Exemplar for Unit Standard

Numeracy Level 1

This exemplar supports assessment against:

Unit Standard 26627

Use measurement to solve problems

> An annotated exemplar is an extract of student evidence, with a commentary, to explain key aspects of the standard. It assists teachers to make assessment judgements at the grade boundaries.

New Zealand Qualifications Authority

To support internal assessment

	Meets Performance Criteria 1.1 and 1.2
1.	**Cutting down a tree**

This sample of learner evidence contributes to a portfolio of naturally occurring evidence generated over an acceptable period of time to meet the requirements of Guidance Information (GI) 2 and GI3. The evidence reflects skills described by step 5 of the *Measure and Interpret Shape and Space* strand of the Learning Progressions for Adult Numeracy (GI4).

Solving this real world problem (1) contributes evidence towards Outcome 1. The learner has made a reasonable estimation of the tree height (2) and taken appropriate and accurate measurements of length (3) and angle (4) (using a clinometer app on an iphone). The learner has then used these measurements in calculations to find the height of the tree (5). Note: using the clinometer app is acceptable, see GI5 and Performance Criteria (PC) 1.2, because it still requires the learner to take a measurement. The app must be calibrated to zero, positioned correctly at eye level, and read accurately.

The measuring tool and units used are appropriate to the problem and context (PC1.1). Although useful formula are provided, the learner has independently chosen the measurements to take, formulae to use, and calculations to make to reach an acceptable solution (as required by GI7, PC1.1 and PC1.2). The signed attestation by the supervisor (6) provides the information necessary to verify that these PCs have been met.

This sample provides acceptable evidence for four of the seven range items required to meet Outcome 1: length, angle, estimation (2) and conversion (7). |

Learner 1: PC 1.1 and 1.2

Cutting down a tree

Sarah wants to cut down a tree in her back paddock, but needs to know how tall it is so she can fell it without hitting anything on the ground. Your tutor/teacher will show you a tree outside that is the same height as Sarah's tree. (1)
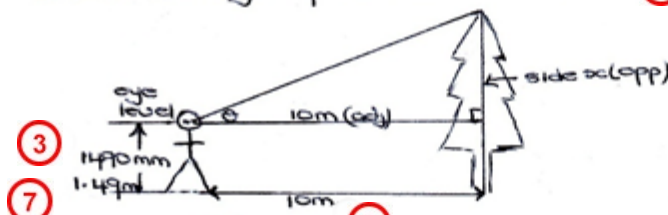
Estimate the height of the tree and then take appropriate measurements and make calculations to work out how tall the tree is for Sarah.

It may help to draw a diagram.

Useful formula: tan x = Opp/Adj   sin x = Opp/Hyp   cos x = Adj/Hyp

I think the height of the tree is about 12m (2)

eye level

1490mm
1.49m

10m (adj)

15m

side x(opp)

$\tan \theta = \frac{opp}{adj}$

measured θ with the clinometer on my iphone

$\theta = 45°$ (4) $\tan 45° = 1$

$\tan 45° = \frac{x}{10m}$

$10m \times 1 = 10m$

$x = 10m$

Total height of tree is

$10m + 1.49m = 11.49m$ (5)

(3) (7) (3)

|	
	Meets Performance Criteria 1.1 and 1.2
2.	**Painting a room** This sample of learner evidence contributes to a portfolio of naturally occurring evidence generated over an acceptable period of time to meet the requirements of Guidance Information (GIs) 2 and 3. The evidence reflects skills described by step 5 of the *Measure and Interpret Shape and Space* strand of the Learning Progressions for Adult Numeracy (GI4). The problem (1) has a useful, real life purpose, which meets GI1 and the intent of the standard. Taking measurements of length and using them in calculations to solve a capacity problem contributes evidence towards Outcome 1. The learner has measured the room's dimensions (2) and used them to calculate the total area to be painted (3) to solve the problem of the amount of paint required (4). The learner has independently selected an effective method to solve the problem, see GI7 and Performance Criteria (PC) 1.2, and checked the reasonableness of the answer (5). The accuracy of the measurements taken has been attested to by the assessor (6) to meet PC1.1. This sample provides acceptable evidence for solving a problem involving both length and capacity (two of the possible range items of Outcome 1).

Learner 2: PC 1.1 and 1.2

① Some of the rooms at your college need painting. You and your friends have offered to help the caretaker by measuring up some of the rooms and calculating how much paint is needed for two coats. You are told that 1 Litre of paint covers about 12 square metres.

Choose a room to measure. How much paint will be needed for this room?

Record the measurements and show your working.

