notes or half coins and half notes.

**Resource:** money-in-a-cash-register-problem.DOCX* Students complete the [Minecraft Pixel Art](https://education.minecraft.net/lessons/fractions-pixel-art) activity to practise calculating the fraction of each colour in an artwork.
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| * Identify fractions in everyday contexts, for example:
* Walking a third of the way up the street
* Going to a half-price sale
* Buying half a dozen eggs Personal and social capability icon
 | Identifying fractions in everyday contexts* Students to watch the 2-minute YouTube video [How to create a healthy plate](https://www.youtube.com/watch?v=Gmh_xMMJ2Pw) and complete the Fraction Plate worksheet. The video shows students that a healthy meal should include half a plate of vegetables, a quarter of a plate of protein and the remaining quarter grains or starches.

**Resource:** healthy-plate-fraction-worksheet.DOCX |  |  |
| * Compare fractions, for example:
* Recognise that half of something is more than a quarter of it Critical and creative thinking icon
 | Comparing fractions* Students to engage in the online learning activity [Comparing fractions](https://teacher.desmos.com/activitybuilder/custom/5fd025d7aa66934235376846). This activity is scaffolded and designed for students to independently compare fractions using both numerals and images.
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| * Calculate simple fraction additions and subtractions using concrete materials, diagrams, formal recording methods or calculators  Information and communication technology capability icon
 | Calculating with fractions* Teacher to facilitate a discussion around what students believe one fifth plus one fifth would equal. Teacher to use tone to emphasise the ‘one’ in each of the fractions. If students are having difficulties understanding then the teacher should link to student’s prior knowledge of what they know one plus one is and then extend into fractions with the same denominator. Repeat this process with subtraction. Students can then complete the worksheets ‘Adding and subtracting fractions’ and ‘Double batch’. Double batch shows students how to double a recipe by adding fractions. This activity could be done as a practical activity in the kitchen.

