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| Ideas for Mathematical investigations — Levels 3 and 4 |

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| Number: Number concepts | | | |
| Investigation | Overview | Links to other Mathematics strands and topics | Possible links to other key learning areas and learning outcomes |
| How long could we live? | Students use statistical data to determine factors that may impact on their lifespan, such as the causes of death for particular age groups, and use the data to make a prediction.  This investigation provides students with opportunities to collect and display relevant data, and then use the data to compare and order whole numbers, decimals and percentages. | **Chance and Data**   * Data | **HPE**  PHIC 3.1, 3.3  PHIC 4.1, 4.3 |
| How much will catering cost for a five-day school camp? | Students take on the role of caterer for a school camp. They collect data to investigate the food and drink preferences of their peers, and the sizes of the servings that are normally consumed. They use these data to make recommendations about an appropriate, nutritionally sound menu for a five-day camp. They calculate the quantities of food required to cater for the group and the total cost of food requirements.  This investigation provides students with opportunities to compare and order numbers, and to calculate mass and volume. | Measurement  * Length, mass, area and volume  Chance and Data  * Data | **HPE**  PHIC 3.1, 3.2  PHIC 4.1, 4.2 |
| How big, how much or how many is a million? | Students investigate the magnitude of one million by calculating ‘how many’ or ‘how big’ one million of something might be. For example, students could investigate the size of a suitcase needed to carry one million dollars or the number of bottles of soft drink needed to make one million litres. | **Number**   * Addition and subtraction * Multiplication and division   **Measurement**   * Length, mass, area and volume |  |
| What is the best way to pay for purchases? | Students investigate different methods of paying for an item of their choice — for example, a sound system — to establish the most economical way to defer payment.  This investigation provides students with opportunities to develop an understanding of percentages, rates and factors that influence financial decisions. |  |  |
| What’s my share of the debt? | Students use available statistical data to compare the populations, gross domestic products and debt levels of a number of countries to establish which countries have the highest and lowest debt or wealth levels per person.  This investigation provides students with opportunities to demonstrate their understandings of whole numbers, decimal fractions and percentages. |  | SOSE  SRP 4.1 |
| How much is that game in the window? | Students use a range of advertising materials, including internet sites, to compare and order the prices of different electronic games and toys with a view to making decisions about what to spend their pocket money on or to buy as a gift for someone. Students roleplay the shop scene using different transactions, both cash and cashless.  This investigation may involve reading, recording and rounding amounts of money, and giving and receiving change. |  |  |
| Making models: How big should they be? | Students investigate the properties of real-life objects, such as a car, aeroplane, house, animal or building, to design a scale model.  This investigation provides students with opportunities to measure length, mass, area and volume, to apply rates to create scale, and to compare and order whole numbers and decimal fractions. | Number   * Multiplication and division   Measurement   * Length, mass, area and volume | Technology  TP 3.1, 3.2, 3.3, 3.4  TP 4.1, 4.2, 4.3, 4.4  Materials  MAT 3.1, 3.2  MAT 4.1, 4.2 |
| Reef and rainforest: How much damage is being done? | Students investigate the percentage of the Great Barrier Reef that has been damaged by the Crown of Thorns starfish and the area that this percentage represents. They also choose another natural environment that is being affected adversely by nature or human intervention and compare the amount of damage done in that region with the damage to the Barrier Reef. | **Space**   * Location, direction and movement | **Science**  LL 3.1, 3.2, 3.3  **SOSE**  PS 3.1, 3.2, 3.3, 3.4 |
| What is the most exciting  four- week overseas holiday you could plan for $10 000? | Students prepare an itinerary for a four-week, around-the-world holiday on a $10 000 budget. They investigate flight schedules, the cost of the travel for flights and other modes of travel, accommodation, food and sightseeing tours necessary to see all the places they wish to visit. They must keep their expenditure within the designated budget. Students also create maps to scale to show the routes they recommend.  This investigation provides students with opportunities to add and subtract whole and decimal numbers to 10 000, to use the conventions of mapping, direction and angle, and to make financial decisions based on best buys, advertising and budget restrictions. | **Number**   * Addition and subtraction  Measurement  * Time  Space  * Location, direction and movement | **SOSE**  PS 3.4  PS 4.4 |
| How can I make my money grow? | Students take on the role of a financial planner whose task is to make recommendations about the best way to invest pocket money. They investigate interest rates offered by different financial institutions and calculate, compare and order the amount of simple interest that might be earned with each one.  This investigation provides students with opportunities to use key percentages, decimals and unit fractions to calculate interest. | **Number**   * Multiplication and division |  |
| How can you choose teams of similar sporting ability? | Students competing in an interclass sporting skills competition investigate ways of dividing their class into teams of similar ability based on statistics about their performances.  This investigation provides students with opportunities to gather data on students’ performances (e.g. goal-shooting scores, rebound percentages, strike rates). They use these data to calculate and compare mean results, and to compare and order percentages and decimal fractions to make decisions about team composition. | **Chance and Data**   * Data |  |

