2 August 2017

re(Solve) MATHS BY INQUIRY

SPECIAL TOPIC 8

Mathematical Inquiry into Authentic Problems

Overview

There will be 10 inquiry units for years F to 6, and an accompanying teacher's guide. The units will be based in authentic real world situations that are relevant and interesting to students around Australia. The major aim is for students to learn to use mathematics to help make sensible real world decisions in response to the ill-structured and open-ended questions that are encountered in life. These are questions such as:

- What do we need for a tea party? (Foundation)
- What fraction of a bottle needs to be filled with water to be the best for bottle flipping? (Year 3)
- What is the best number of balloons to evenly decorate the room? (Year 2)

Each unit has four phases:

- Discover (exploring the context, becoming immersed, and connecting to prior knowledge)
- Devise (planning how to solve the problem, considering different approaches)
- Develop (collecting, analysing and documenting evidence to refine the solution process)
- Defend (presenting solutions and evidence to peers, reflecting on effectiveness)

Core Development Team

Katie Makar, Jill Fielding-Wells, Sue Allmond.

Australian Curriculum: Mathematics

Mathematical content across all strands is brought into these units. The units can be used either to drive teaching of specific mathematical content (e.g. one-to-one correspondence for the tea party inquiry) or to follow up after content has been taught.

Trialling Requirements

We are asking teachers to choose at least one unit to trial with their class. Unit content and availability is up to date at time of 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.

Feedback to help us improve the lessons can be provided by:

- Completing the short online survey (a link is provided on the lesson plans) AND
- Completing the Detailed Feedback questions provided for each lesson, and emailing to us AND/OR
- Making comments on the lesson plan or on student work, then scanning and emailing to us OR
- Phoning us if preferred to give your detailed responses verbally.

Some of our best feedback is obtained when another teacher observes the lesson. If you are able, have a colleague observe and provide additional feedback, or if you wish, contact us and we may be able to arrange for an external observer.

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.

Mathematics by Inquiry is an initiative of, and funded by, the Australian Government Department of Education and Training

Australian Academy of Science

aamt

Term 3 2017 (available approximately 4th August 2017)				
Unit	Year	Summary	Curriculum Links	Program Time
What do we need for a tea party?	F	A purposeful context for counting. Students plan a tea party for a small group. In Foundation year, students are developing confidence in using the language of counting and connecting number names, numerals and quantities using one-to-one correspondence. The tasks in this inquiry allow the teacher insight into these processes and opportunity for diagnostic interactions. Students present their tea party plan to the teacher before holding their party. An assessment opportunity is included.	**ACMNA001, ACMNA002, ACMNA003, ACMNA289**	6x45min approx.
What is the best number of balloons to evenly decorate the room?	2	A purposeful context for division and multiplication. Students explore and present groupings of a bag of 29 balloons to decorate the classroom for an upcoming event. The class decides which grouping is best and the room is decorated. Arrays, commutative properties, repeated addition and skip counting are encountered. There are opportunities for diagnostic interactions. This inquiry unit could be placed before any formal introduction to division and multiplication as it explores the concept of dividing a number into equal parts and grouping into equal sets, and the 'x' sign and equations are not used.	**ACMNA031, ACMNA032**	4x60-90 min approx.
What is the best container to hold 10 000 centicubes?	4	This unit integrates content in number and measurement to deepen students' understanding and confidence working with larger numbers, and to help build an understanding that numbers are partitioned and combined flexibly. Students negotiate what 'best' means and explore ways to reach 10 000 centicubes without actually counting. They determine suitable bases and heights and represent their base with concrete materials and grid paper. To convince others that their container is best, students record their calculations, construct a 3D model of their container and explain the benefits of their container. This unit is for students who have had experience with comparing shapes based on volume and capacity using uniform informal units and will be familiar with recognising 3D objects using their obvious features.	**ACMNA073, ACMNA076, ACMNA079, ACMMG084, ACMMG290**	4-4.5 hours approx. over 4 lessons
What is the best box to hold 2 different sized items that are packaged as pyramids?	6	This unit is for students in Year 6 who are building an understanding of constructing and manipulating three-dimensional objects (prisms and pyramids). The context of this inquiry could be packaging a gift for a classmate or a family member, or sending gifts overseas. Students work flexibly as they construct simple prisms and pyramids from nets they have created, and work through iterations to refine a box that has the least amount of left over space. Students will see the importance of collecting evidence, especially accurately labelled nets, and organising this evidence to show how they have packaged their two different sized pyramids.	**ACMMG140**	5x60min approx.

