Australian Government

Department of Education, Employment and Workplace Relations

MEM30012A Apply mathematical techniques in a manufacturing engineering or related environment

Release: 1

MEM30012A Apply mathematical techniques in a manufacturing engineering or related environment

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit covers applies the *concepts of mathematics* to appropriate and simple engineering situations within the individual's area of engineering expertise.

Application of the Unit

Application of the unit	This unit applies to technician level work that requires basic algebraic, trigonometric and statistical knowledge and skill. **Band**: **0** **Unit Weight**: **4**

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Use concepts of arithmetic in the solution of engineering problems	1.1. Units of physical quantities are converted to facilitate engineering calculations. 1.2. Calculations are performed to solve problems involving rational and irrational numbers. 1.3. Scientific notation is used to represent numbers. 1.4. Calculations are checked for reasonableness using estimating and approximating techniques.
2. Solve engineering problems involving algebraic expressions with one independent variable	2.1. Algebraic expressions are manipulated using mathematical operations in their correct order.
3. Use two-dimensional geometry to solve practical problems	3.1. Angles expressed in degrees are correctly converted to radians and vice versa. 3.2. The perimeter, area, length and angles of a range of two-dimensional figures are correctly calculated. 3.3. The volume and surface area of complex figures are correctly calculated. 3.4. Points identified in terms of cartesian coordinates can be converted to polar coordinates and vice versa.
4. Use trigonometry to solve practical problems	4.1. Basic trigonometry functions are used to calculate the lengths of the sides of right-angled triangles. 4.2. Inverse trigonometry functions are used to determine angles in a right-angled triangle given the lengths of two sides. 4.3. The sine rule is used to determine the lengths of the sides of acute and obtuse angled triangles given one side and two angles. 4.4. The cosine rule is used to determine the lengths of the sides of acute and obtuse angled triangles given two sides and one angle.
5. Graph linear functions	5.1. Linear functions are solved graphically and equations of straight lines are determined from the slope and one point, or two points. 5.2. Two linear functions are solved simultaneously both algebraically and geometrically. 5.3. The length and mid point of a line segment are determined.
6. Solve quadratic equations	6.1. Quadratic equations are solved. 6.2. Simultaneous linear and quadratic equations are solved.

ELEMENT	PERFORMANCE CRITERIA
7. Perform basic statistical calculations	7.1. Mean, median and mode are calculated from given data. 7.2. Standard deviation is calculated and interpreted employing graphical representation.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Look for evidence that confirms skills in:

- using and applying mathematical formulas:
  - logical thinking
  - problem solving
  - calculating
  - applying statistics
  - using computer numerical methods
  - drawing graphs

Required knowledge

Look for evidence that confirms knowledge of:

- transposing and evaluating formulae
- polynomials
- straight line coordinate geometry
- introduction to indices
- introduction to trigonometry
- circular functions
- trigonometry of oblique triangles
- trigonometric identities
- introduction to functions and their graphs

Evidence Guide

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	A person who demonstrates competency in this unit must be able to apply mathematical skills and knowledge to simple engineering applications. Evidence from tasks and projects should/may be used to complement and demonstrate integration of competency.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.
Context of and specific resources for assessment	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with applying mathematical concepts to engineering applications, or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

EVIDENCE GUIDE	
Guidance information for assessment	

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Concepts of mathematics	Include arithmetic, algebraic expressions with one independent variable, two-dimensional geometry, trigonometry, linear functions, basic quadratic functions, basic statistical methods
Correct order	Refers to the correct procedure when expanding brackets, factorising algebraic expressions, factorising quadratic expressions, simplifying algebraic fractions, transposing formulae, solving simple one variable equations, finding the quotient and remainder given a linear division
Complex figures	May include cones, pyramids, spheres, frustums and intersections of figures singularly or in combination

Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units	

Co-requisite units		

Competency field

Competency field	Engineering technician