

## Illinois Learning Standards - High School

### **Mathematics: State Goal 6: Demonstrate and apply a knowledge and sense of numbers, including numeration and operation (addition, subtraction, multiplication, division), patterns, ratios and proportions.**

#### **A. Demonstrate knowledge and use of numbers and their representations in a broad range of theoretical and practical settings.**

- Converts hp into Watts using multiplication.
- Identifies trends using a table of tangent values.
- Extracts data from power generation tables and makes value comparisons.
- Selects heat resistivity (R) values of materials from a table.
- Assesses the properties of insulating materials for effectiveness and value for money.
- Calculates the value of power saved by an energy efficient house.
- Calculates the efficiency percentage of a wind powered generator.

#### **B. Investigate, represent and solve problems using number facts, operations (addition, subtraction, multiplication, division) and their properties, algorithms and relationships.**

- Assesses the properties of insulating materials for effectiveness and value for money.
- Specifies suitable communication links for a landscape within a given budget.
- Justifies choices of composite materials for a specified communication system within a fixed
- Calculates a number of print impressions using simple arithmetic.
- Applies the formula for calculating the gain of inverting operational amplifier.
- Determines how electronic circuits produce arithmetic functions.
- Identifies costs from a budget plan, and income and profit statement.
- Calculate costs and profit from a production budget.
- Calculates finance information from a budget plan.
- Creates a budget plan for a company working with Materials and Processes.
- Arithmetic: Performs basic computations.
- Mathematics: Performs basic computations and approaches problems by choosing from a variety of techniques.
- Resources: Know how to allocate time, money, materials, and staff associated with the manufacture of the components for the design brief.
- Solves math problems in Basic Electricity.
- Uses simple mathematic formulae to calculate area, wind speed and drag.
- Uses simple math formulae to calculate area, wind speed and drag.
- Applies mathematical formulae to the motion of rockets.
- Solves math problems for space systems.
- Interprets flowcharts to solve mathematical problems.
- Solves math problems in Computer Aided Publishing.
- Solves math problems for mechanical systems.
- Solves math problems for hydraulic systems.
- Solves math problems for electronic systems.
- Creates a digital filter using a mathematical matrix.

#### **C. Computer and estimate using mental mathematics, paper-and-pencil methods, calculators and computers.**

- States the units used to measure work, heat and power.
- Describes the methods by which energy transformation can be measured.

Accurately interprets information given for a drawing.  
Examines how to use object snaps as an aid to accuracy.  
Recognizes the features CAD provides to aid the accuracy of a drawing.  
Develops sophisticated control systems with accurate commands.  
Uses an accurate technical vocabulary.  
Calculates the accuracy of a drawing input device to a computer.  
Demonstrates accuracy in changing a graphic sign through written words.  
Accounts for the importance of accurate sensors in systems.  
Uses software to write a control program to cycle control rods with minimal errors and maximum accuracy.  
Uses a flowchart to design a control program to cycle control rods with minimal errors and maximum accuracy.  
Explains the process involved in creating a fully automatic control program to cycle control rods with minimal errors and maximum accuracy.  
Describes how Differential GPS provides accurate position fixes.  
Identifies temperature estimate from graph.  
Compares estimates for the shortest route with the fastest route between two places.  
Uses software to make estimates about routes that involve several legs.  
Estimates the rise in the cost of a journey caused by an increase in the price of fuel.  
Distinguishes between actual and estimated journey information.  
Rounds fuel cost estimates to the nearest whole number.  
Uses a route planning software to compare cost estimates of delivery routes.

**D. Solve problems using comparison of quantities, ratios, proportions and percents.**

Extracts data from power generation tables and makes value comparisons.  
Calculates the efficiency percentage of a wind powered generator.  
Plots a graph comparing inside and outside temperature.  
Interprets a graph showing the strength to carbon ratio of steel.  
Calculates the scaling factor as a percentage.  
Calculates the ratio to which an object has been scaled.  
Solves problems using geometry.  
Detects faulty resistors by comparing measured value with the color coded band.  
Calculates the percentage of resistors that fail in a given batch.  
Measures quantities in an electrical circuit using a multimeter.  
Calculates a stress level as a percentage.  
Calculates percentage weight losses from growth charts.  
Calculates the percentage composition of the contents of a sachet of Oral Rehydration Salts.  
Uses ratios to scale quantities of mass.  
Calculates percentage composition by weight.  
Calculates wing aspect ratios.  
Identifies and uses patterns of bits to interpret and produce binary codes.  
Investigates the financial aspects of various types of communication links.  
Calculates percentages of color.  
Uses gear ratios to predict changes in gear speed.  
Calculates gear ratios.  
Calculates ratios of compound gear trains.  
Applies gear ratio formula to observed results.  
Calculates compound gear train ratios.  
Calculates ratios in a belt drive system.

Applies the gear ratio formula to a timing pulley system.  
Solves problems involving gear ratios.  
Calculates density ratio of air to water.  
States how a multimeter is used to measure physical quantities in an electronic circuit.  
States how an oscilloscope is used to measure physical quantities in an electronic circuit.  
Calculates the weight of quantities of sample materials.  
Identifies the need for materials with a high strength to weight ratio.  
Calculates the strength to weight ratios for sample materials.  
Calculates the strength to weight ratio of a material using division, and correcting the value to 3 decimal places.  
Calculates finance information from a budget plan.  
Calculates the size of a demographic group from a given percentage.  
Compares the power to weight ratio of various modern motor vehicles.  
Uses an engine testing simulation to investigate the relationship between air/fuel ratio and the exhaust emissions of an engine.  
Calculates engine data using engine dimensions and air/fuel ratios.