②
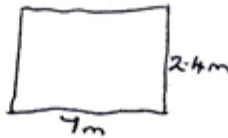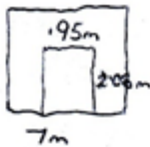
Walls 7 × 2.4 × 4 = 67.2 m²
Window 3 × 2 = 6 m²
Door .95 × 2.08 = 1.976 m² } 7.976 m²

③ Total area to paint = 67.2 m² − 7.976 m²

= 59.224 = 60 m²

60 m² × 2 = 120 m² (for 2 coats)

120 ÷ 12 = 10

④ So 10 litres paint needed

(Check: 7 × 2 = 14 × 4 = 56 × 2 = 112)
⑤   12 × 10 = 120

⑥ I observed the student taking measurements. The measurements were accurate.
　　　　　■■■■■ tutor 7/6/14

	Meets Performance Criteria 1.1 and 1.2
3.	**Grass seed**
	This sample of learner evidence contributes to of a portfolio of naturally occurring evidence generated within the context of an agricultural training course and over an acceptable time period (as required by Guidance Information (GI) 2 and GI3. The evidence reflects skills described by step 5 of the *Measure and Interpret Shape and Space* strand of the Learning Progressions for Adult Numeracy (GI4).
	Taking measurements of length and making calculations to solve the problem of how much grass seed is needed (1) contributes evidence towards Outcome 1. The learner has used an informal measurement of length by pacing out the dimensions of the area to be sown. The assessor has recorded what the learner actually did (2) and how the learner checked the accuracy of the informal measurements by measuring the length of his pace (3).
	Using informal measurement (such as paces) can be acceptable depending on the context and the level of accuracy required for the problem. In this instance the assessor has noted that a high degree of accuracy is not required (4). The learner has calculated the total area using sensible rounding (6), and the amount of grass seed required (7) to solve the problem. The assessor has signed and dated the observation sheet (5).
	This sample provides acceptable evidence of three of the seven range items required to meet Outcome 1: solving problems involving length and mass and conversion within the metric system (8).

Learner 3: PC 1.1 and 1.2

Learner 3: Meets Requirements
Intended for teacher use only

NZQA
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MANA TOHU MATAURANGA O AOTEAROA

Practical observation sheet – for optional use

Unit 26627: Use measurement to solve problems Level 1, Credits 3, Version 2

Learner name and NSN: ▮▮▮▮▮▮▮▮

Date of observation: 4 8/14

Observer name and relationship to learner: ▮▮▮▮ Tutor

Description of situation in which problem occurred: e.g. Cert Hospitality - menu planning module (costs of different menu options) Agriculture Academy Training.	Problem being solved: e.g. How much waste will there be from 1 kg unprocessed potatoes for pommes parisienne? How much grass seed is needed? ①
Measuring equipment selected & used: e.g. Kitchen scales Any preparation of equipment done: e.g. Zeroed scales	

Outcome 1: Use measurement to solve problems

② **I observed the learner take the following measurements:**

Record what was measured, and the actual measurement(s) taken.
e.g. Weighed unprocessed potato (370 g); prepared potato for pommes parisienne; weighed waste potato (135 g).

▮▮▮ paced out length and width of area to be sown. Measured 1 pace to be about 0.8m (used metre ruler). Note: a high degree of accuracy not required. ③ ④

The required level of accuracy with the measurements was: +/-_____   e.g. +/- 10 g

Required level of accuracy in measurements taken was met: Yes / No

② **I observed the learner make the following calculations, derived from the measurements s/he took:**

Record what was calculated (including the actual figures calculated) and the result.
e.g. 1 kg = 1000 g; Calculated how many times weight of unprocessed potato goes into 1 kg (1000 g/370 g = 2.7 rounded); multiplied waste weight by this figure (135 g x 2.7 = 364.5 g)

Calculated area to be sown (Converted paces to metres). Used coverage rate of 5kg/100m² to calculate amount of grass seed needed – [see Learner Work]

The learner's solution to the problem was: (record their solution) e.g. About 365 g waste per 1 kg unprocessed potato.

