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| **Corrimal High School**  **iROBOT**  ***Integrated STEM Project***  ***Stage 4- Year 8***  **Description: C:\Users\NELBATOORY\Desktop\2353_NSWED_STEM_LOGO.png*Rationale: iROBOT is a project based learning unit where students complete the project by designing and building a hydraulic powered robotic arm. Students work in collaboratively with all stages of their project documented using a collaboratus model. Students can publish this documentation by using Google apps or Office 365 cloud based applications.***  ***Duration : 2 school terms***  ***Timetable model: 6 lessons per 2 week cycle shared between 3 teachers HT TAS, Science and Mathematics*** | | |
| Outcome Mapping for iROBOT – Robotic Hydraulic Arm | | |
| Science | TAS | Mathematics |
| SC4-4WS Identifies questions and problems that can be tested or researched and makes predictions based on scientific knowledge  SC4-5WS Collaboratively and individually produces a plan to investigate questions and problems  SC4-6WS Follows a sequence of instructions to safely undertake a range of investigation types, collaboratively and individually  SC4-7WS Processes and analyses data from a first-hand investigation and secondary sources to identify trends, patterns and relationships, and draw conclusions  SC4-8WS Selects and uses appropriate strategies, understanding and skills to produce creative and plausible solutions to identified problems  SC4-9WS Presents science ideas, findings and information to a given audience using appropriate scientific language, text types and representations  SC4-10PW describes the action of unbalanced forces in  everyday situations  SC4-11PW discusses how scientific understanding and  technological developments have contributed  to finding solutions to problems involving  energy transfers and transformations  SC4-3VA demonstrates confidence in making reasoned, evidence-based decisions about the current and  future use and influence of science and technology, including ethical considerations | 4.1.1 applies design processes that respond to needs and opportunities in each design project  4.1.2 describes factors influencing design in the areas of study of Built Environments, Products, and Information and Communications  4.2.2 selects, analyses, presents and applies research and experimentation from a variety of sources  4.3.1 applies a broad range of contemporary and appropriate tools, materials and techniques with competence in the development of design projects (Electronics Technologies)  4.3.2 demonstrates responsible and safe use of a range of tools, materials and techniques in each design project  4.5.2 produces quality solutions that respond to identified needs and opportunities in each design project  4.6.1 applies appropriate evaluation techniques throughout each design project | MA4-1WM communicates & connects mathematical ideas using appropriate terminology, diagrams & symbols  MA4-2WM applies mathematical techniques to solve problems  MA4-3WM recognises and explains mathematical relationships using reasoning  MA4-7NA A student operates with ratios and rates, and explores their graphical representation  MA4-17MG A student classifies, describes and uses the properties of triangles and quadrilaterals, and determines congruent triangles to find unknown side lengths and angles  MA4-18MG A student identifies and uses angle relationships, including those related to transversals on sets of parallel lines  MA4-19SP Data Collection and Representation  Collects, represents and interprets single sets of data, using appropriate statistical displays.  MA4-21SP Probability Represents probabilities of simple and compound events |

**General Capabilities:** (See Teaching and Learning Program to identify links to General Capabilities)

Learning Across the curriculum used in this document are from the Board of Studies Teaching and Educational Standards (BOSTES) NSW <http://syllabus.bostes.nsw.edu.au/mathematics/mathematics-k10/learning-across-the-curriculum/>

The cross-curriculum priorities:

* Aboriginal and Torres Strait Islander histories and cultures Description: Aboriginal and Torres Strait Islander histories and cultures
* Asia and Australia's engagement with Asia Description: Asia and Australia's engagement with Asia  
* Sustainability Description: Sustainability

The general capabilities:

* Critical and creative thinking Description: Critical and creative thinking
* Ethical understanding Description: Ethical understanding
* Information and communication technology capability Description: Information and communication technology capability
* Intercultural understanding Description: Intercultural understanding
* Literacy Description: Literacy
* Numeracy Description: Numeracy
* Personal and social capability Description: Personal and social capability

Other learning across the curriculum areas:

