

LEVEL: Year 3-6	CONTENT: Measurement and Geometry	FOCUS: Measurement, Problem Solving
In the Classroom		
PURPOSE /LEARNING INTENTION	<p>To investigate measurement (and pattern) in a problem solving context.</p> <p>This lesson could easily take more than one session to investigate fully</p>	
WARM UP	Not necessary	
INTRODUCTION	<p>Show the picture of a ribbon bow. Ask “What do you notice?” Allow students time to think. Encourage students to talk to a shoulder partner to discuss ideas. Record ideas on the whiteboard</p> <p>Ask “How could we turn some of these ideas into a maths question? Allow students time to think. Encourage students to talk to a shoulder partner to discuss ideas. Record maths questions on whiteboard</p>	
EXPLICIT TEACHING & LEARNING	<p>Ask students to choose one of the maths questions (or one of their own) to answer - independently, with a partner or with a small group.</p> <p>Some ribbon bows could be available for students to handle, dismantle, investigate. Students need to record their investigations in a way that can be shared.</p>	
DISCUSSION/KEY QUESTIONS	<p>Below are some ideas, but don’t feed them to the students – see what they come up with.</p> <p>Possible ideas that students will notice: length of ribbon needed to make a bow, number of loops needed to make a bow, pattern of loops in the circles (1, 5, 9??),</p> <p>Possible questions: how do you make a 3D bow from a flat ribbon? Could I make a bow with 1 m of ribbon? How big is the bow?, How many bows would fit on my maths book? What is the shortest/longest length of ribbon to make a bow with 15 loops?</p> <p>Second picture: Which one doesn’t belong?, what patterns could I make?, Which bow needs the longest ribbon? How do you make the points? What angle are the points?</p>	
DELIBERATIVE PRACTICE	<p>Ask students to explain which question they chose and how they investigated it?</p> <p>Use reflective questioning e.g.</p> <p>https://www.teachthought.com/learning/use-twitter-exit-slip-teaching/</p> <p>http://www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/CBS_AskingEffectiveQuestions.pdf</p>	
REFLECTION	Allow students to share their investigations – with each other, with another class, with the wider school community, with their parents.....	
RESOURCES	<p>Picture of ribbon bow (Scroll to bottom for a copy of the picture) Ribbon Bow.pptx</p> <p>Ribbon bows for students to handle</p>	
WHAT DOES SUCCESS (PROFICIENCY) LOOK LIKE?	<p>Students chose a maths question to investigate</p> <p>Students record their investigation in a way that can be understood by others</p> <p>Students can explain their investigation</p>	

Curriculum Connections
CONTENT

Content will vary according to the age of the students and the investigations they choose.

Number and algebra

Number and algebra are developed together, as each enriches the study of the other. Students apply number sense and strategies for counting and representing numbers. They explore the magnitude and properties of numbers. They apply a range of strategies for computation and understand the connections between operations. They recognise patterns and understand the concepts of variable and function. They build on their understanding of the number system to describe relationships and formulate generalisations. They recognise equivalence and solve equations and inequalities. **They apply their number and algebra skills to conduct investigations, solve problems and communicate their reasoning.**

Measurement and geometry

Measurement and geometry are presented together to emphasise their relationship to each other, enhancing their practical relevance. Students develop an increasingly sophisticated **understanding of size, shape, relative position and movement of two-dimensional figures in the plane and three-dimensional objects in space.** They investigate properties and apply their understanding of them to define, compare and construct figures and objects. They learn to develop geometric arguments. **They make meaningful measurements of quantities, choosing appropriate metric units of measurement.** They build an understanding of the connections between units and calculate derived measures such as area, speed and density.

Statistics and probability

Statistics and probability initially develop in parallel and the curriculum then progressively builds the links between them. Students recognise and analyse data and draw inferences. They represent, summarise and interpret data and **undertake purposeful investigations involving the collection and interpretation of data.** They assess likelihood and assign probabilities using experimental and theoretical approaches. They develop an increasingly sophisticated ability to critically evaluate chance and data concepts and make reasoned judgements and decisions, as well as building skills to critically evaluate statistical information and develop intuitions about data.

<https://www.australiancurriculum.edu.au/f-10-curriculum/mathematics/structure/>

WHAT DOES PROFICIENCY LOOK LIKE?

Understanding
Fluency
Problem Solving
Reasoning
Communicating
(NSW)
Justifying
(NSW)

Understanding

Students build a robust knowledge of adaptable and transferable mathematical concepts. They make connections between related concepts and progressively **apply the familiar to develop new ideas.** They develop an understanding of the relationship between the 'why' and the 'how' of mathematics. Students build understanding when they connect related ideas, when they represent concepts in different ways, when they identify commonalities and differences between aspects of content, when they describe their thinking mathematically and when they **interpret mathematical information.**

Fluency

Students develop skills in choosing appropriate procedures; carrying out procedures flexibly, accurately, efficiently and appropriately; and recalling factual knowledge and concepts readily. Students are fluent when they calculate answers efficiently, **when they recognise robust ways of answering questions, when they choose appropriate methods and approximations, when they recall definitions and regularly use facts, and when they can manipulate expressions and equations to find solutions.**

Problem-solving

Students develop the **ability to make choices, interpret, formulate, model and investigate problem situations, and communicate solutions effectively.** Students formulate and solve problems when they use mathematics to represent unfamiliar or meaningful situations, **when they design investigations and plan their approaches,** when they apply their existing strategies to seek solutions, and when they verify that their answers are reasonable.

Reasoning

Students develop an increasingly sophisticated capacity for logical thought and actions, such as analysing, proving, evaluating, explaining, inferring, justifying and generalising. Students are reasoning mathematically when they **explain their thinking, when they deduce and justify strategies used and conclusions reached, when they adapt the known to the unknown,** when they transfer learning from one context to another, when they prove that something is true or false, and when they compare and contrast related ideas and explain their choices.

<https://www.australiancurriculum.edu.au/f-10-curriculum/mathematics/key-ideas/>

ASSESSMENT

Rubric for Problem Solving Investigations

<S:\Schools\A. Schools Outreach\AMSI Sample Lessons, Units and games\Problem Solving Investigation Rubric Proficiencies.docx>

