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| Strand: Chance and Data | | Topic: Data |
| 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 gather or provide a small amount of information to support decisions about a class event or activity. | | |
| Elaborations — To support investigations that emphasise thinking, reasoning and working mathematically | | |
| Students know:  collected data can support decisions about familiar events or routines. | Students may:  identify and locate key items for the collection of data relevant to a given question (e.g. in response to a question about who can go swimming  today, students look for swimming bags, not school bags; in response to a question about who can play outside today, students gather data about  who has a hat)  indicate what to put in a data display (e.g. photographs, pictures, objects)  participate in the development of pictorial lists of requirements for familiar activities (e.g. for a cooking session, camping, trip or excursion, swimming, packing the school bag to go home)  interpret pictorial representations of data (e.g. getting the ingredients listed in pictorial recipes, following social stories, following pictorial instructions for making or doing something)  participate in the construction of displays of various collections of data (e.g. number of people going swimming today, various likes and dislikes,  favourite song)  participate in the selection of information from gathered data to make decisions about the choice of an activity, a song or who may participate in a  specific task. | |

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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 1.2  Students collect and classify data to investigate particular situations and create and interpret simple displays. | | |
| **Elaborations — To support investigations that emphasise thinking, reasoning and working mathematically** | | **Core content** |
| Students know:  collected data are used to investigate particular situations  different ways data can be collected  how to classify data  data displays organise information for interpretation  how to create simple data displays  how to interpret simple data displays. | Students may:  identify and clarify an issue of interest or question to be investigated  use observation and questioning as ways of gathering data  suggest and use different recording methods to collect data to support an investigation (e.g. writing or concrete materials)  classify data into suitable categories (e.g. colours or types of vehicles when collecting data about traffic)  check data collected to determine whether or not the question being asked is answered or the data are relevant to the situation being investigated  create simple individual or class displays of collected data  interpret simple data displays  identify and describe possible sources of variation in data  explain differences in data and relate these directly to natural variation when it occurs (e.g. height of students of the same age))  suggest ways of handling data to overcome variations. | Collecting and handling data  collection methods   * observation * questioning   classify data  check data  Exploring and presenting data  simple displays   * lists * tables * people graphs * object graphs * picture graphs * student-generated   Identifying and interpreting variation  sources of variation   * recording methods * observational conditions   natural variation |
| Investigations should occur in a range of contexts. For example, students could investigate:  flavours of milk sold at the school tuckshop  clothing sizes to identify owners of lost property  how many bike racks are needed by finding out how students travel to school  how much sports and games equipment is needed by finding out which sports or games are most popular  the variation in height of students of the same age  the sizes of shadows cast by the same object at different times of the day. | | |

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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 2.2  Students collect and organise data, create and interpret a variety of displays to investigate their own and others’ questions, and identify elements of the displays. | | |
| **Elaborations — To support investigations that emphasise thinking, reasoning and working mathematically** | | **Core content** |
| Students know:  data collections are planned to investigate their own and others’ questions  how to collect and organise data  data displays represent collected data  elements of data displays  how to create data displays  how to interpret data displays using elements of displays. | Students may:  formulate a question or issue to be investigated  plan data collection to investigate a question or issue  identify data sources to be used and give reasons for the selection  determine the method for data collection (observation or simple survey)  determine how the data will be recorded (student-generated, symbols, tally marks, materials) and how the data set will be checked for accuracy  identify possible difficulties in the data collection method  trial the collection of data to determine the suitability of questions  modify questions, collection or recording methods as required  collect data using observation or simple surveys  organise data into categories for display and give reasons for the selection  create displays of collected data using titles and axes  interpret and compare data displays identifying variations in data collection methods, observational conditions and natural variation  describe effects of variation including any natural variation  present data in different ways for interpretation  interpret displays developed by other groups or individuals and identify what information is not provided by the data  evaluate the usefulness of collected data for resolving an issue or question  identify and explain whether additional data are needed for the investigation. | Collecting and handling data  collection methods   * observation * simple surveys   classify data  record and check data  Exploring and presenting data  displays   * tables * picture graphs * bar graphs   main elements of displays   * titles * axes   Identifying and interpreting variation  sources of variation   * recording methods * observational conditions   natural variation  effects of variation |
| Investigations should occur in a range of contexts. For example, students could investigate:  favourite burgers and fillings to prepare for a burger-stall fundraiser  what style and design of new playground equipment is needed by observing how the equipment is used  the growth of plants sown at the same time  preferred activities for lunchtime. | | |