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| Number: Addition and subtraction | | | |
| Investigation | Overview | Links to other Mathematics strands and topics | Possible links to other key learning areas and learning outcomes |
| Design a relay race that gives all teams an equal chance of winning. | Students design a course for a circular relay race that gives all teams an equal chance to win. The race may have a common finishing line although it is not necessary for every runner to run the same distance or to start at the same position on the track.  This investigation involves students in measuring the optimum distance team members can run at their fastest speed and arranging the placement of runners on the track so all members of the team are running their optimum distance. | **Measurement**   * Length, mass, area and volume |  |
| Planning for the road show: How far? How much? How many? How long? | Students take on the role of operations manager of the television show *Australian Idol.* They investigate the number of kilometres to be travelled by the three judges and the compere during the auditions, the cost of their travel to each city and accommodation during their stay, and the average amount of time that can be allowed for each audition.  To conduct this investigation, students research the cities in which the auditions are held, the number of days allocated for auditions in each city, the total number of people who audition at each place, the cost of travel, and the cost of accommodation in each city. | **Number**   * Multiplication and division   **Measurement**   * Time   **Space**   * Location, direction and movement |  |
| What is the most exciting four-week overseas holiday you could plan for $10 000? | Students prepare an itinerary for a four-week, around-the-world holiday on a $10 000 budget. They investigate flight schedules, the cost of the travel for flights and other modes of travel, accommodation, food and sightseeing tours necessary to see all the places they wish to visit. They must keep their expenditure within the designated budget. Students also create maps to scale to show the routes they recommend.  This investigation provides students with opportunities to add and subtract whole and decimal numbers to 10 000, to use the conventions of mapping, direction and angle, and to make financial decisions based on best buys, advertising and budget restrictions. | **Number**   * Number concepts  Measurement  * Time  Space  * Location, direction and movement | **SOSE**  PS 3.4  PS 4.4 |
| How much difference does training make to your chances of making high scores in games such as darts or bowling? | Students conduct experiments to investigate the likelihood of gaining above average scores in a variety of target games such as bowling, darts, quoits and archery, before and after practising for the event.  This investigation requires students to make judgments based on the relative frequency of certain scores occurring in their experiments. | **Chance and Data**   * Chance * Data |  |
| How could you modify a board game to increase your likelihood of winning? | Students investigate how the outcome of a game could be affected if elements of the game were altered, such as if the die used were modified to include a face with ‘miss a turn’, or if extra snakes were added to a game of Snakes and Ladders. Students choose games of chance and conduct experiments to see how the likelihood of winning a game alters as the rules are changed. | **Chance and Data**   * Chance * Data |  |
| How big, how much or how many is a million? | Students investigate the magnitude of one million by calculating ‘how many’ or ‘how big’ one million of something might be. For example, students could investigate the size of a suitcase needed to carry one million dollars or the number of bottles of soft drink needed to make one million litres. | **Number**   * Number concepts * Multiplication and division   **Measurement**   * Length, mass, area and volume |  |

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| Number: Multiplication and division | | | |
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| What a waste! How can we help Australia conserve its precious water? | Students investigate the amount of water used by Australians with a view to calculating how much may be used altogether in one year. They compare Australians’ usage with that of an under-developed or arid country. Students also investigate how much water a dripping tap may waste over a year and what this would cost the consumer.  The investigation could be extended to provide students with opportunities to suggest ways of saving water and calculating the amount that could be saved over a year if their suggestions were implemented. | **Chance and Data**   * Data | **Science**  LL 3.1  **SOSE**  PS 3.5  PS 4.4, 4.5  SRP 3.1 |
| How close is Australia to achieving zero population growth? | Students take on the role of an immigration department employee with the task of determining how many immigrants need to be allowed into Australia to achieve zero population growth. They use data from the Australian Bureau of Statistics to investigate the annual birth, death, immigration and emigration rates in Australia, and use these data to make their judgments.  (Note: A growth rate of zero is achieved when the number of births plus the number of immigrants exactly equals the number of deaths plus the number of emigrants.) | **Chance and Data**   * Data | **SOSE**  CI 3.1  CI 4.1, 4.4  TCC 4.3 |