**Mathematics: State Goal 7: Estimate, make and use measurements of objects, quantities and relationships and determine acceptable levels of accuracy.**

**A. Measure and compare quantities using appropriate units, instruments and methods.**

States the units used to measure work, heat and power.  
Calculates work done using the formula work = force x distance.  
Uses the formula Power = Work/Time to solve problems.  
Calculates the power output of a wind generator using the formula  $W = A \times V$ .  
Describes the methods by which energy transformation can be measured.  
Determines actual size from measured using a scale.  
Calculates the multimeter range setting required to measure the voltage across batteries in series.  
Determines the value of resistors by reading color coded bands and by measurement.  
Detects faulty resistors by comparing measured value with the color coded band.  
Describes the units of measure relating to velocity.  
Uses the maglev system to measure impact.  
Uses the formula for speed to calculate distance and time.  
Uses formula to evaluate realistic unit prices.  
Describes the action of adding a formula to a spreadsheet and calculating calorific values.  
Identifies how drag is measured.  
Identifies how to measure forces using the Aerostream Monitor.  
Uses simple mathematic formulae to calculate area, wind speed and drag.  
Uses a clinometer to measure altitude.  
Uses formula to calculate the height of model rockets.  
Uses velocity formula with data on moving rockets.  
Applies mathematical formulae to the motion of rockets.  
Examines the impact of measurement errors on predictions about rocket flights.  
Calculates distances of images and objects using lens formula.  
Uses photographic data to measure height.  
Uses formulae to calculate height and velocity of model rockets.  
Uses a formula to calculate the speed of orbiting satellites.  
Uses a formula to calculate the orbital period of satellites.  
Performs calculations using orbital mechanics formula.

- Interprets measurements used in Computer Aided Publishing.
- Interprets formula and symbols used by a high level control language to perform calculations.
- Interprets formula and symbols used by a high level control language to perform sort operations.
- Interprets formula and symbols used by a high level control language to perform swap routines.
- Applies gear ratio formula to observed results.
- Applies the gear ratio formula to a timing pulley system.
- Interprets the formula for calculating Mechanical Advantage.
- Uses formula to calculate rotational speed of a pulley wheel.
- Recognizes pressure as a measurement of force in fluids.
- Investigates the measurement of pressure.
- Uses the formula  $F = P \times A$ .
- Applies formulae to calculate the resistance of resistors in series and in parallel.
- Applies formulae to calculate the capacitance of capacitors in series and in parallel.
- Uses the formula for calculating the time constant of a capacitor and resistor combination.
- Applies the formula for calculating the gain of inverting operational amplifier.
- Uses formula to calculate electrical power.
- States how a multimeter is used to measure physical quantities in an electronic circuit.
- States how an oscilloscope is used to measure physical quantities in an electronic circuit.
- Uses a multimeter to measure voltage and resistance.
- Recognizes torque and power as measures of engine performance.
- Calculates engine data using engine measurements.
- B. Estimate measurements and determine acceptable levels of accuracy.**
- Calculates work done using the formula work = force x distance.
- Measures the velocity of a model rocket.
- Calculates average velocity and fuel consumed for a model rocket from given data.
- Interprets information to relate mass of water and applied force.
- Recognizes that forces cause structures to deform.
- Investigates the effect of dynamic forces on structures.
- Identifies how buildings can be designed to resist dynamic forces.
- Describes the units of measure relating to velocity.
- Determines the difference between average and actual velocity.
- Recognizes different types of force.
- Investigates how force, mass and acceleration are related.
- Describes the link between forces and motion and their relationship to energy.
- Identifies how to measure forces using the Aerostream Monitor.
- Identifies how down force is produced by various objects.
- Determines down force and drag forces on a sports car model.
- Identifies greatest lift force produced for various wing designs.
- Describes how lift force is dependent on wing span and chord length.
- Calculates lift coefficient and lift force.
- Investigates the effect of turbulent air flow on down force production.
- Measures turning forces produced by propellers.
- Interprets graph of turning force produced by various propellers.
- Calculates the lift force produced by one rotor blade.
- Compares the force of wind against buildings at different angles.
- Identifies drag forces created by models of structures.
- Calculates forces acting on structures.

Measures aerodynamic forces on a ballistic object.  
States the effect of down force.  
Indicates how lift force is produced, and used by aircraft.  
Uses velocity formula with data on moving rockets.  
Calculates average velocity of model rockets from given data.  
Demonstrates forces acting on model rockets.  
Examines the forces acting on rockets in flight.  
Performs a test to demonstrate forces acting on a projectile.  
States the force produced by pressurized gases that powers rockets.  
Uses potential energy to determine the velocity of rockets on landing.  
Examines the concept of escape velocity.  
Identifies the difference between speed and velocity.  
Uses formulae to calculate height and velocity of model rockets.  
Identifies the forces that are important in space technology.  
Estimates the angle of a slope of a communication system from an elevation diagram.  
Calculates magnitude of amplification of a sound wave.  
Calculates moments of forces for lever systems.  
Recognizes pressure as a measurement of force in fluids.  
Solves force, pressure & area problems.  
Defines pressure as force per unit of area.  
Calculates fluid velocity.

