

| Unit Plan – Number (Chapters 1, 2 and 3) | | Section | Page |
|---|--|----------------|-------------|
| Main Ideas | <ul style="list-style-type: none"> • Number skills are necessary in all branches of Mathematics • To complete everyday tasks it is necessary to master basic number skills. More complex skills allow us to complete more complicated tasks. | | |
| Unit Questions | How can we use number skills to complete everyday tasks and make what look like complicated tasks easier to solve? | | |
| Knowledge & Skills | Students should be able to: | | |
| | Recognise and use correct order of operations | 1:01A | 2 |
| | Work with and convert between fractions, decimals, percentages and ratios | 1:01B – F | 2 |
| | Round numbers to a given number of significant figures | 1:01G | 5 |
| | Approximate numbers and estimate answers | 1:01H – I | 6 |
| | Find the unknown amount in a proportion statement and solve proportional problems | 2:01 – 2:02 | 18 |
| | Work with inverse proportion and solve associated problems | 2:03 | 24 |
| | Solve problems involving different forms of income | 3:01 | 30 |
| | Calculate extra payments and income | 3:02 | 34 |
| | Calculate deductions from income | 3:03 | 38 |
| | Calculate taxable income and the tax payable on an income | 3:04 | 42 |
| | Set up and work with a budget | 3:05 | 45 |
| | Work through problems involving spending money – best buys, lists and change | 3:06 | 47 |
| | Work through problems involving sales tax | 3:07 | 51 |
| | Solve problems on different ways of paying for items | 3:08 | 54 |
| | Solve problems on profit and income | 3:09 | 59 |

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| Assessment Tasks | <ul style="list-style-type: none"> End of unit assessment task (eg: Diagnostic Tests) <p>Investigations: A proportional flip Jobs in the papers Shopper docketts Let's plan a disco</p> | <p>2:02 3:02 3:07 3:09</p> | <p>22 37 53 62</p> |
| Project Idea | <p>Money, money money:</p> <ul style="list-style-type: none"> Have students use the local newspaper or Internet classifieds to find a job for which they would be qualified after year 12. Have them work out a weekly budget based on the net wage – the taxation scale on page 41 could be used to calculate the tax payable. Now they could search advertisements for a car they wish to buy. They need to calculate how many weeks it would take them to save a 10% deposit and calculate the monthly repayments on the balance for a given interest rate – this could be done on a spreadsheet applying the compound interest formula giving options for the length of the loan. There will need to be a maximum time period (say 5 years) for the length of the loan. Students now need to work out a new budget including car items (insurance, registration, fuel, tyres etc). | | |
| Areas of Interaction | <p>Approaches to learning: Thinking mathematically by analysing problems and applying techniques solving the problems.</p> <p>Community Local jobs advertised How the government earns revenue for local spending</p> | <p>Ex 1:01E Ex 1:01F Working Mathematically 1 Ex 2:02 Ex 2:03 Fun spot 3:04 Fun Spot 3:08</p> <p>Investigation 3:02 3:04 Taxation 3:07 Sales tax</p> | <p>4 5 16 21 25 44 58</p> <p>37 42 51</p> |

| Unit Plan – Algebra (Chapters 4, 5, 6, 7, 8, 9 and 10) | | Section | Page |
|---|---|--|--|
| Main Ideas | <ul style="list-style-type: none"> • Translate sentences into symbols • Number laws can be written in general terms. • Most problems can be written algebraically. • Algebraic expressions and problems can be represented diagrammatically | | |
| Unit Questions | <p>How can problems be represented using symbols and in diagrams? How do the algebraic expressions and diagrams help us solve problems?</p> | | |
| Knowledge & Skills | <p>Students should be able to:</p> <p>Translate sentences into algebraic expressions</p> <p>Substitute into an algebraic expression</p> <p>Simplify algebraic expressions</p> <p>Work with algebraic fractions</p> <p>Simplify expressions with grouping symbols</p> <p>Understand and work with binomial products including special binomial products</p> <p>Revise, understand and apply the basic index laws</p> <p>Understand the meaning of a negative index and solve associated problems</p> <p>Work with, apply and understand fractional indices</p> <p>Use and interpret standard (scientific) notation (form)</p> <ul style="list-style-type: none"> – Scientific notation and the calculator – The real number system | <p>4:01</p> <p>4:02</p> <p>4:03</p> <p>4:04</p> <p>4:05</p> <p>4:06 – 4:07</p> <p>5:01</p> <p>5:02</p> <p>5:03</p> <p>5:04</p> <p>5:05</p> <p>5:06</p> | <p>69</p> <p>73</p> <p>74</p> <p>76</p> <p>80</p> <p>83</p> <p>97</p> <p>101</p> <p>103</p> <p>108</p> <p>112</p> <p>115</p> |