28.3 kg of grass seed

Did the learner judge the solution they reached to be reasonable? (Yes) No
Comment: e.g. Yes. Learner reversed initial calculation to check factor multiplying by, then re-did calculation of waste to check.
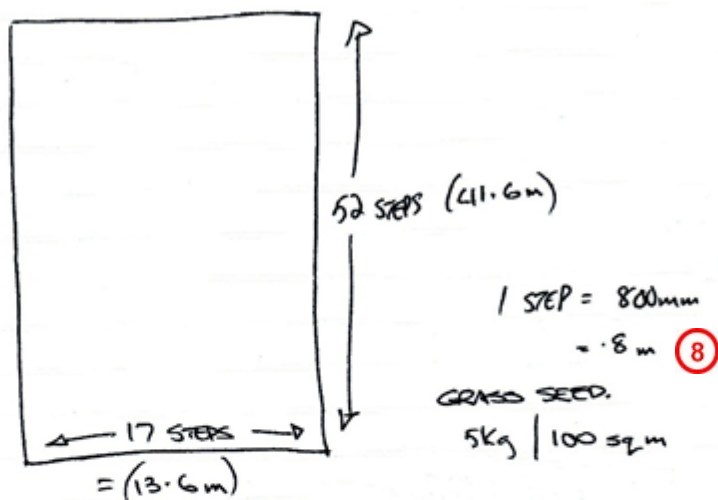
Double checked measurement of pace length and calculation.

The learner:

- ✓ selected the measuring equipment and units of measurement to use
- ✓ selected and used his/her own methods to solve the problem(s)
- ✓ took the measurements him/herself
- ✓ did the calculations him/herself
- ✓ solved the problem(s) without undue assistance.
- / This evidence was generated for a purpose other than the assessment of this standard.

Observer signature: ▮▮▮▮▮▮   Date: 4 8 14 ⑤

GRASS SEED 26627

Learner Work - Grass Seed Problem (see observation sheet)

52 steps (41.6m)

1 STEP = 800mm
= .8 m (8)

GRASS SEED.
5kg | 100 sqm

17 STEPS
= (13.6m)

13.6m × 41.6m = 565.76 sqm
= 566 APPROX (6)

(GRASS SEED REQUIRED.) = 5.66 × 5kg
= 28.3 kg. (7)

	Meets Performance Criteria 1.1 and 1.2
4.	**Ramp 1** This sample of learner work contributes to a portfolio of evidence generated over an acceptable period of time, see Guidance Information (GI) 3. The evidence presented is naturally occurring, from an assessment of standard 5236 (GI 2). The evidence meets (or exceeds) the level of demand described by step 5 of the *Measure and Interpret Shape and Space* strand of the Learning Progressions for Adult Numeracy (GI4). The problem to be solved (1) is applied and relevant to the learner's work and training context. The NZ Building Code regulations (Resource A) has been provided for reference. The learner has taken appropriate and accurate measurements of length (2) and used them in calculations (3) to find the angle of the ramp (4). This solves the problem of whether the ramp meets the building code (5), and contributes evidence towards Outcome 1. The measuring tool and the units used are appropriate to the problem and context (PC1.1). The signed attestation by the supervisor (6) provides the information necessary to verify that PC1.1 and PC1.2 have been met. This sample provides acceptable evidence for two of the seven range items required to meet Outcome 1: solving problems involving length and angle.