**Resource:** adding-and-subtracting-fractions-worksheet.DOCX**Resource:** double-batch-worksheet.DOCX* Students can also practise adding and subtracting fractions using the online Desmos activity [Adding and Subtracting fractions](https://teacher.desmos.com/activitybuilder/custom/5fe112e63b83ee0cac002e65). This activity begins with a visual means of adding fractions with common denominators and then moves onto more challenging questions with different denominators, while still using visuals.
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| * Represent decimals as fractions of 10, 100, etc, for example:
* 0.3 = $\frac{3}{10}$
* Represent percentages as fractions of 100, for example:
* 40% = $\frac{40}{100}$
 | Converting between fractions, decimals and percentages* Students to engage in the online learning activity [Fractions, decimals and percentages](https://teacher.desmos.com/activitybuilder/custom/5fd1c47a55d269308872c56a). This activity is scaffolded and designed for students to independently convert basic fractions into decimals and percentages and vice versa.
* Students complete the online Desmos activity [Battery-Percents, decimals, fractions](https://www.google.com/url?q=https%3A%2F%2Fapps.powerapps.com%2Fplay%2Feb69babd-3e72-4d5e-8655-7929c23e0971%3FSurveyID%3D278%26SessionID%3D264603&sa=D&sntz=1&usg=AFQjCNGHhyP6zREZSBN4vLetmoX2Pe483A). In this activity students describe the amount of charge on a mobile phone battery using fractions, decimals and percentages.
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| S2.2: ProbabilityStudents:* Recognise language related to chance and probability, for example:
* Certain
* Likely
* Probably
* Unlikely
* 50:50 Literacy icon
* Recognise the elements of chance in everyday events
* Recognise that some events are entirely related to chance, for example:
* whether the bus will be late or on time
* describe the likelihood of familiar events Literacy icon
 | Recognising the language related to chance and probability* Students to watch the [Unbelievable Highway Accident](https://www.youtube.com/watch?v=CEYoU5BhGl4) video to introduce probability. Teacher should stop the video just before the probability is shown and ask students what they think the chance of this happening would be?
* Students use THINK PAIR SHARE to brainstorm words associated with probability.
* Students could watch the [Basic probability](https://www.youtube.com/watch?v=KzfWUEJjG18) Youtube video from Math Antics as an introduction to the concepts they will cover in this topic.
* Students match key vocabulary terms related to probability to the statement that best suits in this online interactive [Probability Terminology](https://teacher.desmos.com/activitybuilder/custom/5fa49642dc2267393f4cb84a) activity, developed in Desmos. As an extension students’ can go on to write two examples of their own for each category.
* Students complete the Probability scenario activity either as a class, in small groups or individually. They must match the scenarios to the terms certain, likely, unlikely etc**Resource:** probability-scenarios.DOCX
* Teacher to ask the class “What will the weather be like today?”. As a class, discuss and review weather patterns from previous years. Students are to test their predictions by predicting the forecast for the upcoming week. **Resource:** predicting-the-weather.DOCX
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| * Recognise that the range of probabilities is from 0 to 1, or from 0% to 100% in percentage terms
* order events based on their probability
 | Recognising the range of probabilities* Students to complete the online Desmos activity [Ordering events](https://teacher.desmos.com/activitybuilder/custom/5fdff2168403f64b7cd8e0e6?collections=5f863574b71ab424a255d6f7). Students must place events on a number-line to indicate their chance of occurring. They must also order events from Certain to Impossible. This is a good chance for teachers to discuss how difficult it is to determine if one event is more likely than another, without assigning a numeric probability.
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| * recognise equally likely events, for example:
* getting heads or tails on a coin
* recognise non-equally likely events, for example:
* randomly selecting your favourite candy from a bag with unequal numbers of a variety of flavours
 | Recognising equally likely and non-equally likely events* Students play this interactive, online [Higher or lower card game](https://mrnussbaum.com/card-sharks-online-game) to use their prior knowledge of probability to recognise that some events have a higher or lower chance of occurring than others
* Normal dice are considered ‘fair’ because each number has an equal chance of occurring. Students watch the video [Weird but fair dice](https://www.youtube.com/watch?v=uAnCL3vhVIs) to see other examples of fair dice.
* If students have access to a 3D printer they could design and print their own weird dice and test whether they are fair
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| * understand the term ‘random’ as applied to probability, for example:
* ‘a person is selected at random’ Literacy icon
* identify possible causes of bias or inaccuracy in probability experiments Critical and creative thinking icon Ethical understanding icon
 | Understanding the terms ‘random’ and ‘bias’* Discuss as a class what it means by ‘random’ in terms of probability. When something is random there is an equal chance of that event occurring. For example, put all students' names into a hat and pull one out – a name is selected at random.
* Discuss ways of randomly choosing different items, for example students in the class, winner for a prize, outfit for the day
* Students can use [Minecraft Sheepish probability](https://education.minecraft.net/lessons/sheepish-probability) activity to explore the difference between theoretical and experimental probability; make predictions based on experimental results and design a fair probability experiment
* Students can complete the [Investigation of random processes](https://nzmaths.co.nz/resource/investigation-random-processes) activity where they are provided with experiences of randomness through tossing coins, random walks and Pascal’s Triangle.
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| * represent probabilities using a range of notations, for example:
* words
* fractions
* ratios
* percentages Literacy icon
 | Representing probabilities* [Probability Fair Game](https://mrnussbaum.com/probability-fair-online-game) - this online, interactive game is designed to show students all the different ways probability is used and allows students to play fun games to teach them about probability.
* Students complete the [Minecraft activity Gone Fishing](https://education.minecraft.net/blog/activity-of-the-week-gone-fishing) to practise expressing probability numerically as a fraction, decimal or percentage. Students track the number of fish, junk or treasures they catch and then combine their results with others to determine the probability of catching each.
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| * compare the likelihood of events based on their frequency, for example:
* selecting a heart (13 hearts) from a pack of cards is less likely than selecting a black card (26 black cards) Critical and creative thinking icon