* Work and enterprise Description: Work and enterprise

The outcomes used in this document are from the Board of Studies Teaching and Educational Standards (BOSTES) NSW. <http://www.boardofstudies.nsw.edu.au/syllabus_sc/>

| **Stage 4 Technology (Mandatory) - Area of Study: Built Environments - Design Specialisation: Structural Design**  **Technologies Specific Content: Mixed Materials Technologies** | | | |
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| **Outcome:** | **Students learn about:** | **Students learn to:** | **Teaching and learning strategies:** |
| 4.1.2 describes factors influencing design in the areas of study of Built Environments, Products, and Information and Communications | * Definitions of design   factors affecting design   * Function * scale * cost * physical and material properties | * examine factors affecting design in the areas of study of Built Environments * recall a definition of design * examine factors affecting design in the areas of study of Built Environments, Products, and Information and Communications * describe the factors affecting design in the development of each design project | * Students to complete Factors of evaluation of the design brief. What will a successful project look like? What does it need to include? What tasks will it perform in order to be successful? * Teacher leads students through "factors to influence design" the complete design section of the folio |
| 4.1.1 applies design processes that respond to needs and opportunities in each design project | design processes including:   * analysing needs, problems and opportunities * establishing criteria for success * researching * generating creative ideas * communicating ideas * experimenting and testing ideas * risk management * managing resources * producing design solutions * evaluating ideas and * solutions | * establish a design process that responds to an identified need and opportunity * apply a design process when developing quality solutions * establish criteria for successful achievement of needs and opportunities * record design processes and decision making in a design folio * consider short-term and long-term consequences of design in the design process * identify needs and opportunities that require solutions | * Teacher leads students through brain storming of the design process, * Students research appropriate materials for the design solutions |
| 4.2.2 selects, analyses, presents and applies research and experimentation from a variety of sources | * experimentation and testing of design ideas * relationship of * experimentation to success criteria * research methods * -needs analysis | * apply the results of experimentation to designing and making when developing each design project * identify, interpret and evaluate data from a variety of sources * use effective research methods to identify needs and opportunities and locate information relevant to the development of each design project | * Student to weigh and size 200mm plastic bottles of different shapes * Record the results and determine extremes of each * Students to search for existing designs of Hydraulic robotic arms. Sketch/ cut/copy into folio and complete a "PMI" to determine what they want included into their design * Students to complete prototype labelled sketches of 3 designs they want to make |
| 4.6.1 applies appropriate evaluation techniques throughout each design project | * developing criteria for success as a tool for assessing design development and production * ongoing evaluation of design ideas and decisions * final evaluation considering * design process used * design solutions * reflection on learning | * apply criteria for success in decision making during the development of each design project * use criteria for success to reflect on the design process used and the solutions * evaluate prior to, during and at completion of each design solution * self-assess and peer-assess design solutions | * Students shown examples of Criteria to Evaluate Success * Students complete Criteria to Evaluate Success for 3 factors of their design solution. * At the end of each section within the folio students evaluate each step and consider improvements   Within groups students to evaluate against Criteria to Evaluate Success |
| 4.3.1 applies a broad range of contemporary and appropriate tools, materials and techniques with competence in the development of design projects | * **Materials** characteristics and properties of a wide range of materials such as metals polymers textiles timber   the use of materials in traditional and non traditional ways  **Tools**   * specific tools related to materials appropriate to a design project the function and safe use of a range of contemporary tools used for measuring marking out cutting construction | * experiment with combinations of a wide range of materials considering their characteristics and properties * identify how materials have been used in innovative and non-traditional ways * select and use a wide range of materials for the identified needs and opportunities of a design project * explore ways that tools can be safely used to achieve new results * select and safely use tools and equipment for a design project | * Students research for their design solution appropriate materials, select and justify the usage of these. Materials to include polymers, timber, PVA glue * Students to select from different materials researched, and justify in the use within folios * Teacher demonstrates safe usage of tools and Students complete onguard safety |
|  | strategies  **Techniques**   * traditional and non traditional techniques used for cutting shaping a variety of materials joining different materials finishing |  |
| 4.3.2 demonstrates responsible and safe use of a range of tools, materials and techniques in each design project |  | * experiment with traditional and non-traditional technique * select and use traditional and non-traditional techniques for the identified needs and opportunities of a design project | Teacher demonstrates basic skills in timber constructed projects, students to mark and cut out "letter" of their name and mount on a base plate. Skills include marking, cutting, planning, |
| 4.5.2 produces quality solutions that respond to identified needs and opportunities in each design project | * skill development and refinement * relationship of quality solutions to needs and opportunities and the criteria for success | * practice and refine skills * apply a design process that responds to needs and opportunities * produce solutions reflecting quality standards appropriate to each design project |  |