**C. Select and use appropriate technology, instruments and formulas to solve problems, interpret results and communicate findings.**

Calculates the height of objects using tangents.  
Predicts shadow length at a particular time of day, using a table of values.  
Identifies the height of a cloud from a comparative diagram.  
Uses offset distances to calculate the radius of a circle.  
Calculates distances on the plot of a mechanical component.  
Uses the formula for speed to calculate distance and time.  
Calculates differences in distance traveled and speed, for points on propeller blades.  
Uses software to predict the height of a model rocket.  
Calculates height using angles and trigonometry.  
Obtains tangent values for angles used to calculate height.  
Uses formula to calculate the height of model rockets.  
Rearranges the equation for calculating the height of a model rocket.  
Calculates the average height reached by a launched item after several launches.  
Calculates distances of images and objects using lens formula.  
Uses photographic data to measure height.  
Uses formulae to calculate height and velocity of model rockets.  
Calculates and compares journey times using speed and distance variables.  
Uses Pythagoras' theorem to calculate the length of cable required to connect two buildings on a  
Uses Pythagoras' theorem to calculate the distances in communication systems.  
Creates a proportional graphical image.  
Converts rpm into distance and speed achieved by a vehicle.  
Uses an orienteering compass to design and follow a route plan that involves bearings and  
Obtains the real distance between two places by using the scale of a map.  
Converts a given distance on a 1:62,500 scale map into a real distance.

Finds the bearing and distance of each leg of a journey from a map.  
Adds distances to find the total distance of a journey on a map  
Uses the scale of a map of a classroom to find real distances.  
Uses a map of a classroom to plot routes given by bearings and distances.  
Uses bearings and distance to navigate a submarine in a software simulation.  
Applies Pythagoras' Theorem to find distances of routes.  
Uses Pythagoras' Theorem to find the length of the hypotenuse on a right-angle triangle.  
Obtains bearings and distances from plans to plan single-legged routes for a submarine.  
Obtains bearings and distances from plans to plan two-legged routes for a submarine.  
Explains how a route plan was created using bearings and distances.  
Describes how distances and bearings were found while planning a route.  
Uses scales to find real distances and distances on maps.  
Adds distances together to find the total length of a journey.  
Evaluates light intensity at various distances and angles from a light source.

**Mathematics: State Goal 8: Use algebraic and analytical methods to identify and describe patterns and relationships in data, solve problems and predict results.**

**A. Describe numerical relationships using variables and patterns.**

Converts fractions into decimals.  
Converts decimal numbers to hexadecimal numbers.  
Uses a table of values to convert from decimal to binary coded decimal.  
Converts numbers from decimal to binary.  
Converts decimal and binary numbers to ASCII.  
Converts ASCII to decimal numbers.  
Uses the 'Divide by Two' method to convert decimal numbers into binary.  
Converts binary code into decimal and decimal to binary.  
Solves an algebraic equation.  
Calculates the answers to algebraic equations.  
Calculates the strength to weight ratio of a material using division, and correcting the value to 3 decimal places.  
Identifies symbols used in flow diagrams.  
Calculates and compares journey times using speed and distance variables.  
Identifies and uses patterns of bits to interpret and produce binary codes.  
Identifies flowchart symbols.  
Interprets flowcharts to solve mathematical problems.  
Identifies meanings of variable declarations.  
Recognizes appropriate symbols and conventions by interpreting a flowchart.  
Interprets formula and symbols used by a high level control language to perform calculations.  
Uses software to write a control program to sort two variables.  
Interprets formula and symbols used by a high level control language to perform swap routines.  
Recognizes symbols used in flow charts and logic diagrams.  
Uses route planning software to predict variables for a road journey.  
Predicts the effects of changing input variables when using route planning software.  
Creates a digital filter using a mathematical matrix.  
Interprets tire codes and tire tread wear patterns.

**B. Interpret and describe numerical relationships using tables, graphs and symbols.**

Calculates the power output of a solar cell using the equation  $W = A \times V$ .

Defines the Bernoulli equation.  
Solves static and dynamic pressure problems using the Bernoulli equation.  
Calculates height using angles and trigonometry.  
Examines the relationship between the center of gravity and stability.  
Rearranges the equation for calculating the height of a model rocket.  
States relationships between the values amplitude, frequency, range, wavelength and bandwidth.  
Solves an algebraic equation.  
Calculates the answers to algebraic equations.  
Compares Gauge and Absolute pressures.  
Identifies how boolean algebra can be used to solve control problems using combinations of logic  
Applies trigonometry to find bearings of routes.  
Uses an engine testing simulation to investigate the relationship between air/fuel ratio and the exhaust emissions of an engine.  
Mathematics: Applies mathematic techniques to practical problems to identify quadrants.

**C. Solve problems using systems of numbers and their properties.**

Interprets data from a graph relating to energy costs.  
Plots a graph of Sun angle against time of day.  
Determines radiation emission levels from a half-life decay graph.  
Plots data on the growth rates of children in the form of a graph.  
Reads length of time taken by a model rocket to complete a phase of its launch from a graph.  
Calculates height using angles and trigonometry.  
Plots a graph showing how payload mass affects rocket apogee.  
Reads values from a graph of payload mass against rocket apogee.  
Identifies an axis on a graph used for measuring gravitational acceleration.  
Compares scalar and vector systems of measuring.  
Uses vectors to determine the flight path of model rockets.  
Solves an algebraic equation.  
Calculates the answers to algebraic equations.  
Identifies how boolean algebra can be used to solve control problems using combinations of logic  
Evaluate key points of a cost against production graph.  
Applies trigonometry to find bearings of routes.  
Creates a digital filter using a mathematical matrix.