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|---|-------------|-----|
| Surds | 5:07 | 119 |
| – Addition and subtraction of surds | 5:08 | 121 |
| – Multiplication and division of surds | 5:09 | 123 |
| – Binomial products | 5:10 | 126 |
| – Rationalising the denominator | 5:11 | 128 |
| Recognise equivalent equations | 6:01 | 137 |
| Solve equations with grouping symbols | 6:02 | 140 |
| Solve equations involving fractions | 6:03 – 6:04 | 143 |
| Apply equations to the solution of problems | 6:05 | 148 |
| Understand the need for and the application of inequations | 6:06 | 153 |
| – Changing the subject of a formula | 6:07 | 158 |
| Solve an equation after substituting into a formula | 6:08 | 160 |
| Solve problems written literally | 6:09 – 6:10 | 162 |
| Solve problems using formulae | 6:11 | 167 |
| Factorise algebraic expressions including: common factors, grouping in pairs, difference of two squares/cubes, quadratic trinomials | 7:01 – 7:06 | 176 |
| Simplify algebraic fractions | 7:07 – 7:08 | 190 |
| Calculate the distance between two points on the coordinate axes | 8:01 | 201 |
| Calculate the midpoint of an interval on the coordinate axes | 8:02 | 206 |

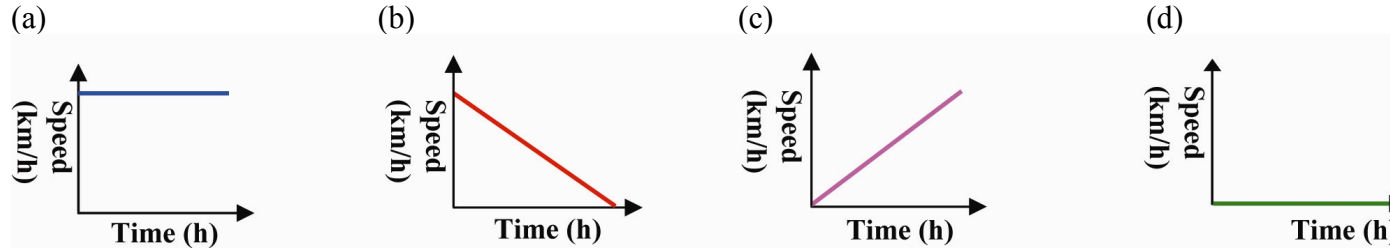
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| | Solutions to inequations | 6:06 | 153 |
| | Gradients in building | 8:03 | 221 |
| | What does $y = mx + c$ tell us? | 8:05 | 220 |
| | Solving problems by 'guess and check' | 9:01A | 245 |
| | Solving simultaneous equations using a GDC | 9:01B | 250 |
| | Graphing coins | 10:01 | 267 |
| | Spreadsheet graphs | 10:02 | 284 |

Project Idea

Speed vs Time

This project is designed to extend the work done on distance/time graphs and for them to begin to interpret what the slope of the curve represents and also what the area under a curve represents.

The graphs below show speed (km/h) against time for moving objects



Answer these questions using the colour of the graph:

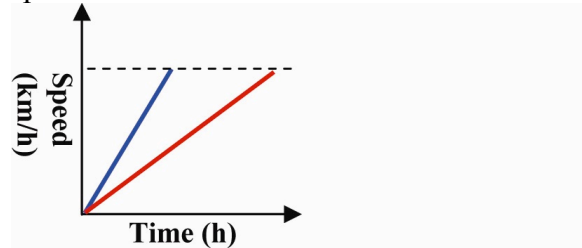
Which of the graphs shows a stationary object?

Which of the graphs shows an object travelling at constant speed?