| **Stage 4 Mathematics**  **Topics: Probability, Statistics, Measurement, Numbers, Angles** | | |
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| **Outcomes** | **Content** | **Teaching and Learning Strategies** |
| MA4-7NA A student operates with ratios and rates, and explores their graphical representation  MA4-1WM communicates & connects mathematical ideas using appropriate terminology, diagrams & symbols  MA4-2WM applies mathematical techniques to solve problems  MA4-3WM recognises and explains mathematical relationships using reasoning | Students solve a range of problems involving ratios and rates, with and without the use of digital technologies   * Interpret and calculate ratios that involve more than two numbers * Solve a variety of real- life problems involving ratios * Convert information into a simplified rate e.g. 150 kilometres travelled in 2hours = 75km/h * Solve a variety of real-life problems involving rates, including problems involving speed which is rate of travel | * Rates in the real world- explore reasons for 40km/h speed zones * Pirrozzo Activity for rates and ratios * Group structures * ICT- SWAY task with a “big” question (SOLE), Google Forms, Google Drawings and Document sharing * Big Question- Asia and Australia * Trade Ratios- countries Australia has traded with from 1950 to today * Speed/Distance/Time- car race |
| MA4-18MG A student identifies and uses angle relationships, including those related to transversals on sets of parallel lines  MA4-1WM communicates & connects mathematical ideas using appropriate terminology, diagrams & symbols  MA4-2WM applies mathematical techniques to solve problems  MA4-3WM recognises and explains mathematical relationships using reasoning | Use the language, notation and conventions of geometry   * Define and label angles using common conventions * Recognise the geometrical properties of angles at a point * complimentary, supplementary and adjacent angles * Identify, name and find straight angles, revolution, vertically opposite and angles embedded in diagrams | * Geometry in design- bridges, art, nature * ICT- office 365 Custom search, research button, class Onenote, office Lens * Angles and Robots * Cranes and Lifting capacity |
| MA4-17MG A student classifies, describes and uses the properties of triangles and quadrilaterals, and determines congruent triangles to find unknown side lengths and angles  MA4-1WM communicates & connects mathematical ideas using appropriate terminology, diagrams & symbols  MA4-2WM applies mathematical techniques to solve problems  MA4-3WM recognises and explains mathematical relationships using reasoning | * Investigate the properties of special quadrilaterals, distinguish between convex and non-convex * Identify line and rotational symmetry * Investigate and determine lines of symmetry and the order of rotational symmetry of polygons, including special quadrilaterals | * Barrier activity * ICT- Infographic, jigsaw, Venn diagrams, Google Sites * Group work * Building and design- Pythagoras |
| MA4-21SP represents probabilities of simple and compound events | * Construct [sample spaces](http://syllabus.bos.nsw.edu.au/glossary/mat/sample-space/?ajax" \t "_blank" \o "Click for more information about 'sample spaces') for single-step experiments with [equally likely outcomes](http://syllabus.bos.nsw.edu.au/glossary/mat/equally-likely-outcomes/?ajax" \t "_blank" \o "Click for more information about 'equally likely outcomes') * Assign [probabilities](http://syllabus.bos.nsw.edu.au/glossary/mat/probability/?ajax" \t "_blank" \o "Click for more information about 'probabilities') to the outcomes of [events](http://syllabus.bos.nsw.edu.au/glossary/mat/event/?ajax" \t "_blank" \o "Click for more information about 'events') and determine probabilities for events * explain the difference between experiments, events, outcomes and the sample space in chance situations (Communicating) L * assign a probability of 0 to events that are impossible and a probability of 1 to events that are certain to occur L * express the probability of an event | * Predicting outcomes through experiments * Watching some experiment designs- i.e., Myth Busters * 8 Way Maths- indigenous ideas * Domino Challenge |
| MA4-19SP collects, represents and interprets single sets of data, using appropriate statistical displays | * use spreadsheets or statistical software packages to tabulate and graph data ICT * discuss ethical issues that may arise from collecting and representing data (Reasoning) CCTEU * use a tally to organise data into a [frequency distribution](http://syllabus.bos.nsw.edu.au/glossary/mat/frequency-distribution/?ajax" \t "_blank" \o "Click for more information about 'frequency distribution') [table](http://syllabus.bos.nsw.edu.au/glossary/mat/frequency-table/?ajax" \t "_blank" \o "Click for more information about 'table') * identify and explain which graph types are suitable for the type of data being considered, eg sector graphs and divided bar graphs are suitable for categorical data, but not for numerical data (Communicating, Reasoning) CCT | * Tennis ball challenge * TES resource-Can I recycle it? (Relate to materials for iROBOT)-Sustainability and Indigenous aspects |