Learner 4: PC 1.1 and 1.2

Ramp 1
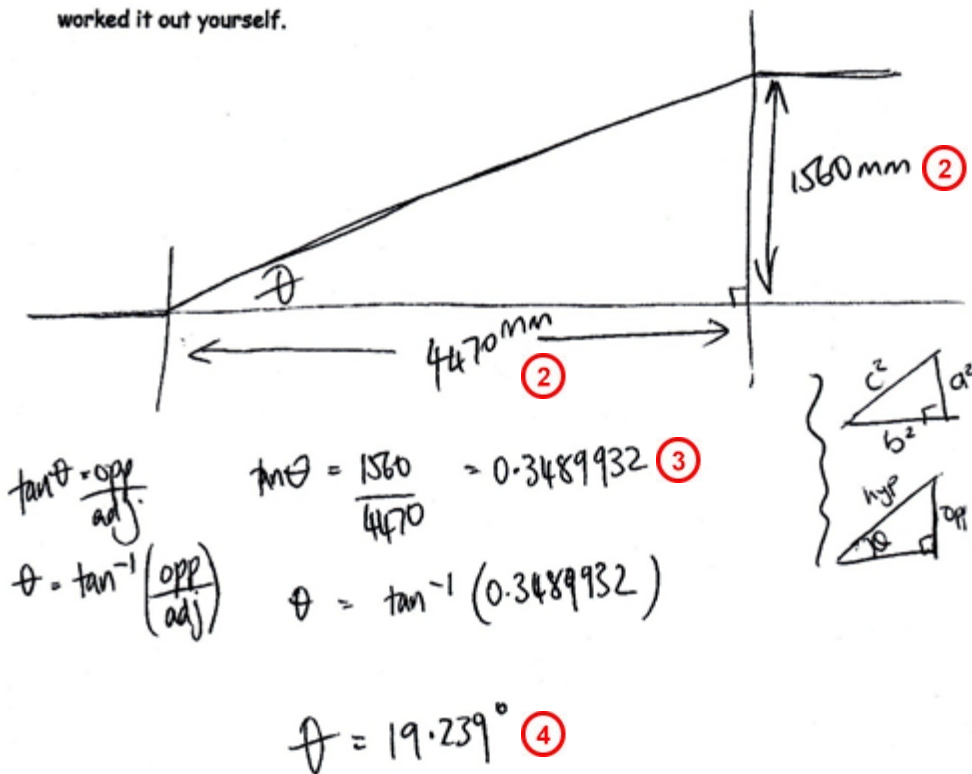
Block course   Unit 5236

Is it legal?

Sketch and measure the ramp you have chosen, and then work out whether or not it meets the Building Code for a public building. ①

Remember: Get your supervisor to sign off that you have measured accurately, and worked it out yourself.

1560mm ②

4470mm ②

$\tan\theta = \frac{opp}{adj}$

$\tan\theta = \frac{1560}{4470} = 0.3489932$ ③

$\theta = \tan^{-1}\left(\frac{opp}{adj}\right)$

$\theta = \tan^{-1}(0.3489932)$

$\theta = 19.239°$ ④

Is it legal? __No__   Why? __the slope angle is way too high (19.239° instead of 4.764°)__ ⑤

Supervisor sign-off – The candidate:
- took the measurements by themselves, using TAPE MEASURE, PLUMB LINE, LEVEL (list equipment used), and the measurements were accurate. Signed
- worked out the problem/s by themselves. Signed _____ 15/10/14 ⑥

	Meets Performance Criteria 1.1 and 1.2
5.	**Ramp 2** This sample of learner work contributes to a portfolio of evidence generated over an acceptable period of time GI3. The evidence presented is naturally occurring, from an assessment of standard 5236 as part of a Trades Block course (GI 2). The evidence meets (or exceeds) the level of demand described by step 5 of the *Measure and Interpret Shape and Space* strand of the Learning Progressions for Adult Numeracy (GI4). The problem to be solved (1) is applied and relevant to the learner's work and training context. The NZ Building Code regulations (Resource A) has been provided for reference. As required by Outcome 1, the learner has taken an appropriate and accurate measurement of length (2) and used it in calculations (3) to find the length of the ramp (4) and the horizontal distance from the landing (5). This solves the problem of building a ramp that meets the building code (1). The measuring tool and the units used are appropriate to the problem and context (PC1.1) and the signed attestation by the supervisor (6) provides the information necessary to verify that PC1.1 and PC1.2 have been met. This sample provides acceptable evidence for two of the seven range items required to meet Outcome 1: solving problems involving length and angle.

Learner 5: PC 1.1 and 1.2

Ramp 2

Block Course   Unit 5236

Design an accessible ramp

(1) Select a building that needs a ramp to allow wheelchair access. Take the measurements and do the calculations to design a ramp for the entrance that meets the regulations. Design it to have the ideal slope (4.086°). Include all dimensions.

Remember: Get your supervisor to sign off that you have measured accurately, and worked it out yourself.

landing
1200mm (2)

(2) 460

opp

Ramp

4.086° (2)

landing
1200 mm

(2)

hyp   opp
θ
adj
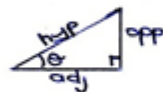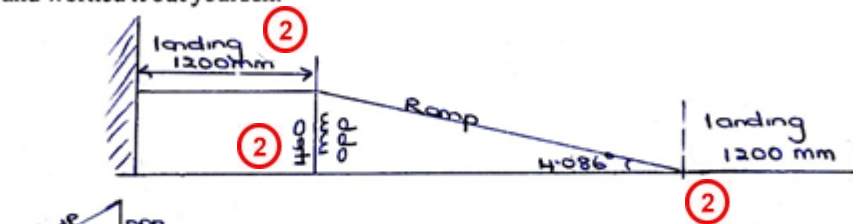
$\tan 4.086 = \frac{460}{adj}$ (3)

$adj \times \tan 4.086 = \frac{460}{adj} \times adj$

$\frac{adj \times \tan 4.086}{\tan 4.086} = \frac{460}{\tan 4.086}$

$\tan 4.086 = 0.071435294$

$adj = 6439.59 mm$

$adj = 6439 mm$ (5)