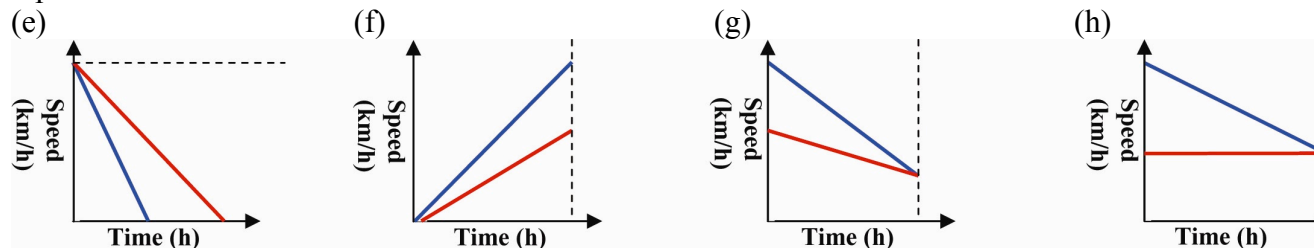
Which of the graphs shows an object that is accelerating?

Which of the graphs shows an object that is decelerating?

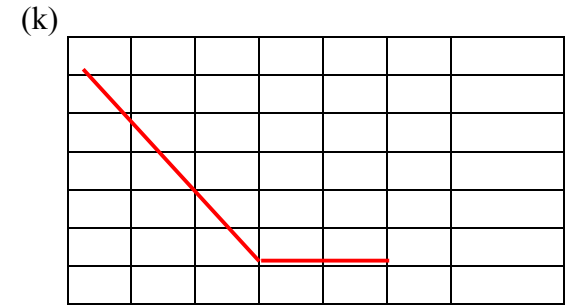
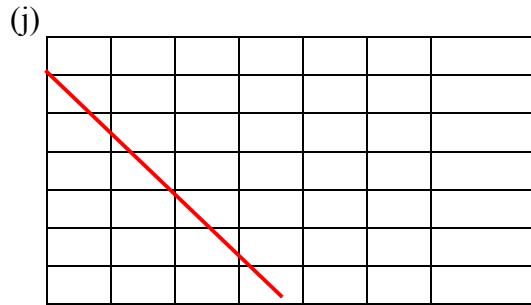
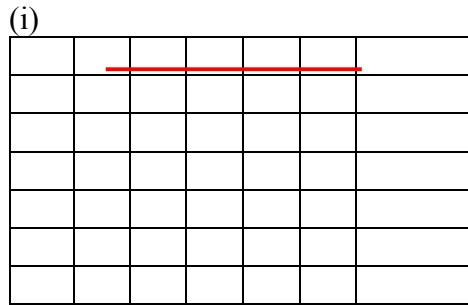
The graph below shows the speed of two objects. They both reach the same maximum speed but the red one takes longer to reach that speed.



Interpret the difference between the blue and red graphs in each of the following. What does the slope/gradient of the graph represent?



Describe what is happening to the object in the graphs below. In your answer describe the speed of the object, any changes in speed and the time it has been travelling at that speed.



Consider the graph in (i). By taking into account the speed of the object and the time it was travelling at that speed, calculate how far the object travelled. How can this distance be calculated *geometrically* from the graph?

How could this geometric method be used to calculate the distance travelled in graphs (j) and (k)?

For the teacher: this could now be extended to non-linear speed/time graphs and students could estimate the instantaneous speed and distance travelled by drawing tangents and counting square units.

This could be an interdisciplinary project with Science (Physics)

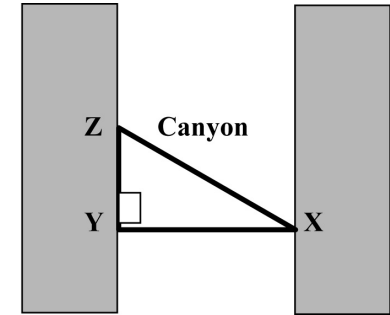
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|----------------------|-------------------------|--|---|---|
| Areas of Interaction | Approaches to learning: | Thinking analytically and logically to apply problem solving skills. | Working Mathematically 4 Working Mathematically 5 Working Mathematically 6 Investigation 6:02 Working Mathematically 7 Working Mathematically 8 Working Mathematically 9 Working Mathematically 10 | 95 135 174 142 199 243 272 291 |
| | Environments: | Investigating how builders, engineers and architects use gradient in building and measure the slope of land. | Investigation 8:03 | 221 |