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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 3.2  Students design and trial a variety of data collection methods and use existing sources of data to investigate their own and others’ questions, organise data and create suitable displays, identifying and interpreting elements of the displays. | | |
| **Elaborations — To support investigations that emphasise thinking, reasoning and working mathematically** | | **Core content** |
| Students know:  data collections are planned to investigate their own and others’ questions  how to design data collection methods to investigate their own and others’ questions  how to plan for and conduct trials of data collection methods  ways to organise data  ways to display data  how to create suitable data displays  elements of data displays  how to interpret data displays using elements of displays. | Students may:  formulate or interpret a question or issue to be investigated  select suitable data collection methods  trial data collection methods including survey questions  decide whether data sources are applicable to the question/s or issue/s being posed.  evaluate data from a trial  modify data collection methods as required to support an investigation  conduct data collection with a targeted sample or using existing data sources  generate categories for the classification of data and justify the categories selected  select tallying methods and give reasons for the selection  check accuracy of data gathered and data tallied  identify the range of results across and within categories  determine a suitable data display to answer the question or resolve the issue and justify selection  create a data display using titles, axes, and scales as required  evaluate the effectiveness of different displays in terms of illustrating data features and variations using the main elements of displays to assist interpretations  describe their own and others’ data displays using comparative and quantitative language  identify and select existing data sources to investigate a question or issue  critically analyse existing data sources taking account of methods of collection, the size and relevance of the sample. | Collecting and handling data  collection methods   * surveys * observations * experiments   classify, record and check data  existing data sources   * publications   Exploring and presenting data  displays   * tables * picture graphs (one-to-many representations) * bar graphs   main elements of displays   * titles * axes * scales   Identifying and interpreting variation  comparative and quantitative language  variety of displays to illustrate data features and variation |
| Investigations should occur in a range of contexts. For example, students could investigate:  the most commonly used materials, shapes and colours in everyday packaging  the effect of shade on the growth of plants  flora and fauna in their school environment compared with statewide data  opinions on current issues. | | |

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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 4.2  Students plan and carry out data collections using their own data record templates, choose and construct appropriate displays and make comparisons about the data based on the displays and measures of location. | | |
| **Elaborations — To support investigations that emphasise thinking, reasoning and working mathematically** | | **Core content** |
| Students know:  data collections are planned to investigate particular situations  how to plan and carry out data collections  how to design data record templates  when to use different data displays  the difference between discrete and continuous data  how to construct appropriate data displays for discrete and continuous data  ways to compare data-based displays  purposes of measures of location  how to determine measures of location  how to make comparisons about the data using measures of location. | Students may:  determine the purpose for collecting data  describe discrete data as data that are allocated to categories and can be described by names that are unconnected (e.g. gender, agreement) or counting numbers (e.g. number of children in a family)  describe continuous data as data that can be given in different units of measurement and broken down into smaller parts that are meaningful (e.g. length, volume, time, temperature)  anticipate whether data gathered will be discrete or continuous and plan for that data collection  design data record templates or spreadsheets  conduct a trial to evaluate the data collection methods and templates used  modify data collection methods and templates as required  carry out the data collection  analyse and describe their own and others’ data sets using comparative and quantitative language  identify and explain variation between sets of data  choose a data display for the data gathered, justify the selection and construct a display  compare and interpret different displays of the same data  explain measures of location (measures used to describe mean, median and mode)  explain the purposes for measures of location  explain mean and median in a data set and the roles of these as measures of location  explain mean as being the average of a number of different amounts  explain median as being the middle point of a set of data  explain mode as being the item occurring most frequently in a set of data  organise data to determine mean, median and mode  describe the effect of extreme observations (outliers) on the mean (e.g. the effect on a cricketer’s mean score if a very high number of runs is scored in one innings and a low number of runs is scored in all other innings)  describe how measures of location are affected by changes in the data  make comparisons about sets of data with reference to measures of location (e.g. in a set of shirts for a sporting group, the mode would be the most common size)  make predictions about sets of data with reference to measures of location   * use given measures of location to speculate on what the gathered responses may have been (e.g. If the mean in a survey about television viewing times is two hours per day, what might the highest and lowest responses have been?). | Collecting and handling data  plans and methods for data collection   * design of data record templates * data entry into spreadsheets * extraction of data from existing data sources   classify data  check data  discrete data   * categorical data * count data   continuous data  Exploring and presenting data  displays   * pie charts * bar graphs * dot-plots * line graphs * two-way tables * lists   Identifying and interpreting variation  features of data   * measures of location (central tendency) * mean * median * mode (for discrete data)   limitations of measures of location |
| Investigations should occur in a range of contexts. For example, students could investigate:  the timetable of events for the school camp by finding out everyone’s favourite activities  the selection of music for a school dance or band performance by finding out the most popular music group or band  sports statistics for team or individual performances  population statistics, such as natural increases and immigration  the number of families in the school with 1, 2, 3 …. children per family  factors that make their community ‘liveable’, such as climate, and recreation activities and facilities. | | |