 | Comparing the likelihood of events* Probability Prediction: Teacher to place counters, marbles or small items into a bag. Students are to identify their prediction of the colour that the teacher will pull out of the bag. Predictions can be written on a white board, or poster cards can be placed around the room and students are to go their chosen colour of choice (location of room). Students can visually see other students’ predictions and they can engage in the lesson by moving around. Anyone who answered correctly can put a tally mark against their name on the whiteboard to see how made the most correct predictions.
* This [Chance Experiments](https://teacher.desmos.com/activitybuilder/custom/59233c9aefd17610dbbd684e) activity, developed in Desmos, introduces students to probability through a spinner game. Which result is more likely—red or blue? Students answer this question by gathering and analyzing class data and then apply what they've learned to consider the likelihood of other chance experiments.
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| * compare the likelihood of events based on their numerical probability, for example:
* rolling a six on a dice (one out of six) is less likely than rolling an odd number (one out of two) Critical and creative thinking icon
* engage with simple theoretical probabilities for events, for example:
* recognise that rolling a dice gives a 1 in 6 chance of getting a 5, or there is a 50% chance of getting heads when tossing a coin
 | * Students watch the video [What happens when you guess](https://ed.ted.com/lessons/leigh-nataro-what-happens-if-you-guess#watch). This website also has follow-up questions for teachers to discuss with the class.
* Students could then complete the activity dicey-test-taking where they investigate whether they would pass their Learners test if they guessed all of the answers to the questions.**Resource:** dicey-test-taking.DOCX
* Students to play the [Horse racing game](https://www.tes.com/en-au/teaching-resource/probability-horse-racing-game-6338302) to realise that when we work with two dice, the totals are not equally likely.
* Students can then use the sample space worksheet to calculate which total is most likely**Resource:** sample-space.DOCX
* Students to complete the Open Middle problem, [Probability with Marbles](https://www.openmiddle.com/probability-with-marbles/).
* Directions: There are \_\_\_\_\_ red marbles and \_\_\_\_\_ blue marbles in Bag A. There are \_\_\_\_\_ red marbles and \_\_\_\_\_ green marbles in Bag B.
* Using the digits 1 to 9 at most one time each, fill in the boxes to make the probability of drawing a red marble from either bag the same.
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| * conduct experiments to determine the experimental probability of an event, for example:
* roll a dice 20 times and record and communicate the result using a suitable strategy (eg graph or table)
* draw conclusions or make predictions from the results of probability experiments Critical and creative thinking icon
* compare theoretical probabilities with the results of experiments and discuss why the experimental results and theoretical results may not match Critical and creative thinking icon
 | Conducting experiments and making predictions* Students complete the coin flip investigation activity where they record the results of flipping a coin 20 times and compare their results with others in the class.**Resource:** coin-flip-investigation.DOCX
* Students play Rock, paper, scissors and complete the [resolve investigation](https://www.resolve.edu.au/probability-rock-paper-scissors) on what a winning strategy would be. They then extend their investigation into rock, paper, scissors, lizard, Spock and compare it to the chances of winning the original game.
* Students play a game to decide who gets the [Last Taco activity](https://teacher.desmos.com/activitybuilder/custom/5a0c6bc6c2c3832b38f5d471), developed in Desmos. They compare experimental probability with a table showing the theoretical sample space.
* Students play the game Greedy pig as a class or in small groups. Teacher can then discuss theoretical vs experimental probability. Students can share their winning strategies and teachers can discuss the Maths behind these strategies. There is an [online version](http://cs.gettysburg.edu/projects/pig/piggame.html) of this game for students who want to play individually. **Resource:** greedy-pig.DOCX
* Students could also play the Chocolate game to investigate experimental vs theoretical probability.**Resource:** chocolate-game.DOCX
* Students conduct the M&M colour comparison where they record the colour of each M&M in a typical bag and work out the probability of each colour. Students then work out what the theoretical probability should be.**Resource:** M&M-colour-comparison.DOCX
* Students conduct a number of Probability investigations to compare theoretical vs experimental probability.**Resource:** probability-investigation.DOCX
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| * relate probability to gambling and discuss issues and potential problems related to gambling Personal and social capability icon
* research the actual probability of winning in common gambling scenarios in Australia using the internet, for example:
* instant lotteries  Information and communication technology capability icon Civics and citizenship icon
 | Understanding the relationship between probability and gambling* Students use THINK PAIR SHARE to start a class discussion on what they perceive gambling to be and discuss why it is designed to make people lose in the long run.
* Guided questions:
* Gambling comes in many forms – list ideas (Lotto, Insta Scratch-Its and/or card games.
* What are the potential problems of gambling? (money loss, dependence to gambling, short- or long-term problems).
* Lotto - Does any of their parents buy lotto tickets? Do they win much?
* Students research the probability of winning in gambling such as the Lotto in Australia. Research the statistics of winning and how common it is. Has anyone every won Lotto more than once?
* As a class, students could predict the cost of Lotto for an average year if they play once a week. Students are then to research the actual cost to play one game and work out the correct total. Compare total costs to student predictions. Discuss how playing a simple game of Lotto would be considered gambling.
* Teacher to introduce students to the Monty Hall problem. “Suppose you're on a game show, and you're given the choice of three doors: Behind one door is a car; behind the others, goats. You pick a door, say No. 1, and the host, who knows what's behind the doors, opens another door, say No. 3, which has a goat. He then says to you, "Do you want to pick door No. 2?" Is it to your advantage to switch your choice? “
* Students should play a few single rounds using the [Monty Hall simulator](https://math.andyou.com/tools/montyhallsimulator/montysim.htm) to see how the problem works before simulating multiple rounds
* Students can then watch this Youtube video by [Numberphile](https://www.youtube.com/watch?v=4Lb-6rxZxx0) for an explanation of why it is better to switch
* Students to complete the Myths and Misconceptions activity where they investigate the Gambler’s Fallacy which is the erroneous belief that if a particular event occurs more frequently than normal during the past it is less likely to happen in the future (or vice versa). They can then verify their findings by watching [The Gambler’s Fallacy](https://www.youtube.com/watch?v=K8SkCh-n4rw) video **Resource:** Myths-and-misconceptions.DOCX
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### Evaluation

