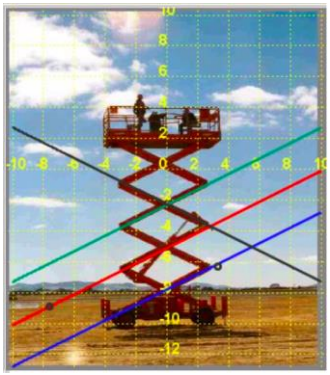
re(Solve) MATHS BY INQUIRY

SPECIAL TOPIC 2

Bringing the Real World into Algebra

Overview



These lessons will help students understand the purposes of algebra and promote algebraic thinking. In particular, they introduce functional thinking and develop it across the year levels. Real world contexts will be brought to the classroom through digital images, hands on activities and data collection – this includes the use of digital instruments normally used in science or music. The functions will arise from a wide variety of settings, including designing housing to accommodate growing populations; sound & music; and movement & gravity. In every case students are engaged in solving real world problems through the use of mathematical modelling that involves functions. The use of algebra (or for Year 5/6 algebraic thinking) is in focus as students record patterns, pay attention to the relationship between two variables, and link visual, numerical, graphical and symbolic representations as they generalize and apply findings to new examples. 'Realistic Mathematics Education' (RME) provides the principles for this guided inquiry approach to mathematical modelling.

Australian Curriculum: Mathematics

The Years 7, 8, 9, 10 lessons will align with the development sequence for algebra in the Australian Curriculum looking at linear functions, quadratics and exponentials. The Years 5/6 lessons will involve graphing, patterns and algebra. The problem solving and reasoning proficiencies are highlighted.

Core development team

Associate Professor Robyn Pierce, Bruce Schmidt, and Duncan Symons.

Trialling Requirements

Year levels

Years 5/6; 7; 8; 9; 10.

Program time required

There will be one unit of 4 or 5 lessons for Years 5 - 9 planned to take about a week of class time. There are two units for Year 10. The lessons can be a part of initial teaching about each family of functions, or they can be used for review, consolidation and extension.

We are asking trialling teachers to choose one complete unit to trial with their classes, although non-trialling classes will get value without doing the whole of the Year 8 – 10 units.

Special requirements

Some tasks will require access to computers, tablets or graphics/CAS calculators and student use of digital photos. Free dynamic geometry software will be used along with commonly available spreadsheet software. Some simple equipment is required for STEM cross-curriculum activities.
Unit content and availability is up to date at writing but may change to a small extent.

Materials can be accessed from the Members section of the reSolve website http://www.resolve.edu.au. Email mbi@science.org.au to trial.

For information about Special Topics, contact Director of Special Topics Kaye.Stacey@science.org.au or Lucy.Bates@science.org.au.To find out more about reSolve Mathematics by Inquiry, visit http://resolve.edu.au or contact mbi@science.org.au.

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Australian Academy of Science

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Unit and date available	Year	Summary	Curriculum Links and Program Time	Special Equipment
Describing a Pattern 22 August 2017	5/6	Beginning with the context of Japanese sleeping capsules or cages at a poultry show, students explore the how the number of walls used increases as the number of capsules increases, making tables and graphs and writing rules. They discuss the equivalence of different rules. Later, they design and construct some different capsules, observing the changes in the relationships between variables.	**ACMNA133** **ACMNA134** 4 x 75 min approx.	Toothpicks etc for building models.
Finding functional relationships 22 August 2017	7	This unit, in the context of motion, has a focus on naming variables, making a table of values, graphing data and describing relationships between variables.	**ACMNA175** **ACMNA178** **ACMNA180** 5x50min approx.	Laptops or tablets. Simple materials for making model cars. Basic equipment for measuring distance and time.
Linear and Inverse relationships 1 Sept 2017	8	This unit, in the context of music, has a focus on naming variables, making a table of values, graphing data and describing relationships between variables.	**ACMNA193** **ACMNA194** 5x50min approx.	Laptops or tablets. Simple materials for making instruments.
Linear Functions 22 August 2017	9	Students explore the role of each parameter in a linear function rule as they match graphs to lines on an image (e.g. the scissor lift picture on page 1).	**ACMNA215** **ACMNA294** 5x50min approx.	Dynamic geometry software; device to take photos (or photos provided)
Quadratic Functions 14 August 2017	10	Students match quadratic graphs to paths such as water spouting from a hose, and the flight of a football. These lessons reveal the links between the graphs of quadratic functions and the three algebraic forms (turning point form, product, sum of three terms) and the influence of the parameters in the functions.	**ACMNA239** 5x50min approx.	Dynamic geometry software; device to take photos (or photos provided)
Exponential Functions 1 Sept 2017	10	Students analyse digital photos of natural objects to examine how exponential functions can model their features. An example is to model the size of the progressively larger chambers of an ammonite fossil.	**ACMNA239** 3x50min approx.	Dynamic geometry software; device to take photos (or photos provided)