$\sin 4.086 = \frac{460}{hyp}$ (3)

$hyp \times \sin 4.086 = \frac{460}{hyp} \times hyp$

$\frac{hyp \times \sin 4.086}{\sin 4.086} = \frac{460}{\sin 4.086}$

$\sin 4.086 = 0.071253721$

$hyp = 6455.80 mm$ (4)

Ramp needs to be at least 6456mm

Supervisor sign off. The candidate:
Took the measurements independently using TAPE MEASURE PLUMBLINE (list equipment used)
and the measurements were accurate BD
Worked out the problems independently BD 25/10/14 (6)

Resource 'A'

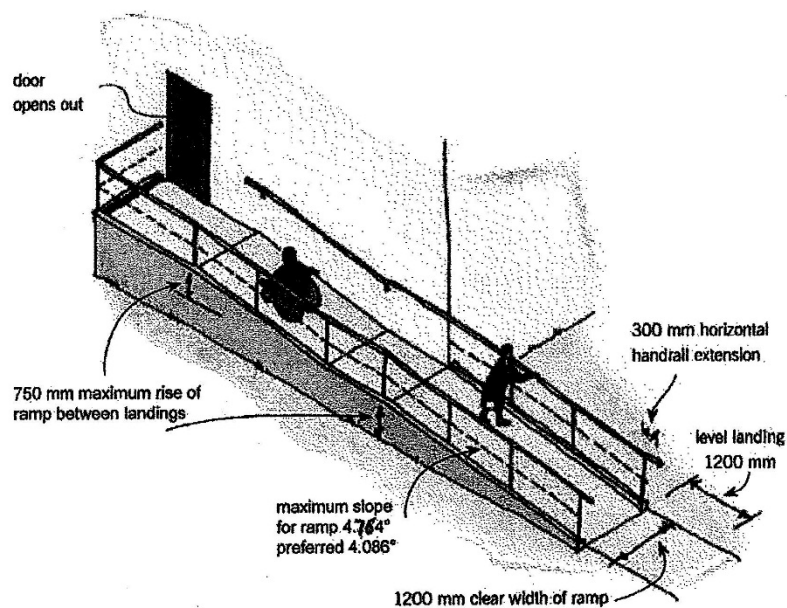Block course   Unit 5236

ACCESSIBILITY RAMPS

NZ Building Code

- If it has a gradient of **more than 1 in 20** (slope of **3.18°**) it's a RAMP.

- (If it has a gradient of less than 1 in 20, it's a footpath.)

Regulations for a **RAMP**:

- Ideal gradient is **1 in 14** (slope of **4.086°**)

- Maximum gradient is **1 in 12** (slope of **4.764°**)

- Ramp must be 1200mm wide

- Maximum rise of ramp between landings is 750mm

- Must have level landings (of 1200mm width & length) at top and bottom of ramp

door
opens out

300 mm horizontal
handrail extension

750 mm maximum rise of
ramp between landings

level landing
1200 mm

maximum slope
for ramp 4.764°
preferred 4.086°

1200 mm clear width of ramp

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	Meets Performance Criteria 1.1 and 1.2
6.	**Orange marmalade** This sample of learner evidence contributes to a portfolio of naturally occurring evidence generated within the context of a learning programme and over an acceptable period of time to meet the requirements of Guidance Information (GI) 2 and GI3. The evidence reflects skills described by step 5 of the *Measure and Interpret Shape and Space* strand of the Learning Progressions for Adult Numeracy (GI4). The activity meets the intent of the standard that the problems posed are in a real context and relevant to learners and/or everyday life. The learner has taken measurements of mass (1) and capacity (2) and used them in calculations (3) (4) to solve problems (5) (6) contributing evidence towards Outcome 1. The learner has selected and used appropriate and effective methods to reach a reasonable solution, see GI7 and Performance Criteria (PC) 1.2. By completing and signing the attestation on the learner work (7) the assessor has verified that the learner has taken accurate measurements without assistance, using appropriate measuring tools and units of measurement (PC1.1). This sample provides acceptable evidence of four of the seven range items required to meet Outcome 1: solving problems involving mass and capacity, as well as estimation (8) and conversion within the metric system (9).

Learner 6: PC 1.1 and 1.2

Orange Marmalade

Ingredients:

* 600g (approx. 6-8) small oranges, halved
* 1 lemon, juiced
* 1.4 l water
* 1.1kg caster sugar

You have been given some oranges and want to make marmalade. You will need to change the recipe to suit the amount of oranges you have .

