 AM4CEC Modelling with functions

MG1H-3 – makes predictions about everyday situations based on simple mathematical models

MG1H-9 – chooses and uses appropriate technology to organise information from a range of practical and everyday contexts

MG1H-10 – uses mathematical argument and reasoning to evaluate conclusions drawn from other sources, communicating a position clearly to others.

[Mathematics General Stage 6 Syllabus](https://www.boardofstudies.nsw.edu.au/syllabus_hsc/pdf_doc/maths-general-syl-2013-and-beyond.pdf) © NSW Education Standards Authority (NESA) for and on behalf of the Crown in right of the State of New South Wales, 2012.

| Content | Teaching Strategies | Resources |
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| Generate tables of values for linear functions (including for negative values of *x*) | Linear Modelling Electronic Worksheet  This electronic, self-marking, worksheet (requires Excel) allows students to investigate and model 4 scenarios with immediate feedback. | triangle Linear Modelling  File: linear-modelling.xlsx downloaded from the [MathsLinks page on Linear Modelling](https://mathslinks.net/faculty/linear-modelling/) |
| Graph linear functions for all values of x with pencil and paper, and with graphing software |  | See triangle |
| Interpret the point of intersection and other important features of given graphs of two linear functions drawn from practical contexts, eg break-even point |  | See triangle |
| Generate tables of values for quadratic functions of the form y=ax^2 and y=ax^2+c (including negative values of *a* and *x*) | Quadratic Discovery  Through practical tasks, students find the shape of relationships. In this activity, students determine the relationship between the side-length of a cube and its surface area. | Quadratics Warm-Up – activity 3 (page 8)  File: Unit 3 Quadratics Part I LessonsDone.doc. Note – this booklet has some additional activities that would suit this course, but also goes beyond the content of this course.  sourced from the [Ontario Association for Mathematics Education website](http://www.oame.on.ca/main/staging9.php?code=OMCA_MBF3C)  The resource includes a table and suitable graph paper.  Requires centicubes. |
|  | Parabolas Electronic Worksheet  This electronic, self-marking, worksheet (requires Excel) allows students to investigate different forms of quadratic functions and their graphs. | filled square inside a square Parabolas  File: parabolas.xlsx [downloaded from the MathsLinks page on Investigating Quadratic Functions – Parabolas](https://mathslinks.net/faculty/investigating-quadratic-functions-parabolas/) |
|  | Graphing parabolas  Complete a table of values and plot points to graph quadratic functions. | half filled square The Parabola  File: ws\_the-parabola.doc |
|  | Quadratic Functions Cloze  A summary sheet, completed as a cloze activity, of the difference elements of the quadratic function. | filled diamond inside a diamond Quadratic Functions Cloze  File: Quadratic Functions cloze.docx  (and answers: Quadratic Functions ans.docx) |
| Graph quadratic functions with pencil and paper, and with graphing software |  | See filled square inside a square half filled square filled diamond inside a diamond |
| Explain the effect of changing the magnitude of *a* and changing the sign of *a* |  | See filled square inside a square half filled square filled diamond inside a diamond |
| Explain the effect of changing the value of *c* |  | See filled square inside a square half filled square filled diamond inside a diamond |
| Identify the maximum and minimum values of a quadratic function from a prepared graph based on a practical context | Rectangular wading pool  In this resource, “you have been given 20 sections of chain-link fence” (model this with toothpicks) to surround a wading pool. You are to determine the largest rectangular pool area possible. | Quadratics Warm-Up: Activity 2 (pages 6-7)  File: Unit 3 Quadratics Part I LessonsDone.doc  sourced from the [Ontario Association for Mathematics Education website](http://www.oame.on.ca/main/staging9.php?code=OMCA_MBF3C)  The resource includes a table and suitable graph paper. |
| * recognise the limitations of models when interpolating and/or extrapolating * use linear and quadratic functions to model physical phenomena. | Penny Circle  This is an online interactive activity for a class. The activity is explained for teachers on the site. The teacher should log in (create an account for free). Students then sign-in with a class code. This allows the activity to collect data from your class.  With the unit of measurement in this activity is inches, students are not required to calculate.  The activity does mention “exponential” so the teacher may want to review the three presented models (linear, quadratic and briefly introduce exponential). | Desmos classroom activity  [‘Penny Circle’ activity from the Desmos website](https://teacher.desmos.com/activitybuilder/custom/586ab17c2f8cd5bc3bcaf259)  Also [available via the MathsLinks website](http://mths.co/3402) |
|  | Car Racing  Does this distance travelled by this toy car model a linear relationship? | Blog post: [MathsLinks page on Car Racing](https://mathsclass.net/comments/car-racing/)  Files available in the folder called ‘car racing’.  Video, worksheet. |
|  | Toothpicks Three-Act Task  How many levels will he build?  From a container of toothpicks, how many levels of the pattern will he make? | Toothpicks – links to [resources on Dan Meyer’s ‘toothpicks’ website](http://threeacts.mrmeyer.com/toothpicks/) |
|  | Problem Page  Students use a linear model to respond to a question in an advice column. | Problem Page  File: problem\_page\_v3\_1.doc and problem\_page\_slides\_v3\_1.ppt  Downloaded from [Bowland Maths assessment page](http://www.bowlandmaths.org.uk/assessment/problem_page.html) |

Additional Links – [MathsLinks AM4CEC: Modelling with functions](http://mathslinks.net/browse/am4cec)