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| Strand: Chance and Data | | Topic: Chance |
| Foundation Level: Level statement  Students are developing an awareness of the occurrence of routines and events and participate in the collection of data to support class decisions. | | |
| Example learning outcomes:  Students demonstrate an awareness of the occurrence of familiar events. | | |
| Elaborations — To support investigations that emphasise thinking, reasoning and working mathematically | | |
| Students know:  familiar events may not occur as expected. | Students may:  indicate ‘yes’ and ‘no’ in response to chance events that will or will not happen  show an awareness of major changes to regular routines (e.g. when a relative collects them from school instead of going home in a taxi)  associate ‘might happen’ with significant changes in daily routines (e.g. if it rains we might have to stay inside)  demonstrate an awareness of the predictability of familiar events (e.g. the cake is cooked in the oven and not the refrigerator, the daily pictorial diary  will show what will happen during the day)  participate in guessing (predicting) some possible outcomes within regular routines (e.g. a rainy day may require a different lunch and play routine; on cooking days, lunch may be eaten indoors and not in the lunch area)  participate in the preparation of the daily pictorial diary using ‘permanent’ and ‘removable’ stickers and anticipate events that ‘will happen’, ‘might happen’ or ‘won’t happen’  identify events that ‘will happen today’ or ‘won’t happen today’ from a group of familiar pictures and photographs  select pictures of events that ‘will happen’ or ‘won’t happen’ on special occasions, such as activities for a school camp or excursion  demonstrate an awareness that unexpected events ‘might happen’  indicate what they would like to have happen in familiar situations  participate in roleplays, songs and games that explore different endings (e.g. responding to questions such as, ‘What might happen now?’ or,  ‘What might happen this time?’)  interact or play with materials or objects that involve ‘cause and effect’ or actions that will happen  make choices about what ‘might happen’ from two presented options (e.g. choosing who might win a race between two people). | |

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| Level 1: Level statement  Students engage in a variety of practical activities involving chance, and make subjective statements about likelihood based on their personal opinions and observations.  Students collect and classify data in response to particular situations. They interpret simple conventional displays and present information using student-generated displays. | | |
| Core learning outcome: CD 1.1  Students use everyday language when commenting on aspects of chance in practical activities and familiar events. | | |
| **Elaborations — To support investigations that emphasise thinking, reasoning and working mathematically** | | **Core content** |
| Students know:  everyday language that relates to chance  aspects of chance (uncertainty) exist in practical activities and familiar events  how to identify aspects of chance in practical activities and familiar events  how and when to use everyday language of chance to comment on aspects of chance. | Students may:  list everyday words associated with chance  identify practical activities and familiar events that involve chance  predict possible alternative outcomes for familiar events or activities (e.g. endings of stories, consequences of actions or events)  give reasons for predictions or judgments  use data to challenge personal opinions or subjective judgments  reflect on the actual outcomes of events or activities and suggest influencing factors  review language used to describe the likelihood of the outcomes. | Likelihood  language of chance   * always, sometimes, never * will, will not or might happen * maybe * fair, not fair * lucky, unlucky   Judgments  subjective judgments   * personal opinions * personal statements |
| Investigations should occur in a range of contexts. For example, students could investigate:  possible places to purchase goods or services, such as always being able to buy a newspaper at the newsagency, sometimes at a garage but never at the butcher shop  possible occurrence of events, such as a visit by the fire truck or the Royal Flying Doctor Service  possible outcomes of events, such as winning a prize at a stall at a fair or fete  likelihood of travelling home from school using different modes of transport  likelihood of seeing animals on the oval at lunch time  likelihood of winning a game. | | |

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| Level 2: Level statement  Students make comparisons and predictions about the likelihood of familiar events. They classify them as likely, unlikely or impossible, though their opinions are often swayed by sentiment. They understand that the outcome of a future event does not depend on the outcome of a previous event.  Students collect and organise data, create and interpret a range of data displays and identify significant elements of the displays. They suggest and distinguish between some sources of variation in data and explain the effects of these variations. | | |
