Gymea Technology High School
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Year 11 Mathematics Extension 1

Task 3: Breaking Down Questions: Investigation and Quiz

Due Date: Thursday 20th June 2024 (Period 0)

Task Distributed: 3rd June 2024

Unit: Polynomials and Combinatorics

Task Type: Investigation and Quiz Task

Task Weighting: 25%

Outcomes: ME11.1, ME11.2, ME11.5, ME11.7

Task Description

This task will require you to identify, interpret and analyse key verbs and terminology in a range of past HSC questions on the topics outlined below. It will assist you in developing your skills and understanding in how to recognise these key terms in examination style questions and determine how they lead you to the solution you are required to develop. These topics have been selected as they are commonly assessed in the HSC exam each year. The questions you will be analysing will cover the following range of techniques from each topic:

Polynomials	Combinatorics
• Understand the definition, notation and terminology of a polynomial • Use long division to factorise a polynomial • Use and prove the remainder and factor theorems • Use properties of roots and coefficients to solve problems and equations • Understand and apply the multiplicity property • Sketch a range of polynomials	• Use counting techniques to determine total arrangements (Fundamental Counting Principle) • Calculate arrangements in a line or a circle using Factorial Notation • Solve and prove problems using the pigeonhole principle • Use permutations to solve problems, including restrictions with or without repetition • Use combinations to solve problems • Solving practical problems involving permutations and combinations

Task Outline

This assessment consists of the following 2 compulsory sections:

Part A: Create a Topic Study Guide

Students will create a Topic Study Guide for the topics outlined above; **Polynomials** and **Combinatorics.** The Topic Study Guide will consist of:

- A glossary of the most commonly featured key verbs and topic specific terminology presented in these HSC questions.
- A list of all of the questions presented in the **2022 and 2023 HSC Exam** that are linked to the two topic areas listed above.
- An annotated worked solution to each of these questions.

Students are required to use the scaffold attached as a guide to create their Topic Study Guides. It can be Word published or handwritten. Students will create the guide by investigating the **2022 and 2023 HSC Exam** papers to identify and analyse the questions asked that link to the two topic areas above.

The attached scaffold is separated into four parts:

1. **HSC Verbs**: You need to identify **at least four key verbs** from suitable HSC Questions. Each verb must be accompanied by a short explanation of what mathematical process that verb requires you to do.

2. **Key mathematical terms:** You need to identify **at least three key mathematical terms from** across both topics. These terms are the words that link to a process studied in class. Each term must be accompanied by a short explanation of the mathematical process it links to.

3. **Identified Past HSC Questions:** Students are to identify and copy **at least four questions** presented in 2022 and 2023 HSC exam that are linked to the two topic areas above. In each question identified, students are also required to **highlight the verb** and **underline the key terms** in this question.

4. **Annotated Worked Solutions:** From at least two of the past HSC question identified above, students also need to identify the worked solution for that question and write a short annotation on how the key verb and mathematical terminology in that question leads you to the solution.

See the scaffold for a worked example from a past HSC paper as a guide.

Part B: Moodle Quiz Assessing Your Glossary Knowledge

Students will sit a short in-class Moodle quiz assessing the knowledge and skills developed through your investigation. The questions will require you to:

- Identify key verbs and terminology in past HSC questions.
- Match definitions to key verbs and key math terms.
- Identify steps to solve a question when presented with a key term
- Solve a range of past HSC multiple-choice questions from the topic areas listed above.

Preparation for this Task

For the Part A component, the following websites may assist you to locate past HSC exams and their marking guidelines:

Students Online

https://studentsonline.nesa.nsw.edu.au/go/pastpapers/

NESA Past HSC Exams

https://educationstandards.nsw.edu.au/wps/portal/nesa/11-12/Understanding-the-curriculum/resources/hsc-exam-papers

For the quiz aspect of this task, you will need to prepare by:

- Reviewing class work and past HSC examples from each topic listed above.
- Ensuring all set work is up to date.
- Practice completing examination questions with detailed answers under time pressure. (1 mark = 1.5 minutes).
- Seek teacher assistance for unclear work.
- Review the HSC Reference Sheet. You will be provided with one for the quiz.