1. Estimate the weight of the oranges   Take the measurements you need to work out how much sugar and water will be required for the recipe above given the amount of oranges you have. (5)

Estimation:

500 grams (8)

Actual measurement:

520 grams (1)

I took this measurement using....

digital scales

Show your calculations here:

$520 \div 600 = 0.86$ (3)

(9) $1.4 L$ water $= 1400 mL \times 0.86$ (5)

$= 1204 mL$ or $1.2 L$ water (9)

$1.1 kg$ sugar $= 1100$ gram $\times 0.86 = 946g$ sugar. (5)

(9)

I observed the learner taking a measurement of _weight_ using appropriate measuring devices and to an appropriate degree of accuracy.

14/4/14 (7)

2. How many jars of the same size will you need if your recipe makes about 1.4 litres of marmalade? (6)

Estimate how much each jar would hold. Then take measurements and make calculations to answer the problem.

I think the jar will hold (8)

about 400 mL

Actual Measurement: (2)

350 mL

I took this measurement ..... I poured water into the jar then into a measuring jug

Show your working here:

1·4 L = 1400 mL (9)

1400 ÷ 350 = 4 (4)

So 4 jars would be needed for 1·4 L of Marmalade. (6)

(7)

> I observed the learner taking a measurement of *capacity* using appropriate measuring devices and to an appropriate degree of accuracy.
>
> 16/4/14

	Meets Performance Criteria 1.1 and 1.2
7.	**Peeling the spuds** This sample of learner evidence contributes to a portfolio of naturally occurring evidence generated within the context of a foundation learning programme and over an acceptable period of time to meet the requirements of Guidance Information (GIs) 2 and 3. The evidence reflects skills described by step 5 of the *Measure and Interpret Shape and Space* strand of the Learning Progressions for Adult Numeracy (GI4). The activity meets the intent of the standard that the problems posed are in a real context and relevant to learners and/or everyday life. Measurements of mass (1) and time (2) have been taken and used in calculations (3) to solve the problems posed (4), thereby contributing evidence towards Outcome 1. The learner has independently chosen effective methods to use to reach a solution, see GI7 and Performance Criteria (PC) 1.2. The assessor has verified (5) that the learner has taken measurements (to an acceptable degree of accuracy), using appropriate measuring tools and units of measurement (PC1.1), and has judged the solutions to be reasonable (6). This sample provides acceptable evidence for three of the seven range items required to meet Outcome 1: solving problems involving mass and time, as well as conversion within the metric system (7).

Learner 7: PC 1.1 and 1.2

Peeling the spuds
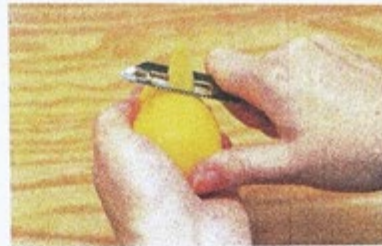
Mia is asked to help out at her local Marae. She is told her job will be to peel about 25kgs of potatoes for the day's meal.

She wants to know approximately how many potatoes she will need to peel and how much time she should allow to get the job done.

Take measurements to work out (approximately) how many potatoes she needs to peel and how much time she should allow to get the job done. ④

One potato = 124g ① (observed Kay 11/24/14) ⑤

25 kg = 25000g ⑦ 25000 ÷ 124 = 208.3 (209) ③

She will need to peel about 209 spuds.

Peeling one spud takes 28 secs ② (observed Kay 11/4/14) ⑤

209 x 28 = 5852 secs ③

5852 ÷ 60 = 97.5 mins (98 mins)

98 mins is 1 hour + 38 mins

Mia will need about 2 hours to get the spuds peeled – with a few short breaks to rest.

(Learner took accurate measurements and checked the reasonableness of answer by: ⑥

2 potatoes = 250
4 = 500
8 = 1kg   KDay
25 x 8 = 200   11/24/14)

peel 2 per minute
200 in 100 minutes).