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### Glossary

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| Term | Description |
| Bias | Bias generally refers to a systematic favouring of certain outcomes more than others, due to unfair influence (knowingly or otherwise). |
| Certain | Something with a probability of 1. It is sure to happen. |
| Chance | A possibility or probability of anything happening |
| Definite | Positive, certain, sure |
| Equal | Exactly the same amount or value |
| Experiment | Something that can be repeated that has a set of possible results.Examples:• Rolling dice to see what random numbers come up.• Asking your friends what their favourite pet is and writing down the results. |
| Frequency | Frequency, or observed frequency, is the number of times that a particular value occurs in a data set. |
| Odds | A ratio of the number of ways something can occur to the number of ways it cannot occur. |
| Outcome | An outcome is a single possible result from a chance experiment. |
| Percentage | A percentage is a fraction whose denominator is 100. |
| Predict | To make a guess based upon the facts you have been given. |
| Probability | The probability of an event is a number between 0 and 1 that indicates the chance of something happening. |
| Random | Happening by chance. Not able to be predicted. |
| Ratio | A ratio is a quotient or proportion of two numbers, magnitudes or algebraic expressions. It is often used as a measure of the relative size of two objects.  |

### Supplementary resources

* [Fractions, Pikelets and Lamingtons](https://education.nsw.gov.au/teaching-and-learning/curriculum/key-learning-areas/mathematics/Early-Stage-1-to-Stage-3/resources) – a PDF booklet created by the NSW Department of Education that contains activities for students to develop their conceptional understanding of fractions.
* [Tangrams 2: investigating fractions](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-3/targeted-teaching/tangrams-3-2-investigating-fractions) – a 3-part video outlining how tangrams can be used to investigate fractions. This resource was created by the NSW Mathematics Strategy.