**D. Use algebraic concepts and procedures to represent and solve problems.**

Calculates the power output of a solar cell using the equation  $W = A \times V$ .  
Uses a weather database to calculate total rainfall.  
Uses the radius of a circle to calculate a diameter.  
Uses offset distances to calculate the radius of a circle.  
Uses the formula for speed to calculate distance and time.  
Uses a spreadsheet to calculate unit prices of cosmetics.  
Enters data into a spreadsheet and calculates calorific total values.  
Describes the action of adding a formula to a spreadsheet and calculating calorific values.  
Records cardiac activity in order to calculate stroke volume using a software model.  
Defines the Bernoulli equation.  
Solves static and dynamic pressure problems using the Bernoulli equation.  
Obtains tangent values for angles used to calculate height.  
Uses formula to calculate the height of model rockets.  
Rearranges the equation for calculating the height of a model rocket.

Uses formulae to calculate height and velocity of model rockets.  
Uses a formula to calculate the speed of orbiting satellites.  
Uses a formula to calculate the orbital period of satellites.  
Performs calculations using orbital mechanics formula.  
Uses Pythagoras' theorem to calculate the length of cable required to connect two buildings on a  
Uses the Windows calculator to solve communication system problems.  
Uses Pythagoras' theorem to calculate the distances in communication systems.  
Solves an algebraic equation.  
Uses software to write a control program to calculate and output to the screen user friendly  
Uses software to write a control program to wait for three numbers to be input by the user and perform a simple calculation.  
Interprets formula and symbols used by a high level control language to perform calculations.  
Calculates the answers to algebraic equations.  
Uses software to write a control program to simulate a simple interactive calculator.  
Interprets the formula for calculating Mechanical Advantage.  
Uses results to calculate the work done pulling loads up inclined planes.  
Uses formula to calculate rotational speed of a pulley wheel.  
Uses the International System of units to calculate volume.  
Applies formulae to calculate the capacitance of capacitors in series and in parallel.  
Uses formula to calculate electrical power.  
Identifies how boolean algebra can be used to solve control problems using combinations of logic  
Explains how profit is calculated for a delivery route plan.  
Uses a trip computer system to calculate speed and fuel economy for a journey.  
Performs efficiency calculations for an electric motor used as a model car powerplant.  
Mathematics: Applies mathematic techniques to practical problems to identify quadrants.

**Mathematics: State Goal 9: Use geometric methods to analyze, categorize and draw conclusions about points, lines, planes and space.**

**A. Demonstrate and apply geometric concepts involving points, lines and space.**

Uses basic geometrical shapes to create a drawing.  
Determines how to add a wide variety of dimensions.  
Measures actual dimensions on a component and converts this information into a 2D working  
Solves problems using geometry.  
Determines how humans perceive 3-dimensional objects.  
Creates 3-dimensional text using perception techniques.  
Mathematics: Understands different dimensioning systems in 2-D.  
Mathematics: Understands different dimensioning systems in 3-D.

**B. Identify, describe, classify and compare relationships using points, lines, planes and solids.**

Uses basic geometrical shapes to create a drawing.  
Measures actual dimensions on a component and converts this information into a 2D working  
Solves problems using geometry.  
Recognizes how to add dimensions to a drawing.  
Calculates the size of a real bridge from a scale model.  
Recognizes the internal dimensions of an engine cylinder.  
Identifies the dimensions of tires and wheels by reading tire codes.  
Mathematics: Understands different dimensioning systems in 2-D.  
Mathematics: Understands different dimensioning systems in 3-D.

**C. Construct convincing arguments and proofs to solve problems.**

- Uses basic geometrical shapes to create a drawing.
- Determines how to use coordinate systems in CAD.
- Solves problems using geometry.
- Selects information from text relating to technological systems.
- States the impacts of existing solutions to technological problems.
- Uses simple mathematic formulae to calculate area, wind speed and drag.
- Applies mathematical formulae to the motion of rockets.
- Compares scalar and vector systems of measuring.
- Uses vectors to determine the flight path of model rockets.
- Interprets flowcharts to solve mathematical problems.
- Identifies the technological advances in industrial control.
- Creates a digital filter using a mathematical matrix.
- Mathematics: Performs basic computations and understands mathematic terminology.
- Mathematics: Performs basic computations by choosing the appropriate mathematic technique.
- Mathematics: Applies mathematic techniques to practical problems to identify quadrants.
- Mathematics: Performs basic computations using a variety of mathematical techniques.
- Mathematics: Performs basic computations and approaches practical problems by choosing from a variety of mathematical techniques.

**D. Use trigonometric rations and circular functions to solve problems.**

- Uses the radius of a circle to calculate a diameter.
- Uses offset distances to calculate the radius of a circle.
- Calculates height using angles and trigonometry.
- Obtains tangent values for angles used to calculate height.
- Identifies and uses patterns of bits to interpret and produce binary codes.
- Identifies the amplitude of a sound wave at given locations.
- Identifies the location within a sound wave when a particular amplitude occurs.
- Calculates magnitude of amplification of a sound wave.
- Obtains information from a graph of a sound wave.
- Locates amplitude and time readings from a sound wave graph.
- Applies trigonometry to find bearings of routes.
- Uses tangents to find an unknown angle in a right-angle triangle.
- Uses Pythagoras' Theorem to find the length of the hypotenuse on a right-angle triangle.

**Mathematics: State Goal 10: Collect, organize and analyze data using statistical methods; predict results; and interpret uncertainty using concepts of probability.****A. Organize, describe and make predictions from existing data.**

- Interprets data from a graph relating to energy costs.
- Extracts data from tables of the origin of pollutant gases.
- Constructs a bar chart to compare data relating to pollutant gases.
- Identifies trends using a table of tangent values.
- Plots a graph of Sun angle against time of day.
- Predicts shadow length at a particular time of day, using a table of values.
- Extracts data from power generation tables and makes value comparisons.
- Determines radiation emission levels from a half-life decay graph.
- Selects the most effective insulating material from a table of data.
- Interprets information on heat insulating materials presented graphically.

