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 Evidence Requirements 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 Explanatory Note (EN) 2 and EN3. The evidence reflects skills described by step 5 of the *Measure and Interpret Shape and Space* strand of the Learning Progressions for Adult Numeracy (EN4).

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 EN5 and Evidence Requirement (ER) 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 (ER1.1). Although useful formulae 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 EN7, ER1.1 and ER1.2). The signed attestation by the supervisor (6) provides the information necessary to verify that these ERs 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).
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.

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: \( \tan x = \text{Opp}/\text{Adj} \quad \sin x = \text{Opp}/\text{Hyp} \quad \cos x = \text{Adj}/\text{Hyp} \)

I think the height of the tree is about 15m

\[ \tan \theta = \frac{\text{Opp}}{\text{Adj}} \]

measured \( \theta \) with the clinometer on my phone

\( \theta = 45^\circ \quad 4.5\text{m} \quad 45^\circ = 1 \)

4.5m \quad 5m

10m \times 1 = 10m

\( xc = 10m \)

Total height of tree is

10m + 1.49m = 11.49m

Teacher/tutor attestation

The estimation was made before any measurements were taken.

I observed learner 1 take these measurements without assistance, using clinometer app on iPhone and measuring tape.

The measurements taken were accurate (within an acceptable tolerance range).

Signed: [Name] (tutor/teacher) Date: 10/4/17

© NZQA 2017
Meets Evidence Requirements 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 Explanatory Notes (ENs) 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 (EN4).

The problem (1) has a useful, real life purpose, which meets EN1 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 EN7 and Evidence Requirement (ER) 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 ER1.1.

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: ER 1.1 and 1.2

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.

1. Walls: $7 \times 2.4 \times 2 = 67.2 \text{ m}^2$
   Window: $3 \times 2 = 6 \text{ m}^2$
   Door: $0.95 \times 2.08 = 1.976 \text{ m}^2$

2. Total area to paint: $67.2 \text{ m}^2 - 1.976 \text{ m}^2$
   $= 59.224 \text{ m}^2$

3. $60 \text{ m}^2 \times 2 = 120 \text{ m}^2$ (for 2 coats)

4. $120 \div 12 = 10$

5. So 10 litres paint needed

(Check: $7 \times 2 \times 1 \times 2 = 56 \times 2 = 112$

6. $12 \times 10 = 120$

I observed the student taking measurements. The measurements were accurate.

Tutor: 7/6/14

© NZQA 2017
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Meets Evidence Requirements 1.1 and 1.2</td>
<td></td>
</tr>
<tr>
<td><strong>3. Grass seed</strong></td>
<td></td>
</tr>
<tr>
<td>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 Explanatory Notes (EN) 2 and EN3. The evidence reflects skills described by step 5 of the Measure and Interpret Shape and Space strand of the Learning Progressions for Adult Numeracy (EN4).</td>
<td></td>
</tr>
<tr>
<td>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).</td>
<td></td>
</tr>
<tr>
<td>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).</td>
<td></td>
</tr>
<tr>
<td>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).</td>
<td></td>
</tr>
</tbody>
</table>
Learner 3: ER 1.1 and 1.2

**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:** ___________

**Description of situation in which problem occurred:**  
*e.g. Cert hospitality - menu planning module (costs of different menu options)*  
**Problem being solved:**  
*e.g. How much waste will there be from 1 kg unprocessed potatoes for pommes parmanoise?*

1. **How much grass seed is needed?**

**Measuring equipment selected & used:**  
*e.g. Kitchen scales*

**Any preparation of equipment done:**  
*e.g. Zeroed scales*

---

**Outcome 1: Use measurement to solve problems**

I observed the learner take the following measurements:

- Record what was measured, and the actual measurement(s) taken.  
  *e.g. Weighed unprocessed potato (379 g); prepared potato for pommes parmanoise; weighed waste potato (135 g).*

2. **Paced out length and width of area to be sown.**

3. **Measured 1 pace to be about 0.8 m (used metric ruler).**

4. **Note: a high degree of accuracy not required.**

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

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

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 x 1000 g; Calculated how many times weight of unprocessed potato goes into 1 kg (1000 g/379 g = 2.7 rounded); multiplied waste weight by this figure (135 g x 2.7 = 364.5 g)*

7. **Calculated area to be sown**  
   *Convered pace to metres.*

8. **Used coverage rate of 5 kg/100m² to calculate amount of grass seed needed.**

9. **(see Learner Work)*

10. **The learner’s solution to the problem was:**  
    *Record their solution.*

11. **e.g. About 365 g waste per 1 kg unprocessed potato.*

12. **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 calculations**

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

© NZQA 2017

© NZQA 26627 observation sheet: version 2014/1

Page 1 of 1
Exemplar for internal assessment resource Numeracy for Unit Standard 26627

**Grass Seed 26627**

**Higher Work - Grass Seed Problem (see observation sheet)**

```
13.6 m x 41.6 m = 565.76 sq m
= 566 approx

(Grass Seed) = 5.66 x 5 kg
(Required) = 28.3 kg
```

© NZQA 2017
<table>
<thead>
<tr>
<th>4.</th>
<th><strong>Ramp 1</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>This sample of learner work contributes to a portfolio of evidence generated over an acceptable period of time, see Explanatory Note (EN) 3. The evidence presented is naturally occurring, from an assessment of standard 5236 (EN 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 (EN4).</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>The measuring tool and the units used are appropriate to the problem and context (ER1.1). The signed attestation by the supervisor (6) provides the information necessary to verify that ER1.1 and ER1.2 have been met.</td>
<td></td>
</tr>
<tr>
<td>This sample provides acceptable evidence for two of the seven range items required to meet Outcome 1: solving problems involving length and angle.</td>
<td></td>
</tr>
</tbody>
</table>
Learner 4: ER 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.