| Core learning outcome: CD 2.1  Students identify and classify familiar events according to the likelihood of occurrence. | | |
| **Elaborations — To support investigations that emphasise thinking, reasoning and working mathematically** | | **Core content** |
| Students know:  chance influences the likelihood of occurrence of familiar events  an event can be independent of a previous event  the language of chance to identify and classify the likelihood of the occurrence of familiar events  how to predict the likelihood of occurrence of familiar events  how to identify and classify familiar events according to likelihood of occurrence. | Students may:  list a range of familiar events involving chance  identify and classify the likelihood of the occurrence of events as likely or unlikely  give reasons for classification of the likelihood of events based on personal opinions and previous experiences  compare their judgments about the likelihood of occurrence of events with those of others  collect data to support or challenge comments and classifications about the likelihood of occurrence of events based on personal opinions and/or previous experiences  decide whether the likelihood of occurrence will always be as predicted  conduct experiments or collect data to investigate the independence of events  review and adjust classifications of possible outcomes as required. | Likelihood  language of chance   * likely, unlikely * impossible   Judgments  subjective judgments   * comparisons and predictions * independence of an event from  a previous event |
| **Investigations should occur in a range of contexts. For example, students could investigate:**   * seasonal weather patterns * possible outcomes of events in fictional texts * the classification of events in terms of the likelihood of occurrence, such as creating posters of events that are likely, unlikely or impossible * the independence of an event from a previous event by conducting experiments, such as drawing names from a hat or playing board games. | | |

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| Level 3: Level statement  Students describe all possible outcomes from a single situation and order these from most likely to least likely to occur. They identify situations where every outcome has an equal chance of occurring. They estimate the probability of an event occurring by conducting experiments and analysing the results. They distinguish between situations where each outcome may or may not depend on the previous outcome.  Students identify issues and topics of particular interest and create, trial and refine questions that allow for appropriate details to be gathered through surveys, interviews and existing sources. They organise data and experiment with a variety of manual or electronic displays, selecting those that represent the data clearly. They make statements regarding the results of their surveys using quantitative and comparative language. | | |
| Core learning outcome: CD 3.1  Students identify all possible outcomes of familiar situations or actions and, for these sample spaces, order the likelihood of occurrence of the identified outcomes using experimental data. | | |
| **Elaborations — To support investigations that emphasise thinking, reasoning and working mathematically** | | **Core content** |
| Students know:  familiar situations or actions may have more than one possible outcome  sample space refers to all possible outcomes of familiar situations or actions  the language of chance to identify the likelihood of occurrence of possible outcomes  the likelihood of occurrence of outcomes of events within a sample space may be the same (equally likely) or different  experiments provide samples of data that illustrate the likelihood of occurrence of possible outcomes  how to conduct experiments to gather experimental data  how to order outcomes of familiar situations and actions by comparing the likelihood of occurrence. | Students may:  relate everyday language or colloquialisms to the likelihood of outcomes  identify and list all possible outcomes of an event (sample space)  estimate the order of likelihood of outcomes of events (e.g. Which do you think will be the most likely outcome? Which do you think will be the least likely outcome?)  make judgments, supported by reasoning, about the likelihood of occurrence of each outcome within a selected sample space  conduct experiments to collect data about the likelihood of outcomes  use data to describe the experimental probability  order outcomes according to judgments about the likelihood of occurrence (e.g. Order the likelihood of occurrence from certain to least likely based on the results of experimental data)  use experimental data to explain why each outcome is independent of a previous or future outcome and if each outcome is equally likely to occur  give reasons for judgments about the likelihood of outcomes of an event and relate these chance ideas to other situations  identify situations or actions that have equally likely outcomes. | Likelihood  language of chance   * more likely, less likely, equally likely * most likely, least likely * certain * multiple outcomes * relate everyday language or colloquialisms to likelihood  (e.g. ‘no chance’) * experimental probability (e.g. one in four chance) * sample space (all possible outcomes)   Judgments  subjective and numerical judgments   * comparisons and predictions based on experimental data * fairness of rules   independence and dependence of subsequent outcomes (randomness) |
