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| **SCOPE AND SEQUENCE**  | Mathematics — Years 1 to 9 | **CHANCE AND DATA** | **DRAFT** |
| **Scope and sequence** identifies what should be taught and what is important for students to have opportunities to learn. It describes the *knowledge* that students need for ongoing learning in Mathematics. This knowledge is presented as *Concepts and facts* and *Procedur*es.The scope and sequence:* is provided for each year of schooling
* should be used together with the *Essential Learnings*
* provides additional detail in each Organiser
* informs the focus of Mathematics in assessment
* is a key document for school curriculum planning.
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| **Prep** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **Year 6** | **Year 7** | **Year 8** | **Year 9** |
| ***Concepts and facts*** | ***Concepts and facts*** | ***Concepts and facts*** | ***Concepts and facts*** | ***Concepts and facts*** | ***Concepts and facts*** | ***Concepts and facts*** | ***Concepts and facts*** | ***Concepts and facts*** | ***Concepts and facts*** |
| * Chance experiences in familiar situations
* Student-generated questions, issues to be resolved, e.g. who can tie their shoelaces?
 | * Randomness (a lack of predictable order and pattern in an event)
* Observation to collect data to resolve question, issues of interest
 | * Uncertainty of occurrence of chance events
* Refinement of questions for data collection
* Data collection:
	+ how, when, how much and conditions
* Sources of variation and error
* Data displays
 | * Predictions about chance events (a selected outcome or subset of all possible outcomes)
* Data collection:
	+ surveys and observations responding to questions to be explored
* Variation in data
* Adequacy of data
 | * Experimental probability is the number of successful trials (one action in an experiment) divided by the total number of trials, e.g. 5 tails in 20 flips of a coin, 5 divided by 20
* Data collection:
	+ experiments exploring chance events
	+ collection methods: tally marks, lists, tables
* Effects of variation on conclusions and predictions
* Adequacy of data
 | * Predictions of the range of possible outcomes (all possible results from a chance experiment)
* Data collection:
	+ experiments and observations responding to questions about the likelihood of occurrence
* Expected and unexpected variation in data sets
* Additional data: reasons for, amount required, impact on statements related to data
 | * Theoretical probability (the number of outcomes in an event divided by the total number of possible outcomes, e.g. ½ for obtaining a head when tossing a coin)
* Probability using experimental data
* Sample spaces, e.g. all possible outcomes within an activity or experiment
* Frequency: the count of occurrences of an event occurring, e.g. rolling an even number on a die
* Predictions based on experimental data
* Discrete data:
	+ numerical
	+ categorical
	+ count
 | * Theoretical probability
* Estimation of theoretical probability
* Continuous data
* Sample data drawn from given populations
* Measures of location: mean, median, mode (for discrete data)
* Variation
* Bias
 | * Estimation of probability with equally or unequally likely outcomes
* Randomness (lack of predictable order and pattern in an event)
* Law of large numbers (as the number of trials increases the experimental probability gets closer to the theoretical probability)
* Ways to calculate probability:
	+ counting
	+ measuring
	+ symmetry
* Sample space: tables, tree diagrams, organised lists
* Single events: individual events measuring the likelihood of one thing occurring, e.g. rolling a 5 on a die
* Effect of replacement and non‑replacement on probability
* Data collection: population, sample
* Data accuracy
* Sources of variation and error
	+ explained and unexplained
	+ bias
	+ effects on mean of adding or deleting data
 | * Theoretical probability
* Experimental probability is the proportion of the number of times an event occurs in an experiment
* Inferences and generalisations
* Data collection:
	+ samples, surveys, experiments, computer simulations, from published data and databases
* Compound probability experiment: a chance procedure with more than one stage, e.g. in rolling two dice, the event of getting a four on one die and a six on the other
* Simple measures of spread and centre, distribution of responses, outliers
* Bins identify the intervals in which the continuous data are grouped (histograms)
* Errors in data
* Bias
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| ***Procedures*** | ***Procedures*** | ***Procedures*** | ***Procedures*** | ***Procedures*** | ***Procedures*** | ***Procedures*** | ***Procedures*** | ***Procedures*** | ***Procedures*** |
| * Classification of the likelihood of familiar events
 | * Classification of the likelihood of daily events
 | * Classification of the likelihood of daily events
* Connections between collected data and interpretations
 | * Connections between classifications of occurrence and predictions
* Connections between collected data displayed data and interpretations
 | * Comparison of the likelihood of events
* Classification of data for chance events
* Connections between organised data, displayed data and interpretations
* Comparison of different data collection methods
 | * Data collection check
* Comparison of data sets
 | * Comparison between:
	+ expected and observed numerical outcomes
	+ experimental data with theoretical probability, e.g. data gathered after rolling a die 50 times with the theoretical probability of it landing on a 6
	+ data sets for accuracy
* Classification of discrete data for chance events: numbered or categories
* Connections between questions with data needed to answer them
 | * Comparison of:
	+ how often an event occurs with the number of trials performed (relative frequency)
	+ experimental probability with theoretical probability
	+ experimental data and expected data
* Summarisation of data
 | * Links between experimental and theoretical probability
* Comparison of probabilities
 | * Comparison of theoretical and experimental probability
* Data analysis