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|--|----------------------------|--|--------------------------|-----|
| | Human Ingenuity: | The development of algebra as a tool and into a branch of Mathematics in its own right | Investigation 4:02 | 74 |
| | | Writing very large and very small numbers | Investigation 4:08 | 90 |
| | | Finding square roots by iteration | Investigation 5:05 | 114 |
| | | The combination of algebra and geometry | Investigation 5:09 | 125 |
| | | Alternative method for factorizing a trinomial | Challenge 7:03 | 181 |
| | | The application of an algebraic expression to a linear relationship | Challenge 7:05 | 187 |
| | | Solving simultaneous equations by trial and error | Investigation 8:05 | 220 |
| | Health & Social Education: | Examining the contents of food given on the packet | Investigation 9:01A | 245 |
| | | | Reading mathematics 9:03 | 259 |

| Unit Plan – Geometry (Chapters 11, 12, 13 and 14) | | Section | Page |
|--|---|----------------|-------------|
| Main Ideas | <ul style="list-style-type: none"> Properties of shapes and the relationships between shapes can help us solve problems. We have to consider shapes in 3 dimensions and calculate the geometric properties of such shapes to solve real life problems | | |
| Unit Questions | <p>How can logic be used to deduce facts about the shapes in our world that are either man made or that occur naturally?</p> <p>How can we quantify the different characteristics of solid shapes?</p> | | |
| Knowledge & Skills | Students should be able to: Use deductive reasoning in numerical exercises | 11:01 | 294 |
| | Solve polygons | 11:02 | 300 |
| | Use deductive reasoning in non-numerical exercises | 11:03 | 306 |
| | Solve congruent triangles | 11:04 | 309 |
| | Prove two triangles congruent | 11:05 | 313 |
| | Use congruent triangles to find unknown sides and angles | 11:06 | 317 |
| | Use deductive geometry and triangles | 11:07 | 319 |
| | Use deductive geometry and quadrilaterals | 11:08 | 323 |
| | Use pythagoras' Theorem and its converse. | 11:09 | 329 |
| | Solve area, perimeter and surface area. | 12:01 – 12:02 | 338 |
| | Solve volumes of prisms and cylinders | 12:03 | 357 |
| Solve volumes of composite solids | 12:04 | 360 | |

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| | Use practical applications of measurement | 12:05 | 366 |
| | Label sides of right triangles and the trigonometric ratios | 13:01 – 13:03 | 377 |
| | Use the calculator with trigonometry | 13:04 | 387 |
| | Find unknown sides and angles using trigonometry | 13:05 – 13:06 | 391 |
| | Apply trigonometry to practical problems | 13:07 – 13:08 | 400 |
| | Understand an introduction to vectors | 14:01 | 414 |
| | Understand column vectors and vector operations | 14:02 | 416 |
| | Understand magnitude of a vector | 14:03 | 423 |
| | Solve problems using vectors | 14:04 | 425 |
| Assessment Tasks | <ul style="list-style-type: none"> • End of unit assessment task (eg: Diagnostic Tests) | | |
| | Investigations: Regular polygons and tessellations | 11:02A | 302 |
| | Spreadsheet | 11:02B | 304 |
| | Theorems and their converses | 11:08 | 328 |
| | Proving Pythagoras' Theorem | 11:09 | 329 |
| | Skirting board and perimeter | 12:01A | 340 |
| | Conversions | 12:01B | 346 |
| | Covering floors | 12:01C | 350 |
| | Tank sizes | 12:03 | 359 |
| | Perimeter area and volume | 12:04 | 364 |
| | Wallpapering rooms | 12:05 | 368 |
| | Operating on vectors | 14:02 | 416 |

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| Project Idea | <p>Measuring without measuring The object of this project is to illustrate the application of both similarity and trigonometry in real life circumstances.</p> <p>A theoretical canyon can be set up on a school field, or the tops of two school buildings can serve as the sides of a canyon.</p> <p>Students construct an imaginary right angled triangle using a point on the opposite of the canyon (X) as a point of reference and ensure that angle Y is a right angle. By measuring YZ and angle Z, students can make a scale drawing and evaluate the length XY.</p> <p>By using YZ and the angle Z students can also evaluate YZ using trigonometry and compare their answers.</p> <p>This can be applied to the distance across a river or a busy road.</p> | | |
| Areas of Interaction | <p>Approaches to learning: Thinking analytically and logically to apply problem solving skills Thinking deductively in geometry</p> <p>Environment: Investigating regular polygons and how they can be put together to form tessellations that either occur naturally (eg: beehive) or are man made (eg: Islamic art). Applying area and perimeter formulae to practical situations</p> <p>Homo Faber: Proving Pythagoras' Theorem Converting Units of area Evaluating exact ratios Developing the formula for the magnitude of a vector</p> | <p>Working Mathematically 11 11:03 Working Mathematically 12 Working Mathematically 13</p> <p>Investigation 11:02A</p> <p>Challenge 12:01 Investigation 12:01A Investigation 12:01C Investigation 12:03 Investigation 12:05</p> <p>Investigation 11:09 Investigation 12:01B Investigation 12:04 Practical Activity 13:04 Practical Activity 14:02</p> | <p>336 306 375 412</p> <p>303</p> <p>339 340 350 359 368</p> <p>329 346 364 390 416</p> |