| **Investigations should occur in a range of contexts. For example, students could investigate:**  the fairness of rules in games of chance  the design of randomising objects, such as dice and spinners, to meet given probability criteria  the likelihood of toast landing buttered side down  the likelihood of different-sized or -shaped balloons exploding  the likelihood of drawing the top prize from a lucky dip. | | |

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| Level 4: Level statement  Students conduct a range of practical activities and experiments and draw frequency tables to assist with the analysis of the data. They compare the numerical results of their experiments with the predicted results and decide whether further trials are needed. They judge the likelihood of particular events using probability values based more on observation than intuition.  Students plan for the collection of data, and design and use data record templates to gather and organise observations or responses. They select data displays that best represent the collected data type and use appropriate measures of location when commenting on data displays. | | |
| Core learning outcome: CD 4.1  Students analyse experimental data and compare numerical results with predicted results to inform judgments about the likelihood of particular outcomes. | | |
| **Elaborations — To support investigations that emphasise thinking, reasoning and working mathematically** | | **Core content** |
| Students know:  the language of chance that relates to experimental data and probability values  how to predict possible results  what experimental data are and how to gather these  how to analyse experimental data  probability values can be assigned to numerical results of experimental data  how to determine probability values  how to compare numerical results with predicted results  how and when to use probability values to inform judgments about the likelihood of particular outcomes. | Students may:  identify all possible outcomes of a controlled experiment or event  predict the likelihood of each outcome of an experiment or event and record predictions  record experimental data in a frequency table and read the number of times an event occurred out of the number of trials conducted (i.e. relative frequency)  determine probability values by expressing relative frequencies as a fraction, decimal or percentage (the relative frequencies of an experiment will add to 1 or 100%)  locate the relative frequency of each possible outcome of an event on a probability scale (from impossible to certain, 0 to 1, 0% to 100%)  relate colloquialisms to probability values  explain the likelihood of a particular outcome using probability values  analyse the data to compare experimental results with the predictions  review the number of trials in an experiment and decide whether more trials are needed  evaluate predictions on the basis of any additional data collected  identify and explain issues related to fairness. | Likelihood  language of chance   * frequency table * relative frequency   probability values   * impossible to certain, 0 to 1, key percentages between 0% and 100% * relate colloquialisms to probability values (e.g. ‘fifty-fifty’, ‘Buckley’s chance’)   Judgments  subjective and numerical judgments   * comparisons and predictions based on experimental and given data * fairness of rules |
| Investigations should occur in a range of contexts. For example, students could investigate:  data collected from target games, such as bowling, darts, quoits and archery  the probability of a particular candidate winning an election or of a team winning an event  aspects of energy and change, such as the buoyancy of objects or how high objects bounce  the effects of changing the rules of a game, such as missing a turn if you roll a six in a board game or of adding extra snakes to a game of Snakes and Ladders. | | |

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| Level 5: Level statement  Students make quantitative judgments, basing their predictions on experimental or theoretical probability. They use the data generated through their own experiments or collected from other research to estimate probabilities. They determine theoretical probabilities where outcomes can be shown to be equally likely.  Students design and carry out observational, experimental and survey studies involving discrete and continuous data. They explain how histograms and stem and leaf plots provide pictorial information on features of data such as location, spread and range. | | |
| Core learning outcome: CD 5.1  Students model and determine probabilities for single events to justify statements and decisions. | | |
| **Elaborations — To support investigations that emphasise thinking, reasoning and working mathematically** | | **Core content** |