Plots a graph of temperature against time to compare single and double glazing.  
Selects the most powerful wind powered generator from a table.  
Plots graphs of weather data.  
Plots a graph comparing inside and outside temperature.  
Identifies temperature estimate from graph.  
Interprets a graph showing the strength to carbon ratio of steel.  
Plots a graph to chart the progress of a construction project.  
Interprets information from a table in a CAD manual.  
Calculates the multimeter range setting required to measure the voltage across batteries in series.  
Determines lamp properties from a table.  
Identifies the conductor of highest conductivity from a table.  
States the purpose of the symbols used in flow charts.  
Extracts information from a graph showing pulse rate over a period of time.  
Uses a word processor to produce information tables.  
Uses data from a spreadsheet to create a chart of results.  
Uses ICT to communicate information and statistics.  
Interprets information from a graph.  
Calculates percentage weight losses from growth charts.

**B. Formulate questions, design data collection methods, gather and analyze data and communicate findings.**

Uses ICT to communicate information and statistics.  
Extracts data from a graph of Polio statistics drawn by the student.  
Interprets data from a table of sports injury statistics.  
Uses a book to see how early explorers surveyed the North American interior.  
Identifies methods used to survey the North American interior.  
Examines methods used by to explorers to survey the Pacific Ocean.  
Creates a map using supplied GPS survey data.

**C. Determine, describe and apply the probabilities of events.**

Identifies lightning distribution for a sample region.  
Extracts information from a precipitation distribution map of the map U.S.  
Uses a thunder storm distribution diagram.  
Navigates around a database to make predictions about model rocket flights.  
Compares predictions made about model rocket launches with results obtained from real launches.  
Calculates the error of rocket flight predictions from given data.  
Examines the impact of measurement errors on predictions about rocket flights.  
Uses altitude readings to make predictions about aerial photography.  
Makes predictions about systems that combine different rotary power transmission systems.  
Uses the formula for calculating the time constant of a capacitor and resistor combination.  
Identifies how boolean algebra can be used to solve control problems using combinations of logic

**Science: State Goal 11: Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.**

**A. Know and apply the concepts, principles and processes of scientific inquiry.**

Makes informed decisions based on both given and researched information.  
Demonstrates knowledge of early wind powered generators, gained from research in a book.  
Makes a presentation to a group on Alternative Energy.  
Makes a presentation to a group on Weather Monitoring.

Makes a presentation to a group on Construction Technology.  
Makes a presentation to a group on Computer Aided Design.  
Makes a presentation to a group on Basic Electricity.  
States the purpose of research and the meaning of 'human factors engineering'.  
Designs and tests a computer program to simulate a transport system operating in continuous  
States the criteria to be reported on when evaluating a design project.  
Writes a report on the tests carried out, and an evaluation of, design work.  
Applies tests and improvement procedures to check the quality of systems.  
Shows basic technical ability in the field of Research and Design technology.  
Makes a presentation to a group on Research & Design.  
Uses a database to research a given topic.  
Uses ICT to communicate information and statistics.  
Makes a presentation to a group on Health Management.  
Extracts data from a graph of Polio statistics drawn by the student.  
Follows written instructions to enable completion of a surgical procedure.  
Interprets data from a table of sports injury statistics.  
Makes a presentation to a group on Biomedical Technology.  
Explains the technical content of a report on an industry that uses aerodynamics.  
Makes a presentation to a group on Aerodynamics Technology.  
Devises an experiment to test an aerodynamic principle.  
Identifies procedures needed to carry out a model rocket launch safely.  
Identifies procedures used when launching a model rocket safely.  
Calculates acceleration caused by gravity from experimental results.

**B. Know and apply the concepts, principles and processes of technological design.**

Designs a beam according to specific criteria.  
Identifies circuit components from schematic symbols.  
Selects information from text relating to technological systems.  
States the impacts of existing solutions to technological problems.  
Writes a control program from a flowchart.  
Interprets information given in a flowchart relating to a transportation control system.  
Identifies the action of a computer controlled mechanical system, from information given in a  
States the tests required to assess the effectiveness of the solution in terms of the design brief and the specifications.  
States the criteria to be reported on when evaluating a design project.  
Uses techniques to reduce the effect of errors.  
Uses flowcharts to design a control program.  
Recognizes syntax and runtime errors in control programs.  
Fixes syntax and runtime errors in control programs.  
Applies tests and improvement procedures to check the quality of systems.  
Defines the advantages of good health and fitness.  
Selects appropriate solutions for emergencies, from data held in a database.  
States the improvements which could be made to a diet.  
Analyzes test results to diagnose diabetes.  
Designs a surgical mask according to specific criteria.  
Follows specific criteria for the design of a mask.  
Describes advantages and disadvantages of various wind tunnel designs.  
Interprets data produced by an instrument panel.