| How can I make my money grow? | Students take on the role of a financial planner whose task is to make recommendations about the best way to invest pocket money. They investigate interest rates offered by different financial institutions and calculate, compare and order the amount of simple interest that might be earned with each one.  This investigation provides students with opportunities to use key percentages, decimals and unit fractions to calculate interest. | **Number**   * Number concepts |  |
| Planning for the road show:  How far? How much? How many? How long? | Students take on the role of operations manager of the TV television show *Australian Idol.* They investigate the number of kilometres to be travelled by the three judges and the compere during the auditions, the cost of their travel to each city and accommodation during their stay, and the average amount of time that can be allowed for each audition.  To conduct this investigation, students research the cities in which the auditions are held, the number of days allocated for auditions in each city, the total number of people who audition at each place, the cost of travel, and the cost of accommodation in each city. | **Number**   * Addition and subtraction   **Measurement**   * Time   **Space**   * Location, direction and movement |  |
| How big, how much or how many is a million? | Students investigate the magnitude of one million by calculating ‘how many’ or ‘how big’ one million of something might be. For example, students could investigate the size of a suitcase needed to carry one million dollars or the number of bottles of soft drink needed to make one million litres. | **Number**   * Number concepts * Addition and subtraction   **Measurement**   * Length, mass, area and volume |  |
| Making models: How big should they be? | Students investigate the properties of real-life objects, such as a car, aeroplane, house, animal or building, to design a scale model.  This investigation provides students with opportunities to measure length, mass, area and volume, to apply rates to create scale, and to compare and order whole numbers and decimal fractions. | **Number**   * Number concepts   Measurement   * Length, mass, area and volume | Technology  TP 3.1, 3.2, 3.3, 3.4  TP 4.1, 4.2, 4.3, 4.4  Materials  MAT 3.1, 3.2  MAT 4.1, 4.2 |

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| Patterns and Algebra: Patterns and functions | | | |
| Investigation | Overview | Links to other Mathematics strands and topics | Possible links to other key learning areas and learning outcomes |
| Patterns: What can we learn from them? | Students investigate patterns in:   * the arrival times for buses from set destinations at different times of day * the relationship between age and the amount of growth. Can students predict what their height will be at the age of 18 given the pattern of growth from birth to their present age? * the relationship between the temperature and time of day. Can students predict what the temperature will be in four hours time based on the pattern of temperature changes on previous days? * the relationship between time elapsed and the temperature of hot drinks as they cool * the relationship between time elapsed and the amount of time taken for ice to melt. |  |  |
| What do Fibonacci numbers and nautilus shells have in common? | Students explore the Fibonacci series of numbers. They identify the pattern among  Fibonacci numbers and explore ways that this pattern can be related to objects and shapes in the natural world (e.g. Which plants have petals or seeds in a seed head in quantities that are Fibonacci numbers? How can the spiral of a nautilus shell and pine cone be drawn using the Fibonacci rectangle?). |  |  |
| Is there a relationship between height or distance jumped and the weight of participants and their equipment in various sporting competitions? | Students investigate a variety of sports — for example, dirt biking, water- or snow-ski jumping, high, long or triple jumping — to determine possible mathematical relationships. Other relationships could be explored (e.g. length of run and distance jumped, distance from basket and shot percentage).  This investigation provides students with opportunities to measure length and mass, to collect and record data or use existing data sources, and to look at relationships between quantities. | Patterns and Algebra  * Patterns and functions  Measurement  * Length, mass, area and volume  Chance and Data  * Data | HPE DCSPA 3.4  DCSPA 4.4 |
| The plants in the classroom are looking unhealthy. How can they be made strong again? | Students investigate the optimum amount of soil, fertilizer and water required to grow  healthy plants. This investigation provides opportunities for students to apply understandings of length, mass and volume to graph data, and to look for patterns in the germination and growth of plants. | Measurement  * Length, mass, area and volume   **Chance and Data**   * Data | Science LL 3.1, 3.2, 3.3  LL 4.2, 4.3 |
| Value for money or an advertising ploy? | Students compare prices of differently packaged items such as chocolate bars and packets of chips to investigate what gives them the best value for their money.  This investigation provides students with opportunities to represent and describe equivalence and non-equivalence using symbols, and to represent relationships between prices and quantities on tables and graphs. | **Patterns and Algebra**   * Equivalence and equations |  |

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| Patterns and Algebra: Equivalence and equations | | | |
| Title of investigation | Overview | Links to other Mathematics strands and topics | Possible links to other key learning areas and learning outcomes |
| Will the record be broken? | Students investigate the scoring system in their sport of choice and determine combinations that would result in certain scores. For example, if in the final basketball game of a season, a team needs to score another 56 points to beat the total points they scored in the previous season, how many free throw and field goal (two point and three point) attempts would need to be successful to achieve 56 points?  This investigation could be extended to include addition, subtraction, multiplication and division by looking at a team’s total scores over the season and determining the combination of points that may have resulted in that total. If students are investigating a national sporting competition, such as the National Basketball League or the National Rugby League, they could check statistical data to see which combination was the result for the previous season. |  |  |
