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| Strand: Chance and Data | Topic: Data |
| Foundation Level: Level statementStudents 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 statementStudents 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 1.2Students 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 situationsdifferent ways data can be collectedhow to classify datadata displays organise information for interpretationhow to create simple data displayshow to interpret simple data displays. | Students may:identify and clarify an issue of interest or question to be investigateduse observation and questioning as ways of gathering datasuggest 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 investigatedcreate simple individual or class displays of collected datainterpret simple data displays identify and describe possible sources of variation in dataexplain 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 datacollection methods* observation
* questioning

classify datacheck dataExploring and presenting datasimple displays * lists
* tables
* people graphs
* object graphs
* picture graphs
* student-generated

Identifying and interpreting variationsources 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 schoolhow much sports and games equipment is needed by finding out which sports or games are most popularthe variation in height of students of the same agethe sizes of shadows cast by the same object at different times of the day. |

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| Level 2: Level statementStudents 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 2.2Students 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’ questionshow to collect and organise data data displays represent collected dataelements of data displayshow to create data displays how to interpret data displays using elements of displays. | Students may:formulate a question or issue to be investigatedplan data collection to investigate a question or issue identify data sources to be used and give reasons for the selectiondetermine 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 accuracyidentify possible difficulties in the data collection methodtrial the collection of data to determine the suitability of questionsmodify questions, collection or recording methods as requiredcollect data using observation or simple surveysorganise data into categories for display and give reasons for the selectioncreate displays of collected data using titles and axes interpret and compare data displays identifying variations in data collection methods, observational conditions and natural variationdescribe effects of variation including any natural variationpresent data in different ways for interpretationinterpret displays developed by other groups or individuals and identify what information is not provided by the dataevaluate the usefulness of collected data for resolving an issue or questionidentify and explain whether additional data are needed for the investigation. | Collecting and handling datacollection methods* observation
* simple surveys

classify datarecord and check dataExploring and presenting datadisplays * tables
* picture graphs
* bar graphs

main elements of displays* titles
* axes

Identifying and interpreting variationsources 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 usedthe growth of plants sown at the same time preferred activities for lunchtime. |

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| Level 3: Level statementStudents 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’ questionshow to design data collection methods to investigate their own and others’ questionshow to plan for and conduct trials of data collection methodsways to organise dataways to display data how to create suitable data displays elements of data displayshow to interpret data displays using elements of displays. | Students may:formulate or interpret a question or issue to be investigatedselect suitable data collection methodstrial data collection methods including survey questionsdecide 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 investigationconduct data collection with a targeted sample or using existing data sourcesgenerate categories for the classification of data and justify the categories selectedselect tallying methods and give reasons for the selectioncheck accuracy of data gathered and data talliedidentify the range of results across and within categoriesdetermine a suitable data display to answer the question or resolve the issue and justify selectioncreate a data display using titles, axes, and scales as requiredevaluate the effectiveness of different displays in terms of illustrating data features and variations using the main elements of displays to assist interpretationsdescribe their own and others’ data displays using comparative and quantitative languageidentify and select existing data sources to investigate a question or issuecritically analyse existing data sources taking account of methods of collection, the size and relevance of the sample. | Collecting and handling datacollection methods* surveys
* observations
* experiments

classify, record and check dataexisting data sources* publications

Exploring and presenting datadisplays* tables
* picture graphs (one-to-many representations)
* bar graphs