NESA Glossary of Key Words

Understand the verb associated with the task. The verb will provide an understanding of the detail needed to successfully answer the question.

- **Evaluate –** Make a judgement based on criteria; determine the value of
- **Factorise –** Use algebraic techniques to write the expression as a product of its factors
- **Find** – Use techniques (generally algebraic) to determine a value or expression
- **Identify –** Recognise and name
- **Prove / Show –** Provide all algebraic steps and working in a logical sequence
- **Simplify** – Use algebraic techniques to write an expression in its simplest form
- **Sketch –** Neatly draw a function on a number plane, clearly showing key features
- **Solve –** Use algebraic techniques to find a solution

Check the NESA Glossary of Key Words for further guidance https://educationstandards.nsw.edu.au/wps/portal/nesa/11-12/hsc/hsc-student-guide/glossary-keywords

Details of Submission

Part A:

Using the Study Guide Scaffold provided with this notification, create a Topic Study Guide in its entirety and submit it before Period 0 on the day of the Moodle Quiz: 20th June, 2024. Your Study Guide may be handwritten or typed and must be handed in before the Moodle Quiz is sat.

Part B:

For successful completion of Moodle Quiz, you must bring the following equipment.

- Board approved calculator
- Blue or black pen,

The quiz will be sat online using your own device or the computers in the Technology Centre. You will be provided with a HSC Reference Sheet for the quiz.

Students who are absent from the examination, or have a legitimate reason for missing the task, must notify the school before the exam commences. To avoid a zero mark being awarded, any absence must be supported by valid misadventure/illness documentation as outlined in the Year 11 Assessment Booklet.

How does this link to my learning?

- This task provides an opportunity for you to investigate and practice identifying and interpreting the key terminology that is presented in HSC questions. This is a skill that is vital for allowing you to correctly break down questions and identify the mathematical processes to be applied that allow the problem to be solved.
- The completion of this task will provide you with a relevant glossary of important key terms that you can use for future study when approaching HSC style questions.
- The questioning style presented in this task will allow you to gain experience with this style of questioning presented in the HSC.

Teacher Feedback and Student Self-Reflection

- The quiz provides immediate feedback.
- The investigation task will typically be returned to students within 14 days of the due date.
- At this time feedback including information on how to improve will be provided through analysis of the examination questions as a class discussion. Explanation will be provided as requested.
- Students can clarify or seek further feedback by speaking with their teacher or the assessment marker.

Upon return of the task, students will also be expected to complete a self-reflection. This will require students to review incorrect responses by seeking clarification from the teacher. Additionally, students will be required to complete a survey in reflection of the examination.

Assessment Procedures

All students should be fully aware of the School Assessment Procedures for their year group. These were provided at the beginning of the school year and are available on the school website under the Learning Tab for each year group.

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4. HOW WILL MARKS BE AWARDED TO MEASURE MY LEARNING?

Part B is self-marking and will provide instant feedback on the day of completion. Part A will be marked according to the rubric listed below:

