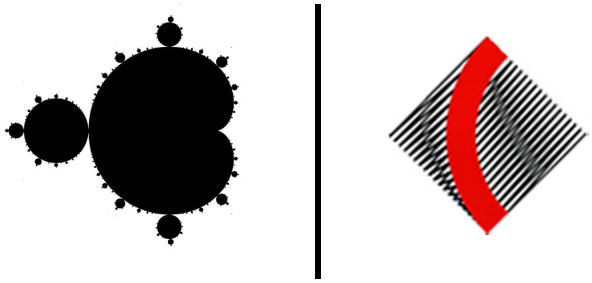

Exploring Mathematics
ASSESSMENT OUTLINE

Stage 5 Elective Course

Cherrybrook Technology High School

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1 Overview

Exploring Mathematics emphasises the importance of metacognition (intentional thinking about the learning process). This skill is developed and displayed through the Class Discussion assessment task (AT1).

2 Task Requirements

Reflection posts are written in response to content covered during lessons. These are intended to provide students with the opportunity to think carefully about what has been learned during each lesson and how it relates to existing knowledge, as well as to open a dialogue with peers over mathematical ideas. These can be written by using the following questions as a scaffold:

- What new concepts/skills did I learn?
- How does this relate to things I already know?
- What old ideas have been challenged?
- Was anything surprising? Why?
- Was anything particularly difficult to understand? Why?
- What unanswered questions do I have that enable me to think more deeply about the concepts/skills that were introduced?

These posts are produced by students individually and then logged electronically on the class website. The method for logging these is as follows:

a) Compose a new email to exploringmathematics2015@gmail.com
b) In the subject, write a descriptive title for your post and include your name in brackets.
   E.g. *Examples of the Golden Ratio in nature (by Chris Martin)*
c) In the body, write your 100-200 words of reflection in response to the prompts given in class (or using the scaffold questions above)
d) Within 15 minutes, your post should appear at www.misterwootube.com/tag/exploremaths

3 Marking Rubric

Since this is an ongoing assessment task, student work will be evaluated at the following three points during the semester:

Friday 6 March	Friday 1 May	Friday 12 June

In addition to work being consistently submitted in a timely fashion, the following guidelines will be used to mark students' work:

Level of competence demonstrated	Marks
Demonstrates sophisticated metacognitive understanding of mathematics by: ▸ exhibiting appropriate questioning of and reflection upon relevant ideas ▸ applying and explaining the nature of mathematical thought ▸ presenting coherent discussion with clarity that displays multi-faceted understanding of mathematical concepts ▸ evaluating and discussing the implications of mathematical concepts in broader contexts than the ones presented during lessons	9-10
Demonstrates strong metacognitive understanding of mathematics by: ▸ exhibiting some questioning of and reflection upon relevant ideas ▸ explaining the nature of mathematical thought ▸ presenting discussion that displays multi-faceted understanding of mathematical concepts	7-8
Demonstrates basic metacognitive understanding of mathematics by: ▸ exhibiting some reflection upon relevant ideas ▸ describing mathematical thought in a brief and rudimentary way	3-6
Demonstrates basic understanding of mathematics by: ▸ composing posts related directly or indirectly to the given skills and concepts	1-2
Non-attempt	0

1 Overview

The opening topics of *Exploring Mathematics* introduce students to the significant connection between beauty and mathematics. Appreciation and investigation of this connection takes places through the creation of a mathematical Artwork (AT2).

2 Task Requirements

Students are to create a two-dimensional artwork that portrays beauty both in a mathematical and non-mathematical context (i.e. someone without a mathematical background ought to be able to appreciate its aesthetic qualities in some measure). They may choose to incorporate one or several of the concepts explicitly introduced in class, such as:

- The Golden Ratio
- Symmetry
- Fractals

Alternatively, students are free to include mathematical ideas that they discover through their own research or experimentation.

The artwork should be a minimum of A3 in size, and must be supplemented by a **1-page rationale** that verbally explains the mathematical concepts or principles that underpin the artwork.

3 Marking Rubric

Students must submit AT2 during or before the scheduled lesson Wednesday 10 September (Week 9, Term 3). The following guidelines will be used to mark students' work (see overleaf):

Level of competence demonstrated	Marks
Demonstrates sophisticated understanding and appreciation of beauty in a mathematical context by: ▸ producing an artwork that clearly embodies mathematical principles ▸ creatively designing and composing an original work ▸ clearly explaining a range of relevant mathematical concepts in relation to artwork through written rationale	13-15
Demonstrates strong understanding and appreciation of beauty in a mathematical context by: ▸ producing an artwork that embodies mathematical principles ▸ designing and composing an original or derivative work ▸ describing a range of relevant mathematical concepts in relation to artwork through written rationale	9-12
Demonstrates basic understanding and appreciation of beauty in a mathematical context by: ▸ producing an artwork that vaguely embodies mathematical principles ▸ composing an entirely derivative work ▸ describing a relevant mathematical concept in relation to artwork through written rationale	5-8
Demonstrates some understanding of beauty in a mathematical context by: ▸ producing an artwork that may or may not obviously embody any mathematical principle ▸ composing a simplified or inarticulate written rationale	1-4
Non-attempt	0

1 Overview

Set theory is a critically important branch of mathematical logic that concerns the study and language of groups of objects. Many of the skills that are fundamental to understanding sets can be assessed through a short response quiz.

