



Australian Government

MEM23005A Apply statistics and probability techniques to engineering tasks

Release: 1

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Modification History

Release 1 (MEM05v9).

Unit Descriptor

This unit of competency covers the application of statistics and probability techniques to engineering applications. It includes the use and application of standard statistical and probability concepts and modelling methods, such as mean, median, mode, frequency distribution, standard deviation plus probability laws, distributions, permutations and combinations to engineering and manufacturing situations.

Application of the Unit

The unit applies to engineering or related activities requiring the application of statistical and probability techniques. It is suitable for people giving technical support to design, operations or maintenance activities and those pursuing technical qualifications and careers at paraprofessional or technician level.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

MEM23004A Apply technical mathematics

Employability Skills Information

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.

Elements and Performance Criteria

1	Determine scope of statistics or probability techniques required for an engineering application	1.1	Analyse an engineering application for required statistics or probability tasks
		1.2	Develop systematic methods for layout and solution validation, including any required external sign-off of solution
		1.3	Identify statistics or probability techniques and any software required for analysis and resolution of identified engineering tasks
		1.4	Identify sources for professional and technical assistance, if required
2	Apply statistical techniques to engineering applications	2.1	Apply standard statistics concepts and models to solve engineering problems
		2.2	Check statistical model and solution is error free
		2.3	Review model and solution to ensure they provide information relevant to resolution of engineering application task
		2.4	Report results and document calculations, graphs and analysis
3	Apply probability techniques to engineering applications	3.1	Apply standard probability concepts and models to solve engineering problems
		3.2	Check model and solution is laid out correctly and is error free

- 3.3 Review solution to ensure it provides information relevant to resolution of engineering application task
- 3.4 Report results and document calculations, graphs and analysis

Required Skills and Knowledge

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

Required skills

Required skills include:

- analysing engineering applications to determine relevant statistics and probability techniques
- applying relevant statistical and probability concepts and tools and applying to engineering applications
- using appropriate software to generate solutions to statistical and probability-related engineering problems
- establishing appropriate procedures for checking and validating solutions
- logical layout and presentation of data
- reporting and effectively communicating the results of statistical and probability-based analysis

Required knowledge

Required knowledge includes:

- meaning and appropriate application of discrete and continuous data
- concepts of mean, median and mode and their application to engineering and manufacturing problems requiring statistics-based solutions
- standard deviation, range, interquartile range and frequency distributions
- use of appropriate software and/or scientific calculators to generate solutions to statistical and probability-related engineering problems and methods for presentation of data, such as:
 - frequency distribution tables
 - histograms
- the concept of variance and its application to engineering and manufacturing situations
- application of statistical modelling to engineering and manufacturing situations
- translation of statistical data into engineering parameters and the applications to:
 - process improvement techniques
 - reliability analysis
- concepts of probability:
 - single events
 - multiple events
 - with permutations and combinations
- probability distributions:
 - normal

- binomial
- sampling distributions:
 - sample size
 - statistical significance
 - confidence intervals
- application of probability-based solutions to engineering and manufacturing problems

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 statistics and probability techniques to engineering-related problems within the context of specified engineering applications and other solution validation and technical oversight procedures. The candidate may demonstrate competence through either working individually or as part of a team.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently: • solve engineering and manufacturing problems using statistics and probability techniques • validate results of simple examples using statistics and probability either analytically and/or graphically • assist decision making processes in industry by analysis of data using statistical and probability concepts and tools.
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 then a simulated working environment 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. • Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. • Access must be provided to appropriate learning and/or assessment support when required. Where applicable, physical resources should include equipment modified for people with disabilities.
Method of assessment	• Assessment must satisfy the endorsed Assessment Guidelines of the MEM05 Metal and Engineering Training Package.

	- Assessment methods must confirm consistency and accuracy of performance (over time and in a range of workplace relevant contexts) together with application of underpinning knowledge. - Assessment methods must be by direct observation of tasks and include questioning on underpinning knowledge to ensure correct interpretation and application. - Assessment may be applied under project-related conditions (real or simulated) and require evidence of process. - Assessment must confirm a reasonable inference that competency is not only able to be satisfied under the particular circumstance, but is able to be transferred to other circumstances. - Assessment may be in conjunction with assessment of other units of competency where required.
Guidance information for assessment	Assessment processes and techniques must be culturally appropriate and appropriate to the language and literacy capacity of the candidate and the work being performed.

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.

Engineering applications related to statistics and probability techniques in this unit	Most engineering disciplines will have applications supported by the statistics and probability skills described in this unit, including mechanical, manufacturing, maintenance and mechatronics engineering. Examples of engineering applications requiring statistics and probability skills described in this unit may include: - assisting decision making in industry by analysis of data using statistical and probability concepts and tools - informing maintenance decisions and reliability analysis - identifying the most appropriate outcome of manufacturing trials - determining the effectiveness of process improvement techniques
Scope of statistical and probability techniques	The scope of statistics and probability techniques required for an engineering or manufacturing application will vary and may include: - use of discrete or continuous data - application of measures of central tendency, such as: - mean

	• median • mode • application of measures of distribution, such as: • standard deviation • range • interquartile range • analysis of statistical inference, such as: • sample size • statistical significance • application of probability concepts and tools, such as: • probability laws • probability distributions
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Unit Sector(s)

Competency field

Unit sector Engineering science

Custom Content Section

Not applicable.