

Title	Use maths and statistics functions and procedures in commercial forestry		
Level	5	Credits	6

Purpose	People credited with this unit standard are able to: apply calculations used in forest mensuration; calculate commonly used forestry parameters; sample and process data; use statistics to derive mean and measure of variability of a population from a sample; and determine stand parameters and per-hectare estimates in forestry.
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Classification	Forestry > Forestry Business Management
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Available grade	Achieved
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Guidance Information

Reference

Rumsey, D. *Statistics for Dummies* (2011). Hoboken, NJ: Wiley Publishing Inc.

Outcomes and performance criteria

Outcome 1

Apply calculations used in forest mensuration.

Performance criteria

- 1.1 The function keys on a calculator are used to calculate forestry-related values.
Range +, -, *, /, sq, sq root, powers, reciprocal.
- 1.2 A sequence of calculations is linked, on a calculator, to solve simple equations.
Range equations, brackets, transformations, memory, chain calculations.
- 1.3 Ratios are applied to derive distance from a scale map and to prepare chemical mixtures.

1.4 Common measurements of weight, distance, area, and volume are converted from one metric unit to another.

Range weight measurements – g, kg, t;
distance measurements – mm, cm, m, km;
area measurements – m², ha;
volume measurements – ml, l, m³.

1.5 Regular areas are calculated.

Range rectangle, triangle, trapezium, circle.

1.6 Irregular areas are calculated from a scale map.

1.7 Volumes of common regular-shaped objects found in forestry are calculated.

Range rectangular boxes, cylinders, tapered cylinders.

1.8 Volumes involving combinations of measurements are calculated.

Range g/m², l/ha, kg/m³, m³/t.

Outcome 2

Calculate commonly used forestry parameters.

Performance criteria

2.1 Conversion factors are used to convert log volume from one system of measurement to another.

2.2 Mix of chemicals and water, per-hectare quantities, and per-hectare costs for spot spraying when given per-hectare rates, dilution rates, delivery rates per spot, spot size, number of spots per hectare and unit costs are calculated.

2.3 Heights and slope-corrected distances are calculated using right-angled triangle formulae and trigonometric functions.

Range sine, cosine, tangent.

2.4 The number of trees per hectare is calculated from a sample of counts per plot of given size.

2.5 Scattergrams and linear regression are used to calculate parameters of the least squares regression line equation, and to interpolate and extrapolate unknown values.

Outcome 3

Sample and process data.

Performance criteria

- 3.1 The terms accuracy, precision, and bias are defined.
- 3.2 Discrete and continuous data are distinguished between.
- Range measurements and counts, classes and frequencies, grades and codes.
- 3.3 A population is sampled using systematic and random sampling techniques.
- 3.4 A population is stratified before and after sampling.
- Range stocking, aspect, terrain classes.
- 3.5 Sampled data are processed to derive sample and population parameters using a calculator.
- Range mean, median, mode, range, inter-quartiles, standard deviation.
- 3.6 Sampled data are displayed and interpreted (without the use of a computer).
- Range frequency classes, tally chart, histograms and bar charts, frequency polygon, box and whisker plots, stem and leaf diagrams.
- 3.7 A computer-based statistical analysis package is used to process sampled data and interpret the output.

Outcome 4

Use statistics to derive mean and measure of variability of a population from a sample.

Performance criteria

- 4.1 Normal distribution tables are used to calculate the probability of occurrence of sampled values about the mean of a population.
- Range inverse normal distribution, distribution of sample means, central limit theorem.
- 4.2 The relationship between the standard deviation of a population and the standard deviation of a sample of that population is identified, and degrees of freedom, standard error, and confidence limits for the mean of a sample of measurements are calculated, using both a normal and a t distribution.

Outcome 5

Determine stand parameters and per-hectare estimates in forestry.

Performance criteria

- 5.1 Description identifies how to measure individual tree parameters.
- Range diameter at breast height over bark (dbhob), tree height, tree volume.
- 5.2 Analysis compares the precision of the measurement of standard tree parameters when using different measuring techniques.
- Range tape, relascope, laser, height pole, hypsometer.
- 5.3 Analysis defines the parameters 'tree height', 'mean crop height', 'predominant mean height' and 'mean top height'.
- 5.4 A spreadsheet-based linear regression analysis is used to derive the Peterson equation for a set of tree height/tree dbhob measurements.
- 5.5 Mean stocking, basal area, mean top diameter, mean top height per hectare, and related confidence limits from a set of plot data are derived, and an estimate of total standing tree volume per hectare is derived from the results.

Planned review date	31 December 2022
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Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	28 January 1995	N/A
Review	2	27 May 1998	N/A
Review	3	27 May 2002	N/A
Review	4	16 October 2009	31 December 2017
Review	5	10 December 2015	N/A
Rollover and Revision	6	28 May 2020	N/A

Consent and Moderation Requirements (CMR) reference	0173
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This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.

Comments on this unit standard

Please contact Competenz qualifications@competenz.org.nz if you wish to suggest changes to the content of this unit standard.