| What games of chance could be used for fundraising? Why? | Students investigate ways of organising games for a fundraising competition. They consider the following questions during their investigation. What game will you use? How much will you charge for a turn? What will the prizes be worth and how are they won? How much profit could you make using your ideas?  This investigation provides students with opportunities to create and interpret equations, and  to collect some experimental data to see if the game is fair and fun, and if you are likely to make a profit. | **Chance and Data**   * Chance |  |
| Value for money or an  advertising ploy? | Students compare prices of differently packaged items such as chocolate bars and packets of chips to investigate what gives them the best value for their money.  This investigation provides students with opportunities to represent and describe equivalence and non-equivalence using symbols, and to represent relationships between prices and quantities on tables and graphs. | **Patterns and Algebra**   * Patterns and functions |  |

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| Measurement: Length, mass, area and volume | | | |
| Investigation | Overview | Links to other Mathematics strands and topics | Possible links to other key learning areas and learning outcomes |
| Find other ways of measuring. | Students design and construct their own measuring instruments to use in situations of their own choice (e.g. volume of a rock, the size of an ant, duration of an event). They collect data using their instruments then construct graphs and tables to represent the data. Students use different displays to show the effects of presenting data in different ways.  (Note: This investigation is connected to the Science sourcebook module, *Measuring in Science*.) | **Measurement**   * Time   **Chance and Data**   * Data | **Science**  SS 3.2  SS 4.2 |
| Design a course for a scavenger hunt | Students use compass points, angles of turn and units of length to design and construct a scavenger hunt course for students in their school. Descriptions for locations of treasures or clues could include ‘5 metres from the north-east corner along the school fence’; ‘face the southern door of the library, turn 45 degrees and travel 20 metres’. | **Space**   * Location, direction and movement |  |
| Is there a relationship between height or distance jumped and the weight of participants and their equipment in various sporting competitions? | Students investigate a variety of sports — for example, dirt biking, water- or snow-ski jumping, high, long or triple jumping — to determine possible mathematical relationships. Other relationships could be explored (e.g. length of run and distance jumped, distance from basket and shot percentage).  This investigation provides students with opportunities to measure length and mass, to collect and record data or use existing data sources, and to look at relationships between quantities. | Patterns and Algebra  * Patterns and functions  Chance and Data  * Data | HPE DCSPA 3.4  DCSPA 4.4 |
| The plants in the classroom are looking unhealthy. How can they be made strong again? | Students investigate the optimum amount of soil, fertilizer and water required to grow healthy plants. This investigation provides opportunities for students to apply understandings of length, mass and volume to graph data, and to look for patterns in the germination and growth of plants. | Patterns and Algebra  * Patterns and functions   **Chance and Data**   * Data | Science LL 3.1, 3.2, 3.3  LL 4.2, 4.3 |
| How much will catering cost for a five-day school camp? | Students take on the role of caterer for a school camp. They collect data to investigate the food and drink preferences of their peers, and the sizes of the servings that are normally consumed. They use these data to make recommendations about an appropriate, nutritionally sound menu for a five-day camp. They calculate the quantities of food required to cater for the group and the total cost of food requirements.  This investigation provides students with opportunities to compare and order numbers, and to calculate mass and volume. | **Number**   * Number concepts   **Chance and Data**   * Data | **HPE**  PHIC 3.1, 3.2 PHIC 4.1, 4.2 |
| Modify the game of handball to make it more exciting. | Students investigate the possibility of modifying the rules of a handball game with a view to making the sport suitable for a higher level of competition. There are opportunities to investigate the effects of modifying the size of the court, the number of players involved and the rules of the game to make it more exciting and a little more difficult. |  |  |
| Design a kite | Students design and build a kite based on their research of the shape; dimensions of the spine compared with the cross-spar; weight of the finished kite; optimum angle of attack when flying; and length of tail and bridle of the type of kite chosen.  The following websites are useful:  http://www.aka.org.au/. Click on ‘Kites in the Classroom’  http://www.kites.org/zoo/class.html |  | **Technology**  TP 3.1, 3.2, 3.3, 3.4  TP 4.1, 4.2, 4.3, 4.4  MAT 3.1, 3.2  MAT 4.1, 4.2 |
| How is measurement used to make money? | Students investigate the measuring procedures and knowledge required in occupations that they might consider as a future career (e.g. architect, surveyor, boat designer, landscape architect and scientist). They report on the units of measure, measuring tools and terms required for their chosen profession and some descriptions of the measurements used. |  |  |
