



Australian Government

MARL5012A Perform basic marine engineering calculations

Release 1

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Modification History

Release 1

This is the first release of this unit.

Unit Descriptor

This unit involves the skills and knowledge required to perform basic marine engineering calculations required for the operation of marine machinery and equipment.

Application of the Unit

This unit applies to Marine Engineering Watchkeepers on commercial vessels greater than 750 kW and forms part of the requirements for the Certificate of Competency Marine Engineer Watchkeeper issued by the Australian Maritime Safety Authority (AMSA).

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

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 required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

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| 1 Apply mathematical formulae to solve marine engineering problems | 1.1 | Proportions, variation, percentages and averages are calculated, and method of unity is applied |
| | 1.2 | Problems involving the manipulation of indices are solved |
| | 1.3 | Written descriptions of actual or hypothetical marine engineering problems are expressed in mathematical terms |
| | 1.4 | Algebraic formulae and equations are manipulated to change subjects, as and when required |
| | 1.5 | Index problems are converted to logarithmic problems, and vice versa, according to the Law of Logarithms |
| | 1.6 | Calculator is used to resolve marine engineering problems |
| 2 Calculate areas, volumes and masses of regular and irregular figures | 2.1 | Problems related to areas and volumes of regular geometric figures are solved using standard formulae |
| | 2.2 | Problems relating to surface areas and volumes of circular figures are solved |
| | 2.3 | Centres of gravity and centroids of area are found for both line figures and areas |
| | 2.4 | Concept of density is applied to calculate masses |
| 3 Apply trigonometry to solve problems relating to angular measurement and the resolution of vectors | 3.1 | Basic trigonometric ratios of sine, cosine and tangent, together with their reciprocals are explained with respect to the sides of a right-angled triangle |
| | 3.2 | Pythagoras' Theorem is proved |
| | 3.3 | Problems associated with single angle trigonometric identities including those derived from the application of Pythagoras' Theorem to the basic sin, cos and tan identities are solved |
| | 3.4 | Derivation of multiple, double and half angle trigonometric identities are shown and used to simplify complicated trigonometric expressions and identities |
| | 3.5 | Sine Rule and Cosine Rule for solution of triangles are proved and applied |

Required Skills and Knowledge

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

Required Skills:

- Assess own work outcomes and maintain knowledge of current codes, standards, regulations and industry practices
- Explain basic mathematical concepts and techniques relevant to marine engineering, and
- Identify and determine appropriate mathematical techniques and formula to solve marine engineering problems
- Identify the methods and procedures needed to select mathematical techniques and formula to solve marine engineering problems
- Impart knowledge and ideas through verbal, written and visual means
- Perform calculations relevant to marine engineering, including volumes and masses of regular and irregular areas
- Read and interpret written information on marine engineering problems and express this information in mathematical terms
- Use a calculator to resolve marine engineering problems

Required Knowledge:

- Centre of gravity (KG, VCG, LCG)
- Centroids of area
- Formulae for areas, volumes and masses of regular and irregular shapes
- Indices
- Law of Logarithms
- Proportions, variation, percentages, averages and method of unity
- Pythagoras' Theorem

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, the required skills and knowledge, the range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

The evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the Elements, Performance Criteria, Required Skills, Required Knowledge and include:

- performing accurate and reliable calculations
- solving problems using appropriate laws and principles.

Context of and specific resources for assessment

Performance is demonstrated consistently over time and in a suitable range of contexts.

Resources for assessment include access to:

- industry-approved marine operations site where performing basic marine engineering calculations may be conducted
- technical reference library with current publications on marine engineering calculations
- tools, equipment and personal protective equipment currently used in industry
- relevant regulatory and equipment documentation that impacts on work activities
- range of relevant exercises, case studies and/or other simulated practical and knowledge assessments
- appropriate range of relevant operational situations in the workplace.

In both real and simulated environments, access is required to:

- relevant and appropriate materials and equipment
- applicable documentation including workplace procedures, regulations, codes of practice and operation manuals.

Method of assessment

Practical assessment must occur in an:

- appropriately simulated workplace environment and/or
- appropriate range of situations in the workplace.

A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate to this unit:

- direct observation of the candidate performing basic marine engineering calculations
- direct observation of the candidate applying relevant WHS/OHS requirements and work practices.

Guidance information for assessment

Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

In all cases where practical assessment is used it should be combined with targeted questioning to assess Required Knowledge.

Assessment processes and techniques must be appropriate to the language and literacy requirements of the work being performed and the capacity of the candidate.

Range Statement

Not applicable.

Unit Sector(s)

Not applicable.

Competency Field

Marine Engineering