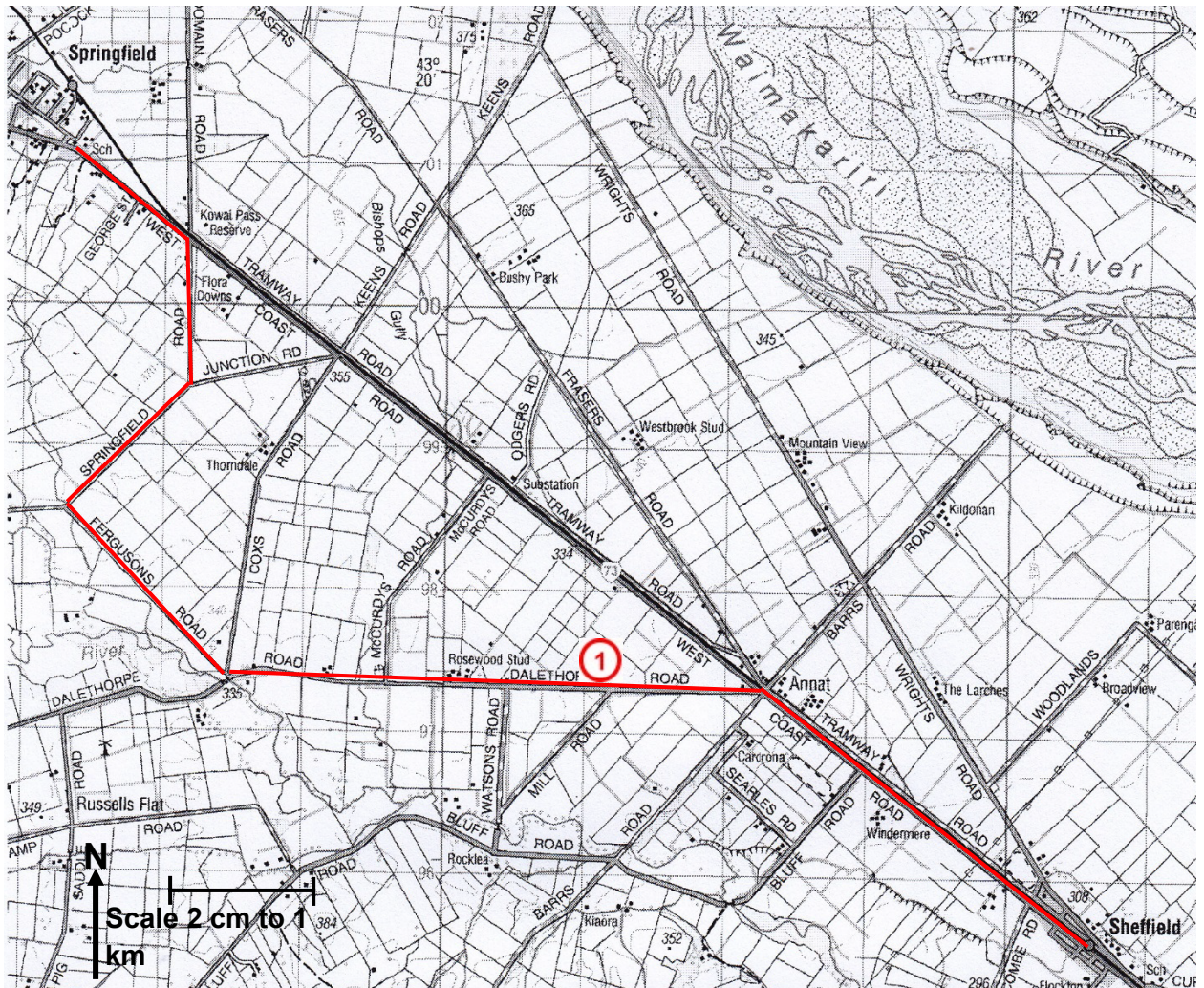|	Meets Requirements of Guidance Information 2, 3 and 4
8.	This sample of learner evidence contributes to a portfolio of naturally occurring evidence generated over an acceptable period of time to meet the requirements of Guidance Information (GI) 2 and GI3. The evidence reflects skills described by step 5 of the *Measure and Interpret Shape and Space* strand of the Learning Progressions for Adult Numeracy (GI4). This sample provides acceptable evidence for location as the learner has shown an understanding of location in terms of direction and distance in marking the sections of the ride on the map (1) in order to determine the finish point for the ride (2).

Learner 8: GI 2, 3 and 4

Susie belongs to a cycling club. One day they meet at Sheffield to start their ride.

The direction and distance of each section of the first part of the ride is shown in the table below:

Direction	Distance
310	2.8 km
W	3.7 km
NW	1.6 km
NE	1.2 km
N	1 km
310	1 km

Show Susie's ride on the map.
Where does this part of the ride finish?