| How big does the tray on the truck need to be? | In the role of a furniture wholesaler who has to send a truckload of furniture to a customer, students investigate the dimensions of the pieces of furniture they consider essential to furnish a family home and calculate the minimum size of container required to move the furniture.  This investigation provides students with opportunities to investigate the relationship between length, width, height and volume of a prism. |  |  |
| How big, how much or how many is a million? | Students investigate the magnitude of one million by calculating ‘how many’ or ‘how big’ one million of something might be. For example, students could investigate the size of a suitcase needed to carry one million dollars or the number of bottles of soft drink needed to make one million litres. | **Number**   * Number concepts * Addition and subtraction * Multiplication and division |  |
| Making models: How big should they be? | Students investigate the properties of real-life objects, such as a car, aeroplane, house, animal or building, in order to design a scale model.  This investigation provides students with opportunities to measure length, mass, area and volume, to apply rates to create scale, and to compare and order whole numbers and decimal fractions. | Number   * Number concepts * Multiplication and division | Technology  TP 3.1, 3.2, 3.3, 3.4  TP 4.1, 4.2, 4.3, 4.4  Materials  MAT 3.1, 3.2  MAT 4.1, 4.2 |
| Design a relay race that gives all teams an equal chance of winning. | Students design a course for a circular relay race that gives all teams an equal chance to win. The race may have a common finishing line although it is not necessary for every runner to run the same distance or to start at the same position on the track.  This investigation involves students in measuring the optimum distance team members can run at their fastest speed and arranging the placement of runners on the track so all members of the team are running their optimum distance. | **Number**   * Addition and subtraction |  |
| Design a storage system for a small area. | Students take on the role of a cabinetmaker whose job it is to create storage spaces for a confined area such as a yacht, a caravan or a storage room in the classroom. They consider the items that may be stored in the area and design the storage space using 3D shapes. They create nets suitable for the construction of some of the shapes and justify their choices of designs based on the geometric properties of the 3D shapes. | **Space**   * Shape and line | **Technology**  TP 3.1, 3.2, 3.3, 3.4  TP 4.1, 4.2, 4.3, 4.4  MAT 3.1, 3.2  MAT 4.1, 4.2 |
| Design and construct a model of a school of the future. | Students take on the role of architect to design school buildings and school grounds for a school of the future. They investigate the use of 2D and 3D shapes in their school environment, and consider the reasons for the choice of shapes. Students use this knowledge to inform their design and construction of a scale model of a particular building or area of the future school.  This investigation provides students with opportunities to analyse the geometric properties of a range of 3D and 2D shapes, classify shapes, choose appropriate units when estimating and measuring, and investigate areas and lengths of boundaries. | **Space**   * Shape and line | **Technology**  TP 3.1, 3.2, 3.3, 3.4  TP 4.1, 4.2, 4.3, 4.4  MAT 3.1, 3.2  MAT 4.1, 4.2 |

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| Measurement: Time | | | |
| Investigation | Overview | Links to other Mathematics strands and topics | Possible links to other key learning areas and learning outcomes |
| What is the most exciting four- week overseas holiday you could plan for $10 000? | Students prepare an itinerary for a four-week, around-the-world holiday on a $10 000 budget. They investigate flight schedules, the cost of the travel for flights and other modes of travel, accommodation, food and sightseeing tours necessary to see all the places they wish to visit. They must keep their expenditure within the designated budget. Students also create maps to scale to show the routes they recommend.  This investigation provides students with opportunities to add and subtract whole and decimal numbers to 10 000, to use the conventions of mapping, direction and angle, and to make financial decisions based on best buys, advertising and budget restrictions. | **Number**   * Number concepts * Addition and subtraction  Space  * Location, direction and movement | **SOSE**  PS 3.4  PS 4.4 |
| Plan an itinerary for a trip to the nation’s capital. | Students participating in a school trip to Canberra are invited to create a timetable of events for the five days they will be in Canberra.  This investigation provides students with opportunities to use appropriate units and conventions of time to create a timetable or itinerary. |  |  |
| Planning for the road show:  How far? How much? How many? How long? | Students take on the role of operations manager of the television show *Australian Idol.* They investigate the number of kilometres to be travelled by the three judges and the compere during the auditions, the cost of their travel to each city and accommodation during their stay, and the average amount of time that can be allowed for each audition.  To conduct this investigation, students research the cities in which the auditions are held, the number of days allocated for auditions in each city, the total number of people who audition at each place, the cost of travel, and the cost of accommodation in each city. | **Number**   * Addition and subtraction * Multiplication and division   **Space**   * Location, direction and movement |  |
| Find other ways of measuring. | Students design and construct their own measuring instruments to use in situations of their own choice (e.g. volume of a rock, the size of an ant, duration of an event). They collect data using their instruments then construct graphs and tables to represent the data. Students use different displays to show the effects of presenting data in different ways.  (Note: This investigation is connected to the Science sourcebook module, *Measuring in Science*.) | **Measurement**   * Length, mass, area and volume   **Chance and Data**   * Data | **Science**  SS 3.2  SS 4.2 |