| **Stage 4 Science**  **Topics: Forces and Energy, Simple Machines, Working like a Scientist.** | | |
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| **Outcomes** | **Content** | **Teaching and Learning Strategies** |
| SC4-10PW describes the action of unbalanced forces in  everyday situations  SC4-11PW  Discusses how scientific understanding and technological developments have contributed to finding solutions to problems involving energy transfers and  SC4-5WS  Collaboratively and individually produces a plan to investigate questions and problems  SC4-6WS  Follows a sequence of instructions to safely undertake a range of investigation types, collaboratively and individually  SC4-7WS  Processes and analyses data from a first-hand investigation and secondary sources to identify trends, patterns and relationships, and draw conclusions  SC4-9WS  Presents science ideas, findings and information to a given audience using appropriate scientific language, text types and representations | PW3  a. identify objects that possess energy because of their motion (kinetic) or because of other properties (potential)  e. investigate some everyday energy transformations that cause change within systems, including motion, electricity, heat, sound and light.  PW4  b. research ways in which scientific knowledge and technological developments have led to finding a solution to a contemporary issue, eg improvements in devices to increase the efficiency of energy transfers or conversions  WS5.1  a. identifying the purpose of an investigation  b. proposing the type of information and data that needs to be collected in a range of investigation types, including first-hand and secondary sources NCCT  c. locating possible sources of data and information, including [secondary sources](http://syllabus.bostes.nsw.edu.au/glossary/sci/secondary-sources/?ajax" \t "_blank" \o "Click for more information about 'secondary sources'), relevant to the investigation CCTL  WS5.2  a. collaboratively and individually planning a range of investigation types, including [fieldwork](http://syllabus.bostes.nsw.edu.au/glossary/sci/fieldwork/?ajax" \t "_blank" \o "Click for more information about 'fieldwork'), experiments, [surveys](http://syllabus.bostes.nsw.edu.au/glossary/sci/survey/?ajax" \t "_blank" \o "Click for more information about 'surveys') and [research](http://syllabus.bostes.nsw.edu.au/glossary/sci/research/?ajax" \t "_blank" \o "Click for more information about 'research') (ACSIS125, ACSIS140)  b. outlining a logical procedure for undertaking a range of  investigations to collect [valid](http://syllabus.bostes.nsw.edu.au/glossary/sci/validity/?ajax" \t "_blank" \o "Click for more information about 'valid') first-hand data, including [fair tests](http://syllabus.bostes.nsw.edu.au/glossary/sci/fair-test/?ajax" \t "_blank" \o "Click for more information about 'fair tests')  c. identifying in fair tests, [variables](http://syllabus.bostes.nsw.edu.au/glossary/sci/variable/?ajax" \t "_blank" \o "Click for more information about 'variables') to be controlled (held constant), measured and changed  d. describing safety and ethical guidelines to be addressed EUPSC  WS5.3 a. b.  a. identifying suitable equipment or resources to perform the task, including safety equipment and digital technologiesICT  b. selecting equipment to collect data with [accuracy](http://syllabus.bostes.nsw.edu.au/glossary/sci/accuracy/?ajax" \t "_blank" \o "Click for more information about 'accuracy') appropriate to the task (ACSIS126, ACSIS141) ICT  WS6  b. assembling and using appropriate equipment and resources to perform the investigation, including safety equipment  c. selecting equipment to collect data with accuracy appropriate to the task (ACSIS126, ACSIS141) ICT  d. following the planned procedure, including in fair tests, measuring and controlling variables (ACSIS126, ACSIS141)EUPSC  e. recording observations and measurements accurately, using appropriate units for physical quantities L  WS7.1  summarising data from students' own investigations and secondary sources (ACSIS130, ACSIS145) NCCT  b. using a range of representations to organise data, including graphs, keys, models, diagrams, tables and spreadsheets N  c. extracting information from diagrams, flowcharts, tables, databases, other texts, multimedia resources and graphs including histograms and column, sector and line graphs NL  d. accessing information from a range of sources, including using digital technologies ICTL  e. applying simple numerical procedures, eg calculating means when processing data and information, as appropriateN  WS7.2  checking the reliability of gathered data and information by comparing with observations or information from other sources CCT  b. constructing and using a range of representations, including graphs, keys and [models](http://syllabus.bostes.nsw.edu.au/glossary/sci/model/?ajax" \t "_blank" \o "Click for