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

\[ \tan \theta = \frac{\text{opp}}{\text{adj}} \]
\[ \theta = \tan^{-1}(\frac{\text{opp}}{\text{adj}}) \]
\[ \theta = \tan^{-1}(\frac{1560}{4470}) \]
\[ \theta = 19.239^\circ \]

Is it legal? No

why? The slope angle is too high (19.239° instead of 4.7°)

Supervisor sign-off - The candidate:
- took the measurements by themselves, using the MEASURE, PLUMB LINE, LEVEL and equipment used, and the measurements were accurate. Signed
- worked out the problem/s by themselves. Signed

© NZQA 2017
Ramp 2

This sample of learner work contributes to a portfolio of evidence generated over an acceptable period of time EN3. The evidence presented is naturally occurring, from an assessment of standard 5236 as part of a Trades Block course (EN 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 (EN4).

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 (ER1.1) and the signed attestation by the supervisor (6) provides the information necessary to verify that ER1.1 and ER1.2 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: ER 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.

2. Ramp needs to be at least 645.6 mm.

3. \[
\tan 4.086° = \frac{140}{x}
\]

4. \[
\cos 4.086° = \frac{140}{x}
\]

5. \[
\sin 4.086° = \frac{140}{x}
\]

6. Supervisor sign off. The candidate:

   Took the measurements independently using the equipment provided and the measurements were accurate.
   Worked out the problems independently.
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

© BUILD December 2007/January 2008
<table>
<thead>
<tr>
<th></th>
<th>Meets Evidence Requirements 1.1 and 1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.</td>
<td><strong>Orange marmalade</strong></td>
</tr>
</tbody>
</table>

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 Explanatory Note (EN) 2 and EN3. The evidence reflects skills described by step 5 of the Measure and Interpret Shape and Space strand of the Learning Progressions for Adult Numeracy (EN4). 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 EN7 and Evidence Requirement (ER) 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 (ER1.1).

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: ER 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.

   **Estimation:**
   - 500 grams

2. **Actual measurement:**
   - 520 grams

3. I took this measurement using:
   - digital scales

4. **Show your calculations here:**
   
   \[
   \text{520 g} \div 500 = 0.86
   \]
   
   1.4 L water = 1400 mL \times 0.86
   
   = 1204 mL or 1.2 L water

   1.1 kg sugar = 1100 g \times 0.86 = 946 g sugar

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

© NZQA 2017
2. How many jars of the same size will you need if your recipe makes about 1.4 litres of marmalade?  

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

I think the jar will hold

about 400 mL  

Actual Measurement:

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

1400 ÷ 350 = 4

So 4 jars would be needed for 1.4 L of marmalade.  

© NZQA 2017
Meets Evidence Requirements 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 Explanatory Notes (ENs) 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 (EN4). 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 EN7 and Evidence Requirement (ER) 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 (ER1.1), 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).
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.

1. One potato = 1.24kg
2. 25 kg = 25000g
3. $25000 \div 124 = 208.3 \ (209)$
4. She will need to peel about 209 spuds.
5. Peeling one spud takes 28 secs
6. $209 \times 28 = 5852 \ \text{secs}$
7. $5852 \div 60 = 97.5 \ \text{mins} (98 \ \text{min})$
8. 98 mins is 1 hour + 38 mins

Mia will need about 2 hours to get the spuds peeled - with a few short breaks to not.

(Leanne took accurate measurements and checked the reasonableness of answer by:
2 potatoes = 2.50
5 = 5.00
25 x $\frac{2}{5} = 200$
peel 2 per-minute $\frac{200}{100} \text{ mins}$.)
<table>
<thead>
<tr>
<th></th>
<th>Meets Requirements of Explanatory Notes 2, 3 and 4</th>
</tr>
</thead>
</table>
| 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 Explanatory Note (EN) 2 and EN3. The evidence reflects skills described by step 5 of the *Measure and Interpret Shape and Space* strand of the Learning Progressions for Adult Numeracy (EN4).

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).
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:

<table>
<thead>
<tr>
<th>Direction</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>310</td>
<td>2.8 km</td>
</tr>
<tr>
<td>W</td>
<td>3.7 km</td>
</tr>
<tr>
<td>NW</td>
<td>1.6 km</td>
</tr>
<tr>
<td>NE</td>
<td>1.2 km</td>
</tr>
<tr>
<td>N</td>
<td>1 km</td>
</tr>
<tr>
<td>310</td>
<td>1 km</td>
</tr>
</tbody>
</table>
Show Susie’s ride on the map.
Where does this part of the ride finish?
<table>
<thead>
<tr>
<th></th>
<th>Meets Requirements of Explanatory Notes 2, 3 and 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.</td>
<td>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 (ENs) 2 and 3. The evidence reflects skills described by step 5 of the <em>Measure and Interpret Shape and Space</em> strand of the Learning Progressions for Adult Numeracy (EN4). 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.</td>
</tr>
</tbody>
</table>
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.
2 cm = 1000 m

400 m 290°

then 900 m S.W.

and 1000 m 170°