| Students know:  different ways to model single events involving probability  theoretical probability relates to the occurrence of outcomes that, in theory, are possible  experimental probability relates to the estimation of the likelihood of a particular outcome based on the relative frequency of data about that outcome arising from the results of an experiment or practical activity  theoretical and experimental probabilities provide numerical values for the likelihood of occurrence of single events  how to determine probabilities for single events  how to justify statements and decisions using theoretical and experimental probabilities  the larger the experimental sample, the closer the relative frequency will be to theoretical probability. | Students may:  identify all possible outcomes of an event by using lists or tables  determine the theoretical probability of a single event occurring (e.g. throwing an odd number on a die)  use various models to determine experimental probability  conduct large-scale computer-generated experiments to support the understanding of the relationship between theoretical and experimental probability  use experimental or theoretical probabilities of a single event to make statements or decisions about the fairness or bias of a situation  use the experimental probability to make statements about the likelihood of outcomes in similar events. | Likelihood  language of chance   * theoretical probability (of a single event)   probability models   * lists, tables * computer simulations * experiments   Judgments  quantitative judgments   * probability of events with equally likely outcomes * fair, unfair and biased judgments * probability to support statements and decisions (single events) * experimental and theoretical probability links * extrapolations from simplified explorations |
| Investigations should occur in a range of contexts. For example, students could investigate:  chances of winning first prize in raffles or art unions  the rules of board games, such as when participants are required to roll a specified number on a die before commencing play or an exact number to complete a turn  rainfall and/or temperature data to make informed decisions about planting crops. | | |

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| Level 6: Level statement  Students determine the theoretical probabilities of multi-outcome and compound events and design and conduct experiments to investigate and model the probabilities.  Students decide on data collection processes appropriate for various purposes to provide representative samples. They identify the nature of variations and relationships within data sets. They analyse data displays and identify strengths and limitations of particular displays. | | |
| Core learning outcome: CD 6.1  Students model and determine probabilities for multi-outcome and compound events and justify decisions. | | |
| **Elaborations — To support investigations that emphasise thinking, reasoning and working mathematically** | | **Core content** |
| Students know:  different ways to model multi-outcome and compound events involving probability  how to determine probabilities for multi-outcome and compound events  non-replacement affects probability  theoretical, conditional and experimental probabilities provide numerical values for the likelihood of occurrence of multi-outcome and compound events  how to justify statements and decisions using theoretical, conditional and experimental probabilities. | Students may:  design and conduct experiments to determine probabilities  analyse and interpret given probabilities  compare identified probabilities with predicted probabilities  use calculated experimental probability values within a model, and/or links with theoretical probabilities, to challenge or support statements  explain theoretical probability as being the likelihood of occurrence being determined by calculating results that would occur under ideal circumstances (e.g. the theoretical probability of rolling a 4 on a four-sided die is one in four, ¼ or 25%)  make predictions (determine expected number) using a theoretical probability, including conditional probability where appropriate  compare experimental and theoretical probabilities to explain and justify judgments to inform decisions about future events  explain and justify decisions related to the probability of an event and compare with similar events in other situations  model multi-outcome events (e.g. throwing an odd number on a die)  model compound events (e.g. asking chance experts about what multi-outcome events are)  use the information gathered from simplified experiments to make decisions (e.g. to devise strategies in a game of chance). | Likelihood  language of chance   * multi-outcome events * compound events * conditional probability (replacement and non-replacement)   theoretical probability of multi-outcome and compound events  probability models   * lists, tables, tree diagrams * computer simulations * experiments   Judgments  quantitative judgments   * predictions and justifications * experimental and theoretical probability links * extrapolations from simplified explorations |
| Investigations should occur in a range of contexts. For example, students could investigate:  health statistics, such as the 1 in 10 chance of non-immunised people getting influenza in a given year  the random selection of a set number of students from a group for a team  chances of winning different types of lotteries using computer simulation  promotional claims such as ‘one in every six chocolate bars wins a prize’ or ‘one in every 10 SMS text messages wins a CD’  likelihood of inheriting genetic traits such as eye colour. | | |