| Unit Plan – Statistics & Probability (Chapters 15 & 16) | | Section | Page |
|--|--|---|-------------------|
| Main Ideas | <ul style="list-style-type: none"> We can use more than the middle of a set of data to make comparisons The spread of a set of data can be measured in many ways successive events can change probabilities of events | | |
| Unit Questions | <p>How can we affectively compare sets of data using their middle and spread?</p> <p>How can we establish the probability of successive events?</p> | | |
| Knowledge & Skills | Students should be able to: Find the inter-quartile range of a set of data | 15:02 | 439 |
| | Display the median, range and inter-quartile range of a set of data in a box and whisker plot | 15:03 | 445 |
| | Find the standard deviation of a set of data. | 15:04 | 449 |
| | Use measures of the centre and measures of spread to compare sets of data. | 15:05 | 455 |
| | Organise outcomes of compound events | 16:02 | 476 |
| | Solve dependant and independent events | 16:03 | 479 |
| | Use probability using tree and dot diagrams | 16:04 | 484 |
| | Use probability using tables and Venn diagrams | 16:05 | 489 |
| Assessment Tasks | <ul style="list-style-type: none"> End of unit assessment task (eg: Diagnostic Tests) Investigations: Chance experiments <ul style="list-style-type: none"> Will it be a boy or a girl? Two stage probability experiments | Investigation 16:01 Investigation 16:03 Investigation 16:06 | 474 483 504 |

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| Project Idea | <p>What is average anyway? Students can research the following on the Internet: The average body mass index for their age. The average mass and height for their age. The average resting heart beat and respiratory rate for their age.</p> <p>These averages can be found for a range of countries or for different times throughout the 20th century.</p> <p>Students should then calculate their own statistics for each of these and work out the averages for their year group (ie: the median and the mean)</p> <p>Students should then compare the averages found and calculated and try to establish reasons for any differences. (eg: cultural, environmental or historical) This could be written up as a report which includes graphs and all their calculations.</p> <p><i>A possible interdisciplinary project with Science and Humanities</i></p> | | | |
| Areas of Interaction | Approaches to learning: | Approaching a question or problem from an experimental perspective. | Working Mathematically 15 Working Mathematically 16 | 465 511 |
| | Environment: | Organising data into diagrams See 'Project Idea' above | 15:03 16:04 | 445 484 |
| | Homo Faber: | Instruments used to compare sets of data | Ex 15:05 | 457 |
| | Community: | See 'Project Idea' above | | |

| Unit Plan – Discrete Mathematics (Chapter 17) | | Section | Page |
|--|---|---------------------|-------------|
| Main Ideas | <ul style="list-style-type: none"> Statements need to be put together in a particular way to make sense logically. | | |
| Unit Questions | <p>How should statements be put together to make sense logically? What makes two different propositions logically equivalent?</p> | | |
| Knowledge & Skills | Students should be able to: Understand and use the ideas behind propositions | 17:01 | 514 |
| | Combine statements to make compound propositions | 17:02 | 515 |
| | Translate between word and logic statements | 17:03, 17:04 | 516 |
| | Use truth tables to evaluate when compound statements are true and to establish the logical equivalence of statements | 17:03, 17:04, 17:05 | 516 |
| | Work with and build conditional statements. | 17:06 | 526 |
| Assessment Tasks | <ul style="list-style-type: none"> End of unit assessment task (eg: Diagnostic Tests) Investigations: The whole truth and nothing butt the truth | Investigation 17:04 | 521 |
| Project Idea | <p>A logic gateway There are web sites that provide virtual circuits where logic gates are used to simulate truth statements.</p> <p>An example can be found at http://www.ee.surrey.ac.uk/Projects/Labview/gatesfunc/index.html</p> <p>Students can work in pairs at researching and working through examples/questions at some of these sites.</p> <p><i>A possible interdisciplinary project with Science.</i></p> | | |

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| Areas of Interaction | <p>Approaches to learning: Thinking about the logic of statements.</p> <p>Homo Faber: Using a table to represent the truth of statements and to establish the truth of compound statements and logical equivalence.</p> | <p>17:01</p> <p>17:03, 17:04, 17:05</p> | <p>514</p> <p>516</p> |
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