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| **Title** | **Demonstrate knowledge of mathematics and mechanics for electrical trades** | | |
| **Level** | **2** | **Credits** | **4** |

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| **Purpose** | This unit standard covers basic mathematics and mechanics for electricians and related trades.<br><br>People credited with this unit standard are able to:<br>– demonstrate knowledge of mathematics for electrical trades;<br>– demonstrate knowledge of mechanical terms and their units; and<br>– demonstrate knowledge of lever systems and mechanical drives. |

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| **Classification** | Electrical Engineering > Core Electrical |

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| **Available grade** | Achieved |

**Guidance Information**

1 This unit standard has been developed for learning and assessment off-job.

2 For assessment purposes
- a Candidates shall be supplied with formulae involving more than three quantities.
- b Use of a calculator during assessment is permitted.
- c Candidates are expected to express calculated values in the relevant Système International (SI) units, including multiples and sub-multiples (pico, nano, micro, milli, kilo, mega, etc) and be able to convert between them.

## Outcomes and performance criteria

**Outcome 1**

Demonstrate knowledge of mathematics for electrical trades.

**Performance criteria**

1.1 Arithmetical calculations are completed.

Range add, subtract, multiply, divide.

1.2 Fractions are converted to decimals and percentages, and vice versa.

1.3 Multiples are expressed to the power of 10 and vice versa.

Range terra, giga, mega, kilo, unit, milli, micro, pico, nano.

1.4 Calculator functions are used to solve problems from given data.

Range square, square root.

1.5 Area and volume calculations are carried out for simple two and three dimensional shapes using given data.

Range area – square, oblong rectangle, triangle, circle;
volume – box, cylinder.

1.6 Right angle triangle trigonometric calculations are carried out using given data.

Range sin, cos, tan, $\sin^{-1}$ (arcsin), $\cos^{-1}$ (arccos), $\tan^{-1}$ (arctan).

1.7 Given formulae are transposed to solve for an unknown quantity.

Range formulae – Ohm's law, electrical power, resistivity, energy.

**Outcome 2**

Demonstrate knowledge of mechanical terms and their units.

Range speed, velocity, force, torque, energy, work, power, efficiency.

**Performance criteria**

2.1 Mechanical terms are defined in terms of elementary physical quantities.

2.2 Symbols for mechanical terms are stated according to international usage.

2.3 Units of measurement are stated according to the Système International.

**Outcome 3**

Demonstrate knowledge of lever systems and mechanical drives.

Range lever systems – three orders of simple lever, compound lever;
mechanical drives – belt and pulley drive, gear drive.

**Performance criteria**

3.1 Lever systems, and mechanical drives are identified and described according to mechanical engineering practice.

3.2 Mechanical quantities are calculated for lever systems and simple mechanical drives from given data.

Range quantities – torque, work, energy, power, efficiency.

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| **Replacement information** | This unit standard replaced unit standard 1176 and unit standard 5912. |

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| **Planned review date** | 31 December 2022 |

**Status information and last date for assessment for superseded versions**

| Process | Version | Date | Last Date for Assessment |
|---|---|---|---|
| Registration | 1 | 10 February 1999 | 31 December 2013 |
| Revision | 2 | 3 April 2001 | 31 December 2013 |
| Review | 3 | 26 May 2005 | N/A |
| Rollover and Revision | 4 | 15 March 2012 | N/A |
| Revision | 5 | 15 January 2014 | N/A |
| Rollover and Revision | 6 | 28 January 2021 | N/A |

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|---|---|
| **Consent and Moderation Requirements (CMR) reference** | 0003 |

This CMR can be accessed at http://www.nzqa.govt.nz/framework/search/index.do.

**Comments on this unit standard**

Please contact The Skills Organisation reviewcomments@skills.org.nz if you wish to suggest changes to the content of this unit standard.