Finishes at Sch   = School

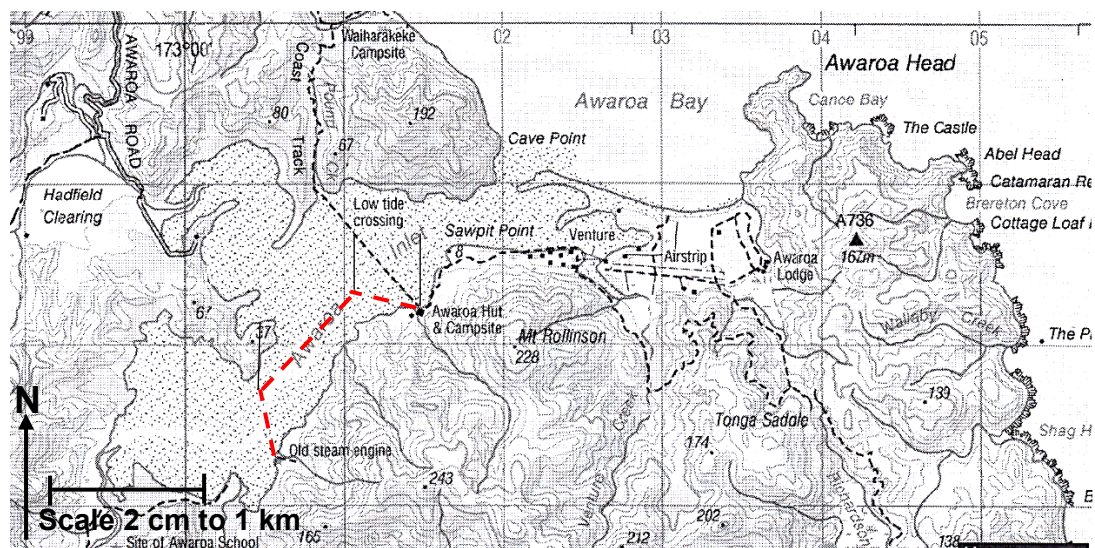|	Meets Requirements of Guidance Information 2, 3 and 4
9.	This sample of learner evidence contributes to a portfolio of naturally occurring evidence generated over an acceptable period of time to meet the requirements of Explanatory Notes (GIs) 2 and 3. The evidence reflects skills described by step 5 of the *Measure and Interpret Shape and Space* strand of the Learning Progressions for Adult Numeracy (GI4). This sample provides acceptable evidence for location as the learner has described the distance and direction of each section of the course (1). Directions have been described using bearings and the 8 point compass.

Learner 9: GI 2, 3 and 4
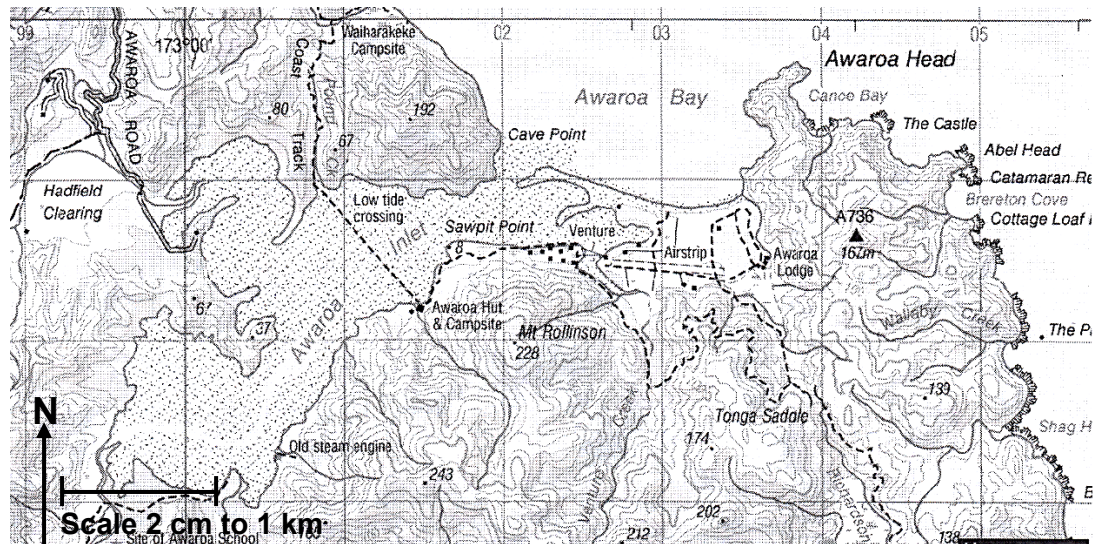
Daniel paddles his kayak in Awaroa Inlet.

He leaves Awaroa Hut & Campsite, paddles out into the inlet and then paddles to the site of the Old steam engine.

The map below shows a possible course for Daniel to paddle.
Write down the distance and direction for each section of the course.

2cm = 1000m

400m 290°

① then 900m S.W.

and 400m 170°