more information about 'models') to represent and analyse patterns or relationships, including using digital technologies as appropriate (ACSIS129, ACSIS144) ICTNL  d. using scientific understanding to identify relationships and draw [conclusions](http://syllabus.bostes.nsw.edu.au/glossary/sci/conclusions/?ajax" \t "_blank" \o "Click for more information about 'conclusions') based on students' data or secondary sources (ACSIS130, ACSIS145)  e. proposing inferences based on presented information and observations CCT  WS9  a. presenting ideas, findings and solutions to problems using scientific language and representations using digital technologies as appropriate (ACSIS133, ACSIS148) LICT  d. constructing and using a range of representations to honestly, clearly and/or succinctly present data and information including diagrams, keys, models, tables, drawings, images, flowcharts, spreadsheets and databasesLICTEU  e. constructing and using the appropriate type of graph (histogram, column, sector or line graph) to express relationships clearly and succinctly, employing digital technologies as appropriate NICT | ***Big Question: What is energy?***  Students should engage in answering – what is energy? Identify that all objects contain energy as potential due to their properties, and can be divided into   * Kinetic (motion/movement)   Discuss applications of energy (possible extension into other types of potential energy including gravitational). In groups, students should formulate a response or definition of what energy is.  Identify and explain energy transfers and transformations in everyday activities and contexts such as: *(this activity can be performed as a demonstration or with work stations whereby students can inquire about each device and complete diagrams and present their findings in a collaborative way)*   * Toys (kinetic, spring operated & battery operated)   Compare effort in using appliances (such as dishwasher and calculator) with completing jobs manually.  Represent the flow of energy transfers and transformations using flowcharts/Sankey diagrams. Students should also apply energy transformations and create a flowchart to illustrate how coal is converted to electrical energy.  *Experiment: conduct an investigation to show that energy (such as heat) can be transferred from one point to another using metal rods. The experiment should be designed around student needs and understanding of energy transfer. Students should also engage with other transformations such as:*   * *elastic band and ball – transfer of elastic energy* * *syringes – large and small*     *The use of concepts maps and planning scaffolds provided to students.*  *Students can also a devise materials list and assembly instructions to demonstrate planning collaboratively using Google Apps.*  *Students are also to complete risk assessments prior to undertaking work.*  *For the design challenge students are given specific parameters to meet in terms of weight to be lifted, amount of materials to be used etc. Investigation and analysis of the strength of materials and structural integrity of construction design will need to be trialled and assessed using scientific methods.*  *Reports of the findings are to be made by students using appropriate scientific language, text types and representations.*  *Students conduct a series of experiments using pulleys, levers and wheels to investigate the concept of mechanical advantage and to identify features of simple machines such as force, effort, fulcrum and load.*  Identify a force as a push or pull  • recognise the ways people use pushes and pulls in everyday life, eg opening and closing a  door  • communicate what happens when a force is applied to an object, eg squeezing/stretching  • observe the change in motion that occurs when a force is applied to an object, eg a car  starting/stopping, a surfer changing direction or an elevator moving up and down.  • observe the way the force of gravity pulls objects towards the Earth  • investigate the effects of gravity as a downward-acting force on a variety of objects  *Students are to complete research on the use of sustainable materials for the design and build of their robotic arm to take into account humans use of resources such as timbers, plastics, fibres, chemicals etc and how ethical alternatives can be used.* Sustainability  *Students are to research traditional aboriginal technologies such as weapons and tools to identify the types of simple machines involved, how they gave mechanical advantage and the materials and purpose of the machine.*  http://syllabus.bostes.nsw.edu.au/wsimages/cca/ahc.gif  *Students can undertake research on foreign overseas aid projects Australia has been involved with in Asia such as providing disaster relief, access to to electricity, water and sewage using simple machines and alternative technologies.* Asia and Australia's engagement with Asia |