2 Task Requirements

Students are given 40 minutes to complete a quiz that includes the following concepts and skills:

- Set terminology and notation
- Set operations
- Construction and interpretation of Venn and Carroll diagrams

This task will be administered in a normal classroom during a regularly scheduled lesson.

3 Marking Rubric

Students will be assessed on their ability to correctly understand the language of set theory and infer accurate conclusions in given scenarios. Additionally, in some questions, students will be required to demonstrate the conceptual logic beneath their final responses.

1 Overview

Mathematical ideas are often complicated and multi-faceted, which presents a genuine challenge to both students (trying to learn a concept) and teachers (trying to explain a concept). Though many different strategies have been employed throughout history to communicate mathematics in an intelligible way, the primary medium that has been used by mathematicians has been in the form of written text. It is well-suited to the structure of linear thought, and is easily shared because it is a cheap and accessible format.

In recent years, the rise of various technologies (e.g. the internet, mobile devices, cameras) has meant that *short-form video* is now increasing in popularity and use. Students find it a useful resource (for learning) and teachers find it a powerful tool (for explaining).

2 Task Requirements

In groups of 4-5, students will create a digital video that satisfies the following conditions:

- Consists of an informative presentation about or applying any topic in mathematics related to or an extension of the students' syllabus level, targeted at their peers
- Include both audio and visual components
- Between 90 and 180 seconds long
- Be original

The final video must contain a title, credits, and a Creative Commons BY-NC-ND 3.0 AU license. If any students are physically identifiable in the video clip, guardian permission must be secured and submitted in hardcopy.

3 Marking Rubric

Students must submit AT4 by USB (or a suitable file-sharing service) in two stages:

- Stage 1 (draft): during or before scheduled lesson Wed 22 October (Week 3, Term 4).
- Stage 2 (final product): during or before scheduled lesson Fri 31 October (Week 4, Term 4).

Projects will be assessed on the following criteria:

- Accuracy and quality of mathematics presented
- Innovative approach to presenting mathematics
- Creativity of overall presentation
- Quality of production

After all groups' videos are submitted, the best will be nominated and submitted as the CTHS entry to the *Maths via Digital Media Competition* administered by the University of Wollongong.

Level of competence demonstrated	Marks
Demonstrates sophisticated understanding of mathematics and highly-developed communication skills by: ▸ conveying a difficult mathematical concept/skill in an accurate fashion ▸ showing the concept/skill in an engaging and interesting way ▸ producing a creative and original presentation ▸ utilising the highest possible production values in the final product	13-15
Demonstrates strong understanding of mathematics and reasonable communication skills by: ▸ conveying a mathematical concept/skill in an accurate fashion ▸ showing the concept/skill in an interesting way ▸ producing a creative presentation ▸ utilising substantial production values in the final product	9-12
Demonstrates basic understanding of mathematics and elementary communication skills by: ▸ conveying a mathematical concept/skill in an accurate fashion ▸ producing a creative presentation	5-8
Demonstrates limited understanding of mathematics and some communication skills by: ▸ conveying a mathematical concept/skill ▸ producing a derivative presentation	1-4
Non-attempt	0

1 Overview

Matrices are one of the most powerful tools in all of mathematics. This is for two reasons. Firstly, these humble grids of numbers are able to represent countless amounts and types of information (such as systems of linear equations and vectors in any number of dimensions). Secondly, their highly structured nature makes them ideally suitable to be handled and manipulated by computers, which enables all the vast processing power of the electronic age to be directed at solving any problem that can be expressed mathematically.

2 Task Requirements

Students are given 30 minutes to complete a quiz that includes the following concepts and skills:

- Interpreting and constructing augmented matrices
- Elementary row operations
- Matrix multiplication
- Inverse of a matrix
- Determinant of a matrix

This task will be administered in a normal classroom during the regularly scheduled lesson on Tuesday 4 November (Week 5). Any students who miss the task at this time will have the opportunity to do it the next day (Wednesday 5 November).

3 Marking Rubric

Students will be assessed on their ability to correctly understand the language of matrices and to accurately manipulate matrices with standard operations and algorithms.