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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 5.2  Students plan investigations involving discrete and continuous data, produce and compare data displays involving grouping, and compare measures of location. | | |
| **Elaborations — To support investigations that emphasise thinking, reasoning and working mathematically** | | **Core content** |
| Students know:  data collections are planned to investigate particular situations  how to plan investigations involving discrete and continuous data  how to group data for different data displays  ways of displaying data for comparison  methods of comparing grouped data  how to determine measures  of location  methods of comparing measures of location. | Students may:  determine issues or questions for data collection  determine the role of the data collector, observer, participant or interviewer  explain similarities and differences between discrete and continuous data  describe data to be collected as being discrete or continuous and give reasons  design appropriate methods of data collection including decisions relating to discrete versus continuous data, grouped versus ungrouped, consistency of conditions  collect data or use existing sets of data  record data using appropriate templates  identify ways to maintain consistency of units (e.g. centimetres) and conditions  identify and explain possible errors in data collection  identify appropriate data displays for the collected data and give reasons for the selection  explain whether the data can be grouped  choose categories for grouping and describe the effect of these on the data displays and interpretation  review the adequacy of the data in relation to the question or problem, and collect or access additional data as required  experiment with different bin choices, for continuous data, to decide on a preferred display of the data and justify decisions  use various groupings to produce a range of data displays for comparison and interpretation  compare data displays that use the same scale  use data displays and data sets to determine spread, range and measures of location  compare measures of location to make generalisations  explain the limitations of measures of location and groupings  analyse generalisations and implications drawn from the various groupings on the data displays and compare with other generalisations and implications drawn from the same data set  determine and compare appropriate data summaries such as spread, range, mean, median and mode (for discrete data) for interpretation relevant to the aims of the investigation  use the analysis of the investigation to determine whether other questions and studies are necessary. | Collecting and handling data  studies involving observations, experiments and surveys  templates for recording data  spreadsheets  consistency of units and conditions  detect errors  discrete data  continuous data  groups (bins)  Exploring and presenting data  displays   * two-way tables * compound bar graphs * histograms * stem and leaf plots   Identifying and interpreting variation  features of data   * spread * range * measures of location (central tendency) and limitations * shape (e.g. asymmetry, unusual features)   histograms and stem and leaf plots as picture estimates |
| **Investigations should occur in a range of contexts. For example, students could investigate:**  weather and leisure in Queensland to inform the construction of an itinerary for a visiting exchange student  opinions on social issues such as elections  daily growth of plants under different conditions  physical attributes versus results in sport. | | |

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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 6.2  Students use and interpret cross-sectional data and data collected over time to identify the nature of variations and relationships. | | |
| **Elaborations — To support investigations that emphasise thinking, reasoning and working mathematically** | | **Core content** |
| Students know:  data collections are planned to investigate particular situations  cross-sectional data are gathered from a representative sample  the difference between census data and sample data  the types of variations and relationships that exist within data  the purpose for collecting data over time. | Students may:  pose a problem or question that can be resolved or answered by collecting data  identify and describe where, when and why cross-sectional data are used  identify and describe where, when and why data collected over time are used  decide whether cross-sectional data or data collected over time are relevant  collect census and/or sample data or use existing sets of data collected over time to investigate a question or a problem  select an appropriate data display and justify the choice  determine measures of location  explain the spread of data on graphs and plots  make comparisons between spread and measures of location  compare the spread of data across categories and data sets  interpret data displays and calculations to identify and describe relationships and variations within and between data sets  use data, display analysis and identified relationships to support or challenge solutions to a problem or issue investigated  decide whether further investigations are required to support or challenge a proposed solution. | Collecting and handling data  data over time (time a major focus)  cross-sectional data (time not a major focus)  nature of types of data sets   * sample data * census data   Exploring and presenting data  displays   * plots over time * scatterplots * two-way tables * histograms * stem and leaf plots   Identifying and interpreting variation  comparisons of features of graphs and plots   * location (mean, median) * spread * shape   relationships between variables   * through scatterplots for continuous data   through two-way tables for categorical data |
| **Investigations should occur in a range of contexts. For example, students could investigate:**   * mobile phone plans * car accident statistics such as ages of drivers and causes of accidents from a number of countries * ethnic groups within the school to make proposals related to languages offered in the curriculum subjects available and food sold in the tuckshop * petrol price variations over a period of time. | | |