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| **ROLE** | **STUDENT NAME** | **WHAT DID YOU DO IN CLASS TODAY?** |
| **Lead Engineer** |  |  |
| **Scribe/Technology** |  |  |
| **Design Engineer** |  |  |
| **Time Manager** |  |  |

**SCOPE AND SEQUENCE**

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| **8 Blue** | **TERM 1** | | | | | | | | | | |
| **Week** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** |
| **Mathematics** | Introduction to Google apps / Office365 | Assigning group roles | Angles  Types | Angles and Robots | Folio templates uploaded | Design and materials drafts due | Measurement conversions and capacity | Cranes and lifting capacity | Folio development | Aboriginal cultural perspectives, sustainability and ethics |
| **Science** | Introduction to Google apps / Office365 | Mini Engineering Challenges  Straw tower etc. | Forces and Energy lessons | Simple Machines lessons | Folio templates uploaded | Design and materials drafts due | Scientific Method in testing design and materials | In class STEM Challenge   Build a Bridge | Folio development | Aboriginal cultural perspectives sustainability and ethics |
| **TAS** | Introduction to Google apps / Office365 | Robotic Arm Project | | | | | | | | Aboriginal cultural perspectives sustainability and ethics |

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| **8 Yellow** | **TERM 2** | | | | | | | | | | |
| **Week** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** |
| **Mathematics** | Building Design and Pythagoras | Rates and Ratios | Rates( Speed, Distance, Time)  Car Race | Probability | Probability Experiments- Predicting Outcomes | Tennis Ball Challenge  Gathering Data | Tennis Ball Challenge  Continued | Folio Catch Up | Folio +iRobot Completion | Showcase  Folio +iRobot Completion |
| **Science** | Hydraulic Experiment | Hydraulic Experiment | Hydraulic  Experiment | Simple Machines | Forces and Gravity |  | | | |
| **TAS** | Robotic Arm Project | Robotic Arm Project | | | | | | | |

**Assessment:**

Students will undergo formative and summative assessment during the course of the unit.

Assessment rubrics will be used to continually assess the students as they move through the various stages of the design and build process. Students will be assessed on their use of ICT, Evidence of critical and creative thinking, numeracy and literacy as well as the syllabus outcomes relevant to the unit.

The assessment will take the form of monitoring progress of the cloud based digital folios, check lists to document evidence of collaboration, critical thinking, creativity, ICT skills etc.

A culminating task involving a robot arm challenge where the student’s products are put through a series of challenges will be used as summative assessment as well as a summative assessment of the completed design folio.

The students will also be asked to self-evaluate throughout the project as well as completing peer reviews of the other group’s progress and product.