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| * Concrete materials:
	+ computers
	+ manipulative materials
* Verbal:
	+ everyday language: might, might not, never happen
* Written:
	+ data display as classified objects and images
* Visual:
	+ photographs
	+ pictorial of chance events
 | * Concrete materials:
	+ computers and other electronic devices
	+ manipulative materials
	+ student-generated data recording sheets
* Verbal:
	+ everyday language: always, sometimes, never, will, will not and might happen, maybe, fair, not fair, lucky, unlucky
* Written:
	+ recorded observations as data
	+ lists
	+ simple data displays, e.g. object and people graph
* Visual:
	+ photographs
	+ pictorial of chance events and data collection
 | * Concrete materials:
	+ computers and other electronic devices
	+ manipulative materials
	+ student-generated data recording sheets
* Verbal:
	+ personal opinions as predictions of chance events
	+ question development
	+ explanations of reasoning (data collection, data display, data variation)
	+ mathematical language: likely, unlikely, impossible, variation
* Written:
	+ data collection records
	+ title and label for data display (manual or electronic)
* Visual:
	+ lists
	+ tables
	+ picture and bar graphs
 | * Concrete materials:
	+ computers and other electronic devices
	+ manipulative materials
	+ student-generated data recording sheets
* Verbal:
	+ personal opinions as predictions of chance events
	+ analytical descriptions of data and variations
	+ explanations of reasoning (data collection, data display, data variation)
	+ mathematical language: likely, unlikely, possible, impossible, variation
* Written:
	+ lists
	+ tables
	+ picture and bar graphs
	+ conventions for data displays (manual or electronic)
* Visual:
	+ other people’s lists, tables, picture graphs and bar graph
 | * Concrete materials:
	+ computers and other electronic devices
	+ manipulative materials
	+ data record sheets
* Verbal:
	+ explanation of judgments about likelihood
	+ descriptions of efficiencies in data collection methods
	+ descriptions of variations,
	+ justified conclusions from data
	+ mathematical language: likely, more likely, most likely, never
* Written:
	+ simple designs for experiments
	+ lists
	+ tables
	+ picture graphs (one-to-many with scale)
	+ horizontal and vertical bar graphs
	+ conventions for data displays: titles, axes, scale
* Visual:
	+ other people’s tables and graphs
 | * Concrete materials:
	+ computers and other electronic devices
	+ manipulative materials
	+ data sets
* Verbal:
	+ statements and predictions based on collected data
	+ limitations of collected data
	+ comparative and quantitative language
	+ describing data displays
	+ mathematical language: more likely, less likely, equally likely, most likely, least likely, certain, multiple outcomes, sample space, randomness
* Written:
	+ organised lists
	+ tables including two-way table line graphs
* Visual:
	+ other people’s tables, pie charts and graphs
 | * Concrete materials:
	+ computers and other electronic devices, e.g. random number generator for chance
	+ manipulative materials
* Verbal:
	+ conclusions from data
	+ informal inferences developed, justified and critiqued
	+ mathematical language: impossible, certain, bias, more/less spread out, clumped, majority, “average” (colloquial use with visual estimate), maximum, minimum, frequency, relative frequency, theoretical probability, discrete data
* Written:
	+ spreadsheets
	+ calculations of probability as key percentages between impossible 0%, 50%, and certain 100%
	+ plans and methods for data collection
	+ summarised and represented data
	+ design of data record templates according to question and type of data
	+ scatter graphs (dot plots)
* Visual:
	+ other people’s tables and graphs
 | * Concrete materials:
	+ computers and other electronic devices, e.g. random number generator for chance
	+ manipulative materials
* Verbal:
	+ subjective and numerical judgments
	+ probability expressed as per cent, fraction, decimal
	+ description of continuous data as distributions of quantities
	+ conclusions from data, developed, justified and critiqued
	+ sources of bias
	+ mathematical language: equally/unequally likely, spread, range, extremes (maximum/minimum), frequency, relative frequency
* Written:
	+ spreadsheets
	+ frequency table
	+ calculations of probability as key percentages between 0% and 100%, common fractions ½, ¼, ¾ and decimal fractions between 0 and 1, e.g. 50%, ½ , 0.5
	+ data representations (two-way table, pie chart, bar or line graph)
	+ plans and methods for data collection and recording
	+ displays to illustrate data features and variation
* Visual:
	+ other people’s tables and graphs
 | * Concrete materials:
	+ computers and other electronic devices, e.g. random number generator for chance
	+ manipulative materials
	+ published data
	+ databases
* Verbal:
	+ random
	+ reasonableness of probability estimates
	+ comparisons and predictions with supporting data
	+ limitations of measures of central tendency
	+ spread, shape, e.g. asymmetry, unusual features
	+ conclusions from data developed, justified and critiqued
	+ mathematical language: key properties of numerical data (centre, spread, shape, extremes), compound events, multi-outcome events, sample data
* Written:
	+ spreadsheets
	+ probability values from sample spaces
	+ histograms (numerical data)
	+ stem and leaf plots
	+ tree diagrams and tables
	+ organised lists
* Visual:
	+ commercial and other people’s tables and graphs
 | * Concrete materials:
	+ computers and other electronic devices, e.g. random number generator for chance
	+ manipulative materials
* Verbal:
	+ effect of bias
	+ biased judgments
	+ effects of anomalous data on measures of location
	+ limitations of findings and judgments
	+ responses to claims and questions
	+ mathematical language: fair, unfair, conditional probability, measures of location, categorical data, proportion, mode, census data
* Written:
	+ spreadsheets
	+ two-way table
	+ tree diagrams
	+ histograms
	+ stem and leaf plots
	+ refined questions to guide study
	+ displays selected to highlight features
* Visual:
	+ commercial and other people’s tables and graphs
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