

<b>Title</b>	<b>Demonstrate knowledge of mathematical principles for mechanical engineering</b>		
<b>Level</b>	<b>3</b>	<b>Credits</b>	<b>15</b>

<b>Purpose</b>	People credited with this unit standard are able to demonstrate knowledge of: algebra to solve mechanical engineering problems; trigonometry to solve mechanical engineering problems; and the use of complex numbers as applied to mechanical engineering problems.
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<b>Classification</b>	Mechanical Engineering > Applied Principles of Mechanical Engineering
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<b>Available grade</b>	Achieved
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**Explanatory notes**

- 1 References  
Health and Safety at Work Act 2015 and supporting Regulations.
- 2 Definitions  
*Accepted industry practice* refers to approved codes of practice and standardised procedures accepted by the wider mechanical engineering industry sectors as examples of best practice.  
*Workplace procedures* refer to procedures used by the organisation carrying out the work and applicable to the tasks being carried out. They may include but are not limited to – standard operating procedures, safety procedures, equipment operating procedures, codes of practice, quality management practices and standards, procedures to comply with legislative and local body requirements.
- 3 Range  
Unless specifically mentioned within the evidence requirements, a minimum of two calculations are required for every evidence requirement where applicable.
- 4 Assessment information
  - a Numerous reference texts and training manuals on mathematics are available and may be used; however, no one textbook or source of information is envisaged. All activities must comply with applicable workplace procedures and must be consistent with accepted industry practice.
  - b Assessment is to be ‘closed book’, with all relevant formulae provided. Computers and/or non-programmable calculators may be used.

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## Outcomes and evidence requirements

### Outcome 1

Demonstrate knowledge of algebra to solve mechanical engineering problems.

#### Evidence requirements

- 1.1 Algebraic concepts and their applications are described.
- Range concepts include but are not limited to – equations of lines, formula manipulation, substitution.
- 1.2 Formulae are manipulated so as to make one unknown quantity the subject.
- 1.3 Algebraic functions are solved and graphed.
- Range evidence is required for a minimum of two each of – linear, polynomial, logarithmic, exponential functions.
- 1.4 Simultaneous equations of two unknowns and three unknowns are solved, and solutions are interpreted.
- 1.5 Quadratic equations are solved by factorisation and the use of formula.

### Outcome 2

Demonstrate knowledge of trigonometry to solve mechanical engineering problems.

#### Evidence requirements

- 2.1 Graphs are drawn of basic trigonometric functions.
- Range evidence is required for a minimum of two each of – sine with amplitude, phase, and period; cosine with amplitude, phase, and period; tangent with phase and period.
- 2.2 Double-angle problems are solved.
- 2.3 Problems involving angles and sides are solved using trigonometric functions.
- Range evidence of a minimum of two each of right-angled and non-right angled triangles is required.

### Outcome 3

Demonstrate knowledge of the use of complex numbers as applied to mechanical engineering problems.

#### Evidence requirements

- 3.1 The nature of complex numbers and their applications are described.

3.2 Conversions from rectangular to polar form and from polar to rectangular form are demonstrated.

3.3 Numerical operations are performed on complex numbers.

Range evidence is required for a minimum of two each of – addition, subtraction, multiplication, division.

3.4 Engineering problems are solved using complex numbers.

<b>Planned review date</b>	31 December 2021
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#### Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	27 October 2005	31 December 2016
Rollover and Revision	2	19 March 2010	31 December 2021
Review	3	20 October 2016	N/A

<b>Consent and Moderation Requirements (CMR) reference</b>	0013
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This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.

#### Please note

Providers must be granted consent to assess against standards (accredited) by NZQA, before they can report credits from assessment against unit standards or deliver courses of study leading to that assessment.

Industry Training Organisations must be granted consent to assess against standards by NZQA before they can register credits from assessment against unit standards.

Providers and Industry Training Organisations, which have been granted consent and which are assessing against unit standards must engage with the moderation system that applies to those standards.

Requirements for consent to assess and an outline of the moderation system that applies to this standard are outlined in the Consent and Moderation Requirements (CMRs). The CMR also includes useful information about special requirements for organisations wishing to develop education and training programmes, such as minimum qualifications for tutors and assessors, and special resource requirements.

#### Comments on this unit standard

Please contact Competenz [qualifications@competenz.org.nz](mailto:qualifications@competenz.org.nz) if you wish to suggest changes to the content of this unit standard.