**MARKING RUBRIC**

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| **GRADE** | **AREA** | **CRITERIA** |
| **A** | **Science** | Explains questions and problems that can be tested or researched and makes accurate predictions based on scientific knowledge  Collaboratively and individually produces a plan to investigate questions and problems  Designs a sequence of instructions to safely undertake a range of investigation types, collaboratively and individually  Processes and analyses data from a first-hand investigation and secondary sources to identify trends, patterns and relationships, and draw conclusions  Selects and uses appropriate strategies, understanding and skills to produce creative and plausible solutions to identified problems  Presents science ideas, findings and information to a given audience using appropriate scientific language, text types and representations  Describes the action of unbalanced forces in everyday situations |
| **Technology** | Selects and justifies3 design ideas through sketching and short passages  Completes a robotic arm that picks up, turns 30 degrees and places a 200mm plastic bottle 20 mm higher than original position  Selects 3 design factors from the design solution, evaluates positive and negative factors |
| **Mathematics** | Communicates mathematically , problem solves and uses reasoning when justifying solutions to a problem.  Consistently applies Pythagoras’ theorem to calculate side lengths in right-angled triangles, and solves related problems.  Clearly identifies and uses angle relationships, including those related to transversals on sets of parallel lines. |
| **B** | **Science** | Identifies questions and problems that can be tested or researched and makes predictions based on scientific knowledge  Produces a plan to investigate questions and problems  Follows a sequence of instructions to safely undertake an investigation collaboratively and individually  Processes and analyses data from a first-hand investigation.  Selects and uses appropriate strategies, understanding and skills to produce creative and plausible solutions to identified problems  Presents science ideas, findings and information to a given audience using appropriate scientific language, text types and representations  Describes the action of unbalanced forces in everyday situations |
| **Technology** | Selects and justifies complex design ideas through sketching and short passages  Completes a robotic arm that picks up, turns 30 degrees and places a 200mm plastic bottle 20 mm higher than original position  Selects3 design factors from the design solution, evaluates positive and negative factors, including proposals for improvement |
| **Mathematics** | Communicates the strategies used and describes  a solution to solve a problem.  Generally applies Pythagoras’ theorem to calculate side lengths in right-angled triangles, and solves some word problems.  Identifies and uses angle relationships, including those related to transversals on sets of parallel lines. |
| **C** | **Science** | Makes predictions based on scientific knowledge  Follows a plan to investigate questions and problems  Follows a sequence of instructions to safely undertake an investigation collaboratively and individually  Can identify a trend in data.  Presents science ideas, findings and information to a given audience using some scientific terminology  Describes the action of unbalanced forces in everyday situations |
| **Technology** | Selects and justifies some design ideas through sketching and notations  Completes a robotic arm that picks up, turns 30 degrees and places a 200mm plastic bottle 20 mm higher than original position  Selects and evaluates3 design factors from the design solution |
| **Mathematics** | Communicates the strategies used and describes  a solution to solve a problem.  Uses Pythagoras’ theorem to calculate side lengths in right-angled triangles, and solves routine problems.  Identifies angle relationships, including those related to transversals on sets of parallel lines. |
| **D** | **Science** | Follows a sequence of instructions to safely undertake an investigation collaboratively and individually  Can record data in a table or a graph  Can produce a scientific report with support and guidance  Describes the action of unbalanced forces in everyday situations |
| **Technology** | Selects and or justifies some design ideas through sketching and notations  Completes some features of a robotic arm, that either picks up, turns 30 degrees, places a 200mm plastic bottle 20 mm higher than original position  Evaluates a design factor from the design solution |
| **Mathematics** | Communicates some information and shows the mathematics they are using to solve the problem.  Basic success in the application of Pythagoras’ theorem to calculate side lengths in right-angled triangles.  Identifies some angle relationships, including some of those related to transversals on sets of parallel lines. |
| **E** | **Science** | Follows a sequence of instructions  Can make observations  Describes the action of unbalanced forces in some situations |
| **Technology** | Selects and or justifies some design ideas through sketching  Completes some features of a robotic arm  Evaluates a design factor from the design solution |
| **Mathematics** | Communicates some information about the strategy used to solve the problem.  Limited success in the application of Pythagoras’ theorem to calculate side lengths in right-angled triangles.  Identifies some angle relationships such as straight angles, vertically opposite and a revolution. |