Derives design criteria from a design brief.  
Identifies the advantages and disadvantages of using a spoiler.  
Constructs a prototype powered model aircraft.  
Distinguishes advantages and disadvantages of drag.  
States alternative problems that have solutions related to aerodynamics.  
Calculates the error of rocket flight predictions from given data.  
Examines the impact of measurement errors on predictions about rocket flights.  
Identifies advantages and disadvantages of Fax technology.  
Investigates cellular phone connections using a computer simulation.  
Identifies advantages and disadvantages of using cellular phones.  
Investigates television scanning using a computer simulation.  
Relates parts of a Radar system to graphics in a computer simulation.  
Investigates the cause and effect of signal errors on an electronic communication link.  
Uses a computer and electronic simulation to investigate binary signals used by modems.  
Uses the search tools of a World Wide Web simulation to research information about planets.  
Uses an Email simulation to read messages.  
Uses an Electronic Mail simulation to send messages.  
Uses a File Transfer Protocol simulation to analyze the process of down loading software from the  
Uses a Web Page Editor simulation to create a Web Page relating to digital signals.  
Investigates the various tools available to a news group on the Internet using a computer  
Demonstrates a page on Binary code created using a Web Page Editor simulation.  
Describes and demonstrates how to use a Web Browser simulation as an electronic book with hot  
Recognizes some social, economic and environmental advantages and disadvantages of electronic  
communication systems.  
States some advantages and disadvantages of speech recognition.  
Identifies flowchart symbols.  
Interprets flowcharts to solve mathematical problems.  
Uses clipart symbols to produce a flowchart.  
Uses graphics tools to produce a flowchart.  
Interprets a flowchart to identify even numbers.  
Converts a flowchart that compares key press values into a computer program.  
Translates a flowchart into a computer program.  
Recognizes and applies the white box testing strategy to find and remove syntax errors.  
Recognizes and applies the white box testing strategy to find and remove run-time errors.  
Recognizes and applies the black box testing strategy.  
Designs and tests a flowchart for a prototype security system.  
Programs and tests a prototype security system.  
Designs a flowchart for a smoke detection system.  
Designs a flowchart for a heating control system.  
Describes the function of a security flowchart.  
Produces a flowchart for an automatic door system.  
Uses ICT based models and simulations to help make decisions.  
Uses and derives specifications, flowcharts and truth tables as part of a systematic design process.  
Uses and derives specifications, flowcharts and truth tables as part of a systematic design process.  
Lists the advantages of modern publishing.  
Lists the advantages of different types of hardware used in Computer Aided Publishing.  
Recognizes appropriate symbols and conventions by interpreting a flowchart.  
Recognizes appropriate symbols and conventions by identifying a flowchart operation box.

Recognizes appropriate symbols and conventions by identifying the type of flowchart box an 'If' statement is represented by.

Uses a flowchart to design a program to move the robot and run the conveyor a specified number

States the advantages of using programmable digital controllers in automated systems.

Identifies the advantages of closed over open loop control.

Identifies the advantages and disadvantages of using robots.

Uses a flowchart to design a control program to fully automate a workcell.

Uses a flowchart to design a control program to input three numbers and output them biggest first.

Uses software to write a control program to cycle control rods with minimal errors and maximum

Uses a flowchart to design a control program to cycle control rods with minimal errors and maximum accuracy.

Explains the process involved in creating a fully automatic control program to cycle control rods with minimal errors and maximum accuracy.

Uses a flowchart to design a control program to add, subtract or multiply two numbers.

Uses a flowchart to design a control program which is completely interactive.

Uses flowcharts to design control programs.

Calculates Mechanical Advantage for pulley systems.

Interprets the formula for calculating Mechanical Advantage.

Calculates mechanical advantages for moving pulley systems.

Compares the theoretical mechanical advantage with observed mechanical advantage of pulley

Rounds the value of mechanical advantage for a pulley system.

Recognizes the advantages and disadvantages of power systems compared to pneumatic systems.

Identifies the advantages of using electronics with pneumatics.

Communicates a hydraulic system solution using a circuit diagram.

Identifies errors in the logic for a sample control program.

Identifies the technological advances in industrial control.

Outlines the origin of animation.

Recognizes control functions in a PC based animation package.

Determines the function of an animation control button.

Distinguishes between traditional animation techniques.

Outlines the process of creating a feature length animation.

States the function of key elements in animation.

Estimates the effect of reducing path length upon an animation.

Outlines the steps used in adding text to an animation.

Clarifies which elements in the cockatoo animation are to be changed.

Calculates the run-time for animation using loops.

Identifies the animation sequence in the Sales presentation.

Selects the elements of a news reader animation.

Establishes animation switch status.

Creates an animation from information given in a storyboard.

Completes a partially finished animation of a news reader announcing a shuttle launch.

States the advantage of a computer based animation package compared with traditional methods.

Describes how a cloud animation can be made to appear fluid.

Identifies sound effects and their use in enhancing a space shuttle launch animation.

Evaluates animation techniques used to create the illusion of distance.

Creates a sky background for use in a space shuttle animation.

Completes an animation of a shuttle matching velocities with a satellite.

Identifies how movement characteristics can be used to enhance realism in animation.

Identifies the differences between fluid and linear animation.  
Simplifies the steps to achieving 'fluid' animation.  
Applies problem solving techniques to develop an animation character.  
Investigates a design problem and solution for a commercial animation movie.  
Defines a stage in the problem and solution cycle for an animation task.  
Creates a range of solutions to publicize the release of fictional car.  
Explains the process involved in creating the solutions for car promotional material.  
Corrects errors in video counter based editing.  
Identifies the usage of text, graphics, animation, audio, and video within a multimedia  
Measures the Izod Impact Strength of acrylic using a software simulation program.  
Evaluates and redesigns a product to fulfill a design criteria.  
Uses bearings to navigate a submarine in a software simulation.  
Uses bearings and distance to navigate a submarine in a software simulation.  
Investigates the impact that errors in GPS readings can have.  
Examines instruments used to navigate at sea before the use of GPS.  
Describes the use of navigation instruments in the past.  
Evaluates the operation of bus services on a GPS bus tracking system simulation.