| Construct a timeline of a historic voyage. | Students take on the role of a journalist travelling with an expedition such as the First Fleet. They record the events of the days and weeks, and represent the information on a calendar that will be used by others (e.g. naval officers in London) to track the voyage. They also develop a timeline that could to be used to inform the planning of future expeditions. | Space  * Location, direction and movement |  |

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| Chance and Data: Chance | | | |
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| Who is most likely to win a game of chance? I want them on my team. | The class is holding a ‘games of chance’ competition and students are invited to form teams for the event. They conduct experiments that will inform them how to choose a team that has a good chance of winning.  This investigation provides opportunities for students to collect and record data and make comparisons based on measures of location. | **Chance and Data**   * Data |  |
| Design a randomising object for a game. | Students design a randomising object (e.g. spinner or die) that will meet a specific criterion, such as providing a greater than equal chance of throwing a six or spinning ‘Miss a turn’. |  |  |
| The toast always lands buttered side down! Can you affect the results of an experiment or is it just luck? | Students consider the elements of a fair test as they conduct experiments with buttered toast to support or refute the statement ‘toast always lands buttered side down’. They determine the likelihood of toast landing buttered side up, buttered side down or on its edge. They may experiment to see if the results are affected by the quantity of butter or the height from which the toast is dropped. |  |  |
| Blow up and bust! Which balloons are the most durable? | In the role of quality control officers in a balloon factory, students conduct experiments to determine the likelihood of different-sized or different-shaped balloons bursting, and make judgments about which balloons are likely to last the longest. |  |  |
| Design a poster for a lucky dip stall. It must show the chance of winning different prizes. | Students conduct experiments to determine the likelihood of drawing the most favourable prize from a lucky dip.  Students determine sample space, and compare and order the likelihood of each outcome. |  |  |
| How much difference does training make to your chances of making high scores in games such as darts or bowling? | Students conduct experiments to investigate the likelihood of gaining above average scores in a variety of target games such as bowling, darts, quoits and archery, before and after practising for the event.  This investigation requires students to make judgments based on the relative frequency of certain scores occurring in their experiments. | **Number**   * Addition and subtraction   **Chance and Data**   * Data |  |
| How could you modify a board game to increase your likelihood of winning? | Students investigate how the outcome of a game could be affected if elements of the game were altered, such as if the die used were modified to include a face with ‘miss a turn’, or if extra snakes were added to a game of Snakes and Ladders. Students choose games of chance and conduct experiments to see how the likelihood of winning a game alters as the rules are changed. | **Number**   * Addition and subtraction   **Chance and Data**   * Data |  |
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| What games of chance could be used for fundraising? Why? | Students investigate ways of organising games for a fundraising competition. They consider the following questions during their investigation. What game will you use? How much will you charge for a turn? What will the prizes be worth and how are they won? How much profit could you make using your ideas?  This investigation provides students with opportunities to create and interpret equations,  and to collect some experimental data to see if the game is fair and fun, and if you are likely to make a profit. | **Patterns and Algebra**   * Equivalence and equations |  |

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| Investigation | Overview | Links to other Mathematics strands and topics | Possible links to other key learning areas and learning outcomes |
| How much will catering cost for a five-day school camp? | Students take on the role of caterer for a school camp. They collect data to investigate the food and drink preferences of their peers, and the sizes of the servings that are normally consumed. They use these data to make recommendations about an appropriate, nutritionally sound menu for a five-day camp. They calculate the quantities of food required to cater for the group and the total cost of food requirements.  This investigation provides students with opportunities to compare and order numbers, and to calculate mass and volume. | **Number**   * Number concepts   **Measurement**   * Length, mass, area and volume | **HPE**  PHIC 3.1, 3.2  PHIC 4.1, 4.2 |
| Find other ways of measuring. | Students design and construct their own measuring instruments to use in situations of their own choice (e.g. volume of a rock, the size of an ant, duration of an event). They collect data using their instruments then construct graphs and tables to represent the data. Students use different displays to show the effects of presenting data in different ways.  (Note: This investigation is connected to the Science sourcebook module, *Measuring in Science*.) | **Measurement**   * Length, mass, area and volume * Time | **Science**  SS 3.2  SS 4.2 |