main elements of displays* titles
* axes
* scales

Identifying and interpreting variationcomparative and quantitative languagevariety 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 packagingthe effect of shade on the growth of plantsflora and fauna in their school environment compared with statewide dataopinions 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 situationshow to plan and carry out data collectionshow to design data record templateswhen to use different data displays the difference between discrete and continuous datahow to construct appropriate data displays for discrete and continuous dataways to compare data-based displayspurposes of measures of locationhow to determine measures of locationhow to make comparisons about the data using measures of location. | Students may:determine the purpose for collecting datadescribe 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 collectiondesign data record templates or spreadsheetsconduct a trial to evaluate the data collection methods and templates usedmodify data collection methods and templates as requiredcarry out the data collectionanalyse and describe their own and others’ data sets using comparative and quantitative languageidentify and explain variation between sets of datachoose a data display for the data gathered, justify the selection and construct a displaycompare and interpret different displays of the same dataexplain 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 locationexplain mean as being the average of a number of different amountsexplain median as being the middle point of a set of dataexplain mode as being the item occurring most frequently in a set of dataorganise data to determine mean, median and modedescribe 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 datamake 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 dataplans and methods for data collection* design of data record templates
* data entry into spreadsheets
* extraction of data from existing data sources

classify datacheck datadiscrete data* categorical data
* count data

continuous dataExploring and presenting datadisplays* pie charts
* bar graphs
* dot-plots
* line graphs
* two-way tables
* lists

Identifying and interpreting variationfeatures 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 activitiesthe selection of music for a school dance or band performance by finding out the most popular music group or bandsports statistics for team or individual performancespopulation statistics, such as natural increases and immigrationthe number of families in the school with 1, 2, 3 …. children per familyfactors that make their community ‘liveable’, such as climate, and recreation activities and facilities.  |

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| Level 5: Level statementStudents 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 datahow to group data for different data displays ways of displaying data for comparison methods of comparing grouped datahow to determine measures of locationmethods of comparing measures of location. | Students may:determine issues or questions for data collectiondetermine the role of the data collector, observer, participant or interviewerexplain 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 conditionscollect data or use existing sets of data record data using appropriate templates identify ways to maintain consistency of units (e.g. centimetres) and conditionsidentify and explain possible errors in data collectionidentify appropriate data displays for the collected data and give reasons for the selectionexplain whether the data can be groupedchoose categories for grouping and describe the effect of these on the data displays and interpretationreview the adequacy of the data in relation to the question or problem, and collect or access additional data as requiredexperiment with different bin choices, for continuous data, to decide on a preferred display of the data and justify decisionsuse various groupings to produce a range of data displays for comparison and interpretationcompare data displays that use the same scaleuse data displays and data sets to determine spread, range and measures of locationcompare measures of location to make generalisationsexplain 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 setdetermine and compare appropriate data summaries such as spread, range, mean, median and mode (for discrete data) for interpretation relevant to the aims of the investigationuse the analysis of the investigation to determine whether other questions and studies are necessary. | Collecting and handling datastudies involving observations, experiments and surveystemplates for recording dataspreadsheetsconsistency of units and conditionsdetect errorsdiscrete datacontinuous datagroups (bins)Exploring and presenting datadisplays* two-way tables
* compound bar graphs
* histograms
* stem and leaf plots

Identifying and interpreting variationfeatures 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 studentopinions on social issues such as electionsdaily growth of plants under different conditionsphysical attributes versus results in sport.  |

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| Level 6: Level statementStudents 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 samplethe difference between census data and sample datathe types of variations and relationships that exist within datathe purpose for collecting data over time. | Students may:pose a problem or question that can be resolved or answered by collecting dataidentify and describe where, when and why cross-sectional data are usedidentify and describe where, when and why data collected over time are useddecide 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 problemselect an appropriate data display and justify the choicedetermine measures of location explain the spread of data on graphs and plotsmake comparisons between spread and measures of locationcompare the spread of data across categories and data setsinterpret data displays and calculations to identify and describe relationships and variations within and between data setsuse data, display analysis and identified relationships to support or challenge solutions to a problem or issue investigateddecide whether further investigations are required to support or challenge a proposed solution. | Collecting and handling datadata 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 datadisplays* plots over time
* scatterplots
* two-way tables
* histograms
* stem and leaf plots

Identifying and interpreting variationcomparisons 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.
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