**Science: State Goal 12: Understand the fundamental concepts, principles and interconnections of life, physical and earth/space sciences.**

**A. Know and apply concepts that explain how living things function, adapt and change.**

Defines the nutritional values of food.  
Interprets nutritional information from a diagram  
States the importance of diet for a healthy life.  
Investigates the impact of orthotics and prosthetics on quality of life.  
Uses computer software to examine the physiology of the urinary system.  
Measures temperature, pulse and respiration rates.  
Explains the process of genetic finger printing.  
Interprets the results of genetic finger prints.  
Identifies parts of the human anatomy that allow us to speak.  
States how human anatomy is used in sound recognition.  
Identifies that Life Cycle Analysis aids recycling by saving materials and energy.

**B. Know and apply concepts that describe how living things interact with each other and with their environment.**

Identifies the effect of population size on the cost effectiveness of forms of energy.  
Investigates the physical and emotional causes of stress.  
Assesses physical condition using the Harvard Fitness Index.  
Compares population data for countries using GIS software.  
Compares the population size of countries using data in a table.

**C. Know and apply concepts that describe properties of matter and energy and the interactions between them.**

Identifies the operating parameters of a fossil fuel powered generating station.  
Identifies the operating parameters of a nuclear powered generating station.  
Calculates the potential energy and kinetic energy of a model rocket.  
Calculates average velocity and fuel consumed for a model rocket from given data.  
Interprets information to relate mass of water and applied force.  
Describes the processes involved in nuclear fission.

Identifies the risks and problems of dealing with the waste products of nuclear power stations.  
States the acceptable radiation limits of low level nuclear waste.  
Describes the function of the major parts of a nuclear power plant.  
Describes the operation of a nuclear power plant.  
Describes the methods by which energy transformation can be measured.  
States the principles behind nuclear power.  
States the principles behind solar power.  
States the principles behind wind power.  
States how water power is obtained.  
Compares energy, work and power.  
States some of the problems pollution causes.  
Identifies why energy conservation is important.  
Identifies how alternative energy can be used in building designs.  
Recognizes the properties of X-Rays as electromagnetic waves.  
Calculates kinetic energy of rockets.  
Converts mass from grams to kilograms.  
Identifies wavelength, frequency, and amplitude properties of electromagnetic waves.  
Quantifies wavelength, frequency, and amplitude properties of electromagnetic waves.  
Investigates the wavelength of a microwave.

**D. Know and apply concepts that describe force and motion and the principles that explain them.**

Identifies the operating parameters of a nuclear powered generating station.  
Describes the processes involved in nuclear fission.  
Identifies the risks and problems of dealing with the waste products of nuclear power stations.  
States the acceptable radiation limits of low level nuclear waste.  
Describes the function of the major parts of a nuclear power plant.  
Describes the operation of a nuclear power plant.  
States the principles behind nuclear power.  
Describes the operation of an electromagnetic relay.  
Constructs an electromagnetic relay circuit.  
States the electromagnetic induction principle for generating electricity.  
Identifies magnetic and electromagnetic principles.  
Recognizes the factors influencing the acceleration of a vehicle.  
Investigates how force, mass and acceleration are related.  
Recognizes the properties of X-Rays as electromagnetic waves.  
Examines acceleration caused by gravity.  
Calculates acceleration caused by gravity from experimental results.  
Identifies an axis on a graph used for measuring gravitational acceleration.  
Defines acceleration caused by gravity.  
Identifies wavelength, frequency, and amplitude properties of electromagnetic waves.  
Quantifies wavelength, frequency, and amplitude properties of electromagnetic waves.  
Uses Kilo, Mega and Giga prefixes when describing properties of electromagnetic waves.  
Identifies the relationship between the frequency and bandwidth properties of electromagnetic  
Uses software to write a control program to automatically load a simulated nuclear reactor with  
Identifies the compression of gases, liquids and solids using the molecular structure model.  
Applies formulae to calculate the capacitance of capacitors in series and in parallel.  
Identifies the diagram for the molecular structure of a wooden material.  
Identifies the molecular structure of various materials.

Identifies the molecular structure of various materials.  
Recognizes how a motor vehicle is controlled using the accelerator, transmission and brake.  
Recognizes an accelerometer as a sensor for detecting acceleration and deceleration.

**E. Know and apply concepts that describe the features and processes of the Earth and its resources.**

Identifies the energy sources in use today.  
Identifies the operating parameters of a fossil fuel powered generating station.  
Interprets data from text relating to energy sources.  
Calculates the potential energy and kinetic energy of a model rocket.  
Describes the principles of a solar cell.  
Measures current output of solar cell.  
Calculates the power output of a solar cell using the equation  $W = A \times V$ .  
Identifies locations where it would be suitable to use renewable energy sources.  
Identifies components of a solar collector.  
Identifies the properties of a solar collector.  
Calculates the savings made by a solar collector.  
States the principles behind solar power.  
Identifies why some alternative energy sources are more suitable than others.  
States the principles behind wind power.  
States how water power is obtained.  
Plots a graph comparing inside and outside temperature.  
Extracts temperature information from a graph of weather data.  
Describes seasonal changes in global temperature.  
Describes the potential for disaster created by floods.  
Interprets a contour map and issues a warning to sites at risk from flooding.  
Determines the effects of extreme temperature on the human body.  
Describes characteristics of the Earth's climate.  
Classifies areas of the Earth into climate types.  
Describes some issues affecting the Earth's climate.  
Identifies temperature estimate from graph.  
States the definition of energy and the type of energy sources used in transportation systems.  
Calculates the energy production of a solar cell.