| Is there a relationship between height or distance jumped and the weight of participants and their equipment in various sporting competitions? | Students investigate a variety of sports — for example, dirt biking, water- or snow-ski jumping, high, long or triple jumping — to determine possible mathematical relationships. Other relationships could be explored (e.g. length of run and distance jumped, distance from basket and shot percentage).  This investigation provides students with opportunities to measure length and mass, to collect and record data or use existing data sources, and to look at relationships between quantities. | Patterns and Algebra  * Patterns and functions   **Measurement**   * Length, mass, area and volume | HPE DCSPA 3.4  DCSPA 4.4 |
| Who is most likely to win a game of chance? I want them on my team. | The class is holding a ‘games of chance’ competition and students are invited to form teams for the event. They conduct experiments that will inform them how to choose a team that has a good chance of winning.  This investigation provides opportunities for students to collect and record data, and make comparisons based on measures of location. | **Chance and Data**   * Chance |  |
| The plants in the classroom are looking unhealthy. How can they be made strong again? | Students investigate the optimum amount of soil, fertilizer and water required to grow healthy plants. This investigation provides opportunities for students to apply understandings of length, mass and volume to graph data and to look for patterns in the germination and growth of plants. | Measurement  * Length, mass, area and volume  Patterns and Algebra  * Patterns and functions | Science LL 3.1, 3.2, 3.3  LL 4.2, 4.3 |
| How long could we live? | Students use statistical data to determine factors that may impact on their lifespan, such as the causes of death for particular age groups, and use the data to make a prediction.  This investigation provides students with opportunities to collect and display relevant data, and then use the data to compare and order whole numbers, decimals and percentages. | **Number**   * Number concepts | **HPE**  PHIC 3.1, 3.3  PHIC 4.1, 4.3 |
| Which sports would you recommend to the school as being the safest for players? | Students have been given the task of deciding which sports will be played in the interschool competition. Before they make their recommendations, they have to research the probability of injury in each of the sports they wish to include in the competition. The investigation may involve a data collection from students at the school or accessing data sources on the internet. For example, http://www.iii.org/. Click on ‘Media’, then ‘Facts and statistics’.  This investigation provides students with opportunities to compare and order whole numbers, decimal fractions and percentages. | **Number**   * Number concepts | **HPE**  DCSPA 3.4  DCSPA 4.4  PHIC 3.3  PHIC 4.3 |
| How much difference does training make to your chances of making high scores in games such as darts or bowling? | Students conduct experiments to investigate the likelihood of gaining above average scores in a variety of target games such as bowling, darts, quoits and archery, before and after practising for the event.  This investigation requires students to make judgments based on the relative frequency of certain scores occurring in their experiments. | **Number**   * Addition and subtraction   **Chance and Data**   * Chance |  |
| How could you modify a board game to increase your likelihood of winning? | Students investigate how the outcome of a game could be affected if elements of the game were altered, such as if the die used were modified to include a face with ‘miss a turn’, or if extra snakes were added to a game of Snakes and Ladders. Students choose games of chance and conduct experiments to see how the likelihood of winning a game alters as the rules are changed. | **Number**   * Addition and subtraction   **Chance and Data**   * Chance |  |
| How can we help Australia conserve its precious water? | Students investigate the amount of water used by Australians with a view to calculating how much may be used altogether in one year. They compare Australians’ usage with that of an under-developed or arid country. Students also investigate how much water a dripping tap may waste over a year and what this would cost the consumer.  The investigation could be extended to provide students with opportunities to suggest ways of saving water and calculating the amount that could be saved over a year if their suggestions were implemented. | **Number**   * Multiplication and division | **Science**  LL 3.1  **SOSE**  SRP 3.1 |
| How close is Australia to achieving zero population growth? | Students take on the role of an immigration department employee with the task of determining how many immigrants need to be allowed into Australia to achieve zero population growth. They use data from the Australian Bureau of Statistics to investigate the annual birth, death, immigration and emigration rates in Australia, and use these data to make their judgments.  (Note: A growth rate of zero is achieved when the number of births plus the number of immigrants exactly equals the number of deaths plus the number of emigrants.) | **Number**   * Multiplication and division | **SOSE**  CI 3.1  CI 4.1, 4.4  TCC 4.3 |
| How could you measure items that are unusual shapes or are very small? | Students design and construct their own measuring instruments to use in situations of their own choice (e.g. volume of a rock, the size of an ant, duration of an event). They collect data using their instruments then construct graphs and tables to represent the data. Students use different displays to show the effects of presenting data in different ways.  (Note: This investigation is connected to the Science sourcebook module *Measuring  in Science*.) | **Measurement**   * Length, mass, area and volume * Time | **Science**  SS 3.2  SS 4.2 |
| How can you choose teams of similar sporting ability? | Students competing in an interclass sporting skills competition investigate ways of dividing their class into teams of similar ability based on statistics about their performances.  This investigation provides students with opportunities to gather data on students’ performances (e.g. goalshooting scores, rebound percentages, strike rates). They use these data to calculate and compare mean results, and to compare and order percentages and decimal fractions to make decisions about team composition. | **Number**   * Number concepts |  |

