 Year 12 Mathematics Extension 1

| ME-T3 Trigonometric equations | Unit duration |
| --- | --- |
| The topic Trigonometric Functions involves the study of periodic functions in geometric, algebraic, numerical and graphical representations. It extends to include the exploration of both algebraic and geometric methods to solve trigonometric problems.A knowledge of trigonometric functions enables students to manipulate trigonometric expressions to prove identities and solve equations.The study of trigonometric functions is important in developing students’ understanding of the connections between algebraic and graphical representations and how this can be applied to solve problems from theoretical or real-life scenarios, for example involving waves and signals. | 6-7 lessons |

| Subtopic focus | Outcomes |
| --- | --- |
| The principal focus of this subtopic is to consolidate and extend students’ knowledge in relation to solving trigonometric equations and to apply this knowledge to practical situations.Students develop complex algebraic manipulative skills and fluency in applying trigonometric knowledge to a variety of situations. Trigonometric expressions and equations provide a powerful tool for modelling quantities that vary in a cyclical way such as tides, seasons, demand for resources, and alternating current. | A student:* applies advanced concepts and techniques in simplifying expressions involving compound angles and solving trigonometric equations ME12-3
* chooses and uses appropriate technology to solve problems in a range of contexts ME12-6
* evaluates and justifies conclusions, communicating a position clearly in appropriate mathematical forms ME12-7
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| Prerequisite knowledge | Assessment strategies |
| --- | --- |
| Students should have studied Year 11 Trigonometry content, MA-T2, Trigonometric functions and identities, and ME-T2, Further trigonometric identities, as well as the Year 12 subtopic, MA-T3, Trigonometric functions and graphs. | * Students could complete proofs on vertical whiteboards, which provides instant feedback to the teacher about their understanding. Students could also correct incorrect proofs.
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All outcomes referred to in this unit come from the [Mathematics Extension 1](http://educationstandards.nsw.edu.au/wps/portal/nesa/11-12/stage-6-learning-areas/stage-6-mathematics/mathematics-extension-1-2017) syllabus
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Glossary of terms

| Term | Description |
| --- | --- |
| domain | The domain of a function is the set of x values of y=f(x) for which the function is defined. Also known as the ‘input’ of a function. |

| **Lesson sequence** | **Content** | **Suggested teaching strategies and resources**  | **Date and initial** | **Comments, feedback, additional resources used** |
| --- | --- | --- | --- | --- |
| Converting expressions to and (1 lesson) | * convert expressions of the form to or and apply these to solve equations of the form , sketch graphs and solve related problems (ACMSM048) Critical and creative thinking icon
 | **Note:** See the resourceme-t3-unit-worked-solutions.DOCX which contains algebraic and graphical solutions for the sample questions and activities referred to throughout this unit.**Converting expressions to and** * Students to review compound formulae.
* Teacher to model converting expressions of the form to or

Note: and can be either positive or negative.* **Examples:**
	+ Show
	+ Find 4 expressions equivalent to
	+ Graph a function by converting it to or
	+ Teacher can demonstrate equivalence of different forms by graphing each using graphing software such as Geogebra or Desmos ( to be inputted in terms of ).
	+ **Resource:** me-t3-matching-expressions.DOCX
 |  |  |
| Solving equations of the form (1 or 2 lessons) | * convert expressions of the form to or and apply these to solve equations of the form , sketch graphs and solve related problems (ACMSM048) Critical and creative thinking icon
* solve trigonometric equations and interpret solutions in context using technology or otherwise  Information and communication technology capability icon
 | **Solving equations of the form** * Teacher to model:
	+ solving equations of the form by converting to the form or
	+ adjusting the domain. with a domain of implies
	+ questions where both a and b are positive or negative as well as where one is negative.
	+ Solving an equation using a variety of equivalent expressions.
	+ checking and solving equations graphically. Suggested software: Geogebra or Desmos.

Note: This technique can be used by students to check their solutions. * Questions may or may not be leading:
	+ Solve
	+ Solve by first expressing it in the form
 |  |  |
| Solving equations using factorisation and/or compound angle results(1 lesson) | * solve trigonometric equations requiring factorising and/or the application of compound angle, double angle formulae or the -formulae
* solve trigonometric equations and interpret solutions in context using technology or otherwise  Information and communication technology capability icon
 | **Equations using factorisation and/or compound angle results*** Teacher to model/demonstrate:
	+ solving trigonometric equations involving factorising and/or compound angle formulae.
	+ Questions which include those with a specified domain and those without (general results).
	+ adjusting the domain. with a domain of implies
	+ solving and checking equations graphically. Suggested software: Geogebra or Desmos.

**Note:** This technique can be used by students to check their solutions. * Sample equations include:
* Sample domains for equations could include:
	+ No domain specified, general results.
 |  |  |
| Solving equations using double angle results(1 lesson) | * solve trigonometric equations requiring factorising and/or the application of compound angle, double angle formulae or the -formulae
* solve trigonometric equations and interpret solutions in context using technology or otherwise  Information and communication technology capability icon
 | **Solving equations using double angle results*** Students to review the double angle formulae.
	+
	+
	+
* Teacher to model/demonstrate:
	+ solving trigonometric equations involving double angle formulae.
	+ adjusting the domain. with a domain of implies 0
	+ questions which include those with a specified domain and those without (general results).
	+ solving and checking equations graphically. Suggested software: Geogebra or Desmos.

Note: This technique can be used by students to check their solutions. * Sample equations might include:
* Sample domains for equations include:
	+ No domain specified, general results.
 |  |  |
| Solving equations using the t-formulae(1 lesson) | * solve trigonometric equations requiring factorising and/or the application of compound angle, double angle formulae or the -formulae
* solve trigonometric equations and interpret solutions in context using technology or otherwise  Information and communication technology capability icon
 | **Solving equations using the t-formulae*** Students to review the t-formulae.

where * Teacher to model/demonstrate:
	+ solving a variety of equations using the t-formulae.
	+ adjusting the domain. Solving with a domain of implies 0
	+ checking solutions graphically. Suggested software: Geogebra or Desmos.

Note: This technique can be used by students to check their solutions.* Example:
	+ Solve using the result
 |  |  |
| Proofs and applications of trigonometric identities(1 lesson) | * prove and apply other trigonometric identities, for example (ACMSM049)
 | **Proofs and applications of trigonometric identities*** Teacher to model formal proofs of trigonometric identities.

One method of proving is by showing and .* Sample trigonometric identities to prove include:
* Sample proof and application:
	+ Prove . Hence or otherwise solve .
 |  |  |

Reflection and evaluation

Please include feedback about the engagement of the students and the difficulty of the content included in this section. You may also refer to the sequencing of the lessons and the placement of the topic within the scope and sequence. All ICT, literacy, numeracy and group activities should be recorded in the ‘Comments, feedback, additional resources used’ section.