Instructional Marking Rubric for Part A

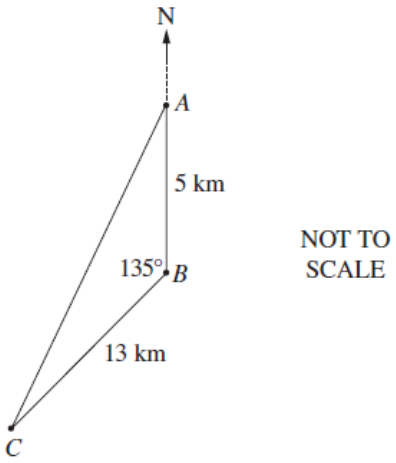
Category	0 Marks	1 Mark	2 Marks	3 Marks
Identification of key HSC verbs	Does not identify a question verb or does not show a clear understanding of the verb's meaning.	Correctly identifies at least one verb from a suitable HSC question and attempts to explain its meaning.	Correctly identifies at least three verbs from suitable HSC questions and correctly explains their meaning.	Correctly identifies at least four key verbs from suitable HSC questions and correctly explains their meaning.
Definitions of topic specific terminology	Does not correctly define any key mathematical terms for either topic or does not show a clear understanding of the terminology.	Correctly identifies at least one key term identified in suitable HSC questions, but the links to the syllabus ideas are not well explained.	Correctly defines at least three key terms identified in suitable HSC questions and provides sufficient understanding of how they link to syllabus ideas / techniques.	Correctly defines at least three key terms from each topic area identified in suitable HSC questions and provides sufficient understanding of how they link to syllabus ideas / techniques.
Identification of questions linked to the topic areas	Does not identify any questions that link to either topic.	Identifies questions that link to both topics and/or attempts to identify and highlight the key verbs and underline the topic terminology from a suitable HSC question.	Identifies and correctly highlights the key verbs and underlines the topic terminology for at least three questions. They must be suitable HSC questions.	Identifies and correctly highlights the key verbs and underlines the topic terminology for at least four questions. They must be suitable HSC questions.
Annotation of worked solutions, explaining why each step was used.	Does not identify a question or does attempt to annotate a solution to a question.	Attempts to annotate one identified question that provides a clear understanding of how the key verbs and topic specific terminology link to the solution.	Correctly annotates at least two of their identified questions that provides a clear understanding of how the key verbs and topic specific terminology link to the solution.	Correctly annotates at least two of their identified questions in each topic that provides a clear understanding of how the key verbs and topic specific terminology link to the solution.

Use the example below as a guide.

Worked Example

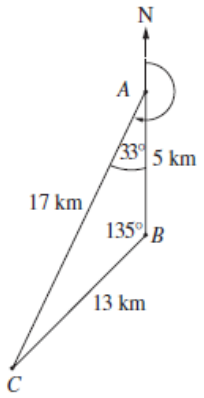
Trigonometry – Topic Study Guide	
Question Verb(s)	**Definition**
Calculate	*Find the value or the numerical answer.*
Determine	*Find the result and describe why or how – draw meaning from the mathematical result*
Key Terms	**Definition**
Location	*Describes the position of the object*
Due North	*Gives the direction*
Shortest distance	*The unknown side length to be calculated. This is done using the trigonometric ratios, the Sine Rule or Cosine Rule.*
Bearing	*A bearing shows direction travelled by an object from North. It shows the location using either compass directions (compass bearings) or a three figure (true bearings) out of a total of 360°*
Questions Appearing in Past HSC Papers	
Question Name	2016 Mathematics HSC Q12a

The diagram shows the location of three schools. School A is 5 km due north of school B, school C is 13km from school B and angle ABC is 135°.



i) Calculate the shortest distance from school A to school C, to the nearest kilometre.

ii) Determine the bearing of school C from school A, to the nearest degree.

Worked Solution	Annotation
(i) $AC^2 = 13^2 + 5^2 - 2 \times 5 \times 13 \times \cos 135°$ $= 285.92\ldots$ $AC = \sqrt{285.92\ldots}$ $= 16.9\ldots$ $= 17$ km (nearest kilometre)	*Use the cosine rule to calculate the distance from A to C because 2 sides and the included angle were given.* *Square root the calculated values to solve for side length AC as the cosine formula states $(AC)^2$* *Gives the required accuracy*
(ii) $\frac{\sin A}{13} = \frac{\sin 135°}{17}$ $\sin A = \frac{13 \sin 135°}{17}$ $= 0.5407$ $A = 32.7\ldots°$ $= 33°$ (nearest degree)	*Use the Sine Rule to calculate the size of angle A because two sets of corresponding angles and sides were given.* *Calculates the answer using inverse sin, because you are finding an angle and round as required*
The bearing of school C from school A is $180° + 33° = 213°$.  	*Bearing from A to C starts from North, wrapping around in a clockwise direction from A until you are facing C. So you need to add 33 to 180 as B is south of A.*