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| Space: Shape and line | | | |
| Investigation | Overview | Links to other Mathematics strands and topics | Possible links to other key learning areas and learning outcomes |
| Design a storage system for a small area. | Students take on the role of a cabinetmaker whose job it is to create storage spaces for a confined area such as a yacht, a caravan or a storage room in the classroom. They consider the items that may be stored in the area and design the storage space using 3D shapes. They create nets suitable for the construction of some of the shapes and justify their choices of designs based on the geometric properties of the 3D shapes. | **Measurement**   * Length, mass, area and volume | **Technology**  TP 3.1, 3.2, 3.3, 3.4  TP 4.1, 4.2, 4.3, 4.4  MAT 3.1, 3.2  MAT 4.1, 4.2 |
| Design the perfect lunchbox. | Students use 2D and 3D shapes to design the perfect lunchbox or other personal item (e.g. CD holder, battery storage, pencil box, tidy tray). |  | **Technology**  TP 3.1, 3.2, 3.3, 3.4  TP 4.1, 4.2, 4.3, 4.4  MAT 3.1, 3.2  MAT 4.1, 4.2 |
| How can you use 3D shapes to create a holder for your stationery? | Students design and construct stationery sets that include paper, envelopes, pencil holder, paper holder, and holders for paper clips, rubbers and scissors. The paper may be of any geometric shape and the holders should be a 3D shape suitable for the storage of a particular item.  This investigation provides students with opportunities to investigate a variety of prisms, lines and angles. |  | **Technology**  TP 3.1, 3.2, 3.3, 3.4  TP 4.1, 4.2, 4.3, 4.4  MAT 3.1, 3.2  MAT 4.1, 4.2 |
| Design and construct a model  of a school of the future. | Students take on the role of architect to design school buildings and school grounds for a school of the future. They investigate the use of 2D and 3D shapes in their school environment, and consider the reasons for the choice of shapes. Students use this knowledge to inform their design and construction of a scale model of a particular building or area of the future school.  This investigation provides students with opportunities to analyse the geometric properties of a range of 3D and 2D shapes, classify shapes, choose appropriate units when estimating and measuring and investigate areas and lengths of boundaries. | **Measurement**   * Length, mass, area and volume | **Technology**  TP 3.1, 3.2, 3.3, 3.4  TP 4.1, 4.2, 4.3, 4.4  MAT 3.1, 3.2  MAT 4.1, 4.2 |

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| Space: Location, direction and movement | | | |
| Investigation | Overview | Links to other Mathematics strands and topics | Possible links to other key learning areas and learning outcomes |
| What is the most exciting four- week overseas holiday you could plan for $10 000? | Students prepare an itinerary for a four-week, around-the-world holiday on a $10 000 budget. They investigate flight schedules, the cost of the travel for flights and other modes of travel, accommodation, food and sightseeing tours necessary to see all the places they wish to visit. They must keep their expenditure within the designated budget. Students also create maps to scale to show the routes they recommend.  This investigation provides students with opportunities to add and subtract whole and decimal numbers to 10 000, to use the conventions of mapping, direction and angle, and to make financial decisions based on best buys, advertising and budget restrictions. | **Number**   * Number concepts * Addition and subtraction   **Measurement**   * Time | **SOSE**  PS 3.4  PS 4.4 |
| Construct a timeline of a historic voyage. | Students take on the role of a journalist travelling with an expedition such as the First Fleet. They record the events of the days and weeks, and represent the information on a calendar that will be used by others (e.g. naval officers in London) to track the voyage. They also develop a timeline that could to be used to inform the planning of future expeditions. | **Measurement**   * Time | **SOSE**  TCC 3.2, 3.4  TCC 4.1 |
| Reef and rainforest: How much damage is being done? | Students investigate the percentage of the Great Barrier Reef that has been damaged by the Crown of Thorns starfish and the area that this percentage represents. They also choose another natural environment that is being affected adversely by nature or human intervention and compare the amount of damage done in that region with the damage to the Barrier Reef. | **Number**   * Number concepts | **Science**  LL 3.1, 3.2, 3.3  **SOSE**  PS 3.1, 3.2, 3.3, 3.4 |
| Design a course for a scavenger hunt | Students use their knowledge of compass points, angles of turn and units of length to design and construct a scavenger hunt course for students in their school. Descriptions for locations of treasures or clues could include ‘5 metres from the north-east corner along the school fence’; ‘face the southern door of the library, turn 45 degrees and travel 20 metres’. | **Measurement**   * Length, mass, area and volume |  |
| Planning for the road show:  How far? How much? How many? How long? | Students take on the role of operations manager of the television show *Australian Idol.* They investigate the number of kilometres to be travelled by the three judges and the compere during the auditions, the cost of their travel to each city and accommodation during their stay, and the average amount of time that can be allowed for each audition.  To conduct this investigation, students research the cities in which the auditions are held, the number of days allocated for auditions in each city, the total number of people who audition at each place, the cost of travel, and the cost of accommodation in each city. | **Number**   * Addition and subtraction * Multiplication and division * Measurement * Time |  |