**F. Know and apply concepts that explain the composition and structure of the universe and Earth's place in it.**

Calculates how long it takes light to travel the circumference of the Earth.  
Describes characteristics of the Earth's climate.  
Classifies areas of the Earth into climate types.  
Describes some issues affecting the Earth's climate.  
Recognizes different needs when returning space vehicles to earth.  
Compares images of the earth taken from different distances.  
Investigates the maximum range of a line of sight communication system due to the curvature of

**Science: State Goal 13: Understand the relationships among science, technology and society in historical and contemporary contexts.**

**A. Know and apply the accepted practices of science.**

Identifies the risks and problems of dealing with the waste products of nuclear power stations.  
Interprets a contour map and issues a warning to sites at risk from flooding.  
Examines how to use object snaps as an aid to accuracy.

Recognizes the features CAD provides to aid the accuracy of a drawing.  
Selects information from text relating to technological systems.  
States the impacts of existing solutions to technological problems.  
States the relationship between science and technology.  
Develops sophisticated control systems with accurate commands.  
Uses techniques to reduce the effect of errors.  
Recognizes syntax and runtime errors in control programs.  
Fixes syntax and runtime errors in control programs.  
Uses an accurate technical vocabulary.  
Uses an accurate technical vocabulary.  
Uses an accurate technical vocabulary.  
Uses an accurate technical vocabulary.  
Investigates the risks to health from drinking alcohol.  
Investigates the risks to health from smoking tobacco.  
Investigates the risks to health from misusing drugs.  
Investigates the risks to health and well being.  
Devises an experiment to test an aerodynamic principle.  
Calculates the error of rocket flight predictions from given data.  
Examines the impact of measurement errors on predictions about rocket flights.  
Calculates acceleration caused by gravity from experimental results.  
States the scientific principles of importance to space technology.  
Performs an experiment to investigate the reflection of microwaves on different materials.  
Investigates the cause and effect of signal errors on an electronic communication link.  
Recognizes and applies the white box testing strategy to find and remove syntax errors.  
Recognizes and applies the white box testing strategy to find and remove run-time errors.  
Calculates the accuracy of a drawing input device to a computer.  
Demonstrates accuracy in changing a graphic sign through written words.  
Accounts for the importance of accurate sensors in systems.  
Uses software to write a control program to cycle control rods with minimal errors and maximum accuracy.  
Uses a flowchart to design a control program to cycle control rods with minimal errors and maximum accuracy.  
Explains the process involved in creating a fully automatic control program to cycle control rods with minimal errors and maximum accuracy.  
Identifies errors in the logic for a sample control program.  
Identifies the technological advances in industrial control.  
Corrects errors in video counter based editing.  
Investigates the impact that errors in GPS readings can have.  
Describes how Differential GPS provides accurate position fixes.  
Uses efficient learning techniques to acquire and apply new knowledge and skills.  
Develop CNC programs using knowledge acquired throughout the module.

**B. Know and apply concepts that describe the interaction between science, technology and society.**

Makes informed decisions based on both given and researched information.  
Calculates and compares the amount of work done and energy requirements of a team of workers.  
Identifies the effect of population size on the cost effectiveness of forms of energy.  
Compares energy, work and power.  
Compares the strength of different shaped columns.  
Compares bearing wall and frame construction.

Compares series and parallel circuits.  
Selects information from text relating to technological systems.  
States the impacts of existing solutions to technological problems.  
Applies tests and improvement procedures to check the quality of systems.  
States the improvements which could be made to a diet.  
Compares the mechanisms of two asthma drug delivery systems.  
Compares heart rate data to identify the effect of exercise.  
Compares the force of wind against buildings at different angles.  
Compares predictions made about model rocket launches with results obtained from real launches.  
Compares scalar and vector systems of measuring.  
Compares images of the earth taken from different distances.  
Makes informed decisions based on information in a flow diagram.  
States the scientific principles of importance to space technology.  
Compares methods of travel using information in a table.  
Calculates and compares journey times using speed and distance variables.  
Identifies a strategy for creating an audio presentation.  
Uses ICT based models and simulations to help make decisions.  
Compares modern publishing techniques with traditional publishing techniques.  
Compares a selection of printers used for Computer Aided Publishing.  
Compares different types of scanners used in Computer Aided Publishing.  
Compares rotary power transmission systems.  
Compares the theoretical mechanical advantage with observed mechanical advantage of pulley  
Compares the input power with the output power of a motorized winch system.  
Compares the efficiency of different winch systems.  
Compares alternative power transmission systems.  
Recognizes the advantages and disadvantages of power systems compared to pneumatic systems.  
Compares energy forms.  
Compares performance of air with water as brake fluids.  
Identifies the technological advances in industrial control.  
States the advantage of a computer based animation package compared with traditional methods.  
Compares different types of pulse generators.  
Constructs and compares truth tables for AND and NOT gates.  
Compares land area data for countries using GIS software.  
Compares population data for countries using GIS software.  
Uses GIS software to compare and contrast demographic data.  
Compares the population size of countries using data in a table.  
Compares estimates for the shortest route with the fastest route between two places.  
Uses software to compare road journeys between cities.  
Uses a route planning software to compare cost estimates of delivery routes.  
Compares the operation of conventional and digital cameras.  
Compares the power to weight ratio of various modern motor vehicles.  
Compares the performance of an engine using variable valve timing with that of a standard engine.  
Compares the relationship between power and engine displacement for a range of engines.  
Compares the fuel economy of a vehicle at a range of engine loads.  
Thinking: Ability to learn, reason, think creatively, make decisions, and to solve problems.  
Thinking Skills: Decision making.