Term 4 2017 (available approximately 4th October 2017)				
Unit	Year	Summary	Curriculum Links	Program Time
What is the best way to count?	1	This unit provides an authentic context for counting large collections (around 100) with the aim of developing a need for skip counting and partitioning using place value when counting large amounts. Students consider ways to grab a handful of 100 pieces of macaroni and the best way to count their handfuls, prompted by questions such as: "Can you think of a way to grab more macaroni?" and "Why are you losing count?" As they progress through the unit, students find better ways to grab 100 pieces of macaroni and more efficient ways to count the pieces. They use evidence to convince others their grab is close to 100 and has been efficiently counted.	**ACMNA012, ACMNA014, ACMNA018**	TBC
What fraction of a bottle needs to be filled with water to be the best for bottle flipping?	3	This unit is in the context of bottle flipping, a popular game. Students decide what fraction of a bottle to fill with water in order to enhance its chances of flipping. They work in pairs to devise a way to collect and record data, organise the data into categories and create displays to support their findings. Their displays may include lists, tables, picture graphs and/or simple column graphs, created with and without the use of digital technologies.	**ACMNA058, ACMSP068, ACMSP069**	TBC
Can you design an expanded square so it has about half the paper on the outside of the square?	4	Students design an expanded square that includes symmetrical patterns by reflecting irregular shapes cut from inside a coloured paper square. Their finished design needs to have about half of the coloured paper outside the original square perimeter. Students will explore different methods to determine whether they have removed about half of the original square and adjust their design accordingly. They share their designs describing the symmetrical patterns created and the transformations used. To convince others their design has met the given requirements, students will share the thinking and methods used to create the finished design.	**ACMNA077, ACMMG087, ACMMG091**	TBC
Who has the best reaction time?	5	Students consider the importance of reaction times: which people might need and/or have quick reaction times? Students predict their own reaction times and design and investigate questions involving two categorical variables, such as reaction times vs time spent exercising. They conduct their investigations (e.g. using stop watch and a drop-and-catch technique, or an online game), collect data and construct data displays to compare times. Students reflect on how different factors can affect someone's reaction time.	**ACMNA131, ACMMG135, ACMSP147, ACMSP148**	TBC

Term 1 2018 (available approximately 29th January 2018)				
Unit	Year	Summary	Curriculum Links	Program Time
How far does a ball roll?	1	Students work collaboratively to test different balls to see which roll the furthest. They negotiate consistent measurement practices to ensure fair testing (e.g. surface, type of ball, how to roll, who rolls, how to record) and select an appropriate informal, uniform unit of measure to make comparisons. Students make predictions about what may happen using the language of chance, and record their responses. They may annotate photos of their attempts and then compare and share measurements. This provides opportunities to discuss the accuracy of measurements and reflect on predictions.	**ACMNA013, ACMMG019, ACMSP024, ACMSP262, ACMSP263**	TBC
How many sandwiches would our class eat in a day/week?	2	Sandwiches seem to be popular in lunchboxes – just how many sandwiches would a class eat in a nominated period of time? Students make predictions about how many sandwiches they eat in a day (and then later, a week) and share their predictions with their peers. Collaboratively, pairs of students devise plans for finding out the total number of sandwiches eaten by checking their own lunchboxes and surveying peers. Students calculate their answers and can then scale up the responses to predict over a longer timeframe. There are a variety of methods students can choose to collect and check their data and then to represent and model the problem.	**ACMNA027, ACMNA028, ACMNA030, ACMSP049**	TBC