

## Instructions for administering the Assessment Options

The purpose of the assessments is to find out what students know and can do, beyond whether they get the correct answers. Each task is marked using a detailed scoring rubric provided with the assessment options. The total score obtained by a student can be mapped to the *Learning Assessment Framework for Multiplicative Thinking* (LAF) using the Raw Score Translator for that option.

**Please read the following instructions carefully before using any of the Assessment Options for Multiplicative Thinking.**

### Before using the Assessment Option

**Allocate sufficient time** - For the assessment to be a valid reflection of students' multiplicative thinking, it is essential that all students have sufficient time to do as much as they can on each task.

The tasks have been designed to be given over three to four sessions within a 1 to 2-week period. For instance, many teachers do the extended task in one teaching session then one or two of the shorter tasks at the start of subsequent teaching sessions.

While teachers may choose to do more than one task per session, it is suggested that no more than two tasks be attempted in any one session unless the session is more than one hour long. In general, 30 minutes seems to be sufficient for most students to do what they can on the extended task and 10-15 minutes seems to be sufficient for student to do as much as they can on the shorter tasks.

**Prepare the materials** - You will need to photocopy as many copies of the assessment tasks as needed. These should be prepared as booklets (i.e., printed and stapled) so that individual student work can be kept together [Note: students do not need copies of the Scoring Rubrics, Student Score sheet or Raw Score Translator].

**Prepare the class** - Treat this as you would a normal classroom activity. Try to avoid using the word 'test' and stress that the purpose of doing this is to inform future teaching.

Students should have access to pens, pencils, and erasers. Rulers may be used but they are not essential. Calculators and rulers are **not** needed.

**Use the Sample Question** - Many students are reluctant to write explanations or show their working and need to be encouraged to provide as much evidence of their mathematical thinking as possible.

The worked example below should be discussed with students to make sure that they understand what is expected of them prior to the assessment. Show and discuss the four student responses and use the scoring rubric with the class to score each response, noting that diagrams, words or symbols may be used.

In particular, it is important that students understand what is meant by the instructions:

- "Show all your working and explain your answer in as much detail as possible."
- "Explain your reasoning using as much mathematics as you can."
- "Use as much mathematics as you can to support your answer."

### SAMPLE QUESTION

A gecko is about 8 cm long.

A frilled-neck lizard is about 6 times as long as a gecko.

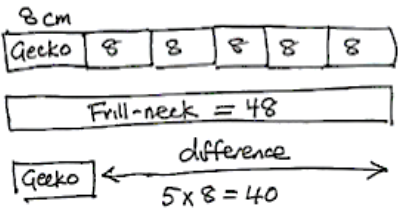
The difference between the length of a frilled-neck lizard and a gecko is about

- 2 cm       14 cm       40 cm       48 cm

Explain your reasoning using as much mathematics as you can (you may use a diagram if you wish)

(ACARA, 2013)

#### Four Student Responses:

<p>Student 1.</p> <p style="margin-top: 20px;"><i>40 cm</i></p>	<p>Student 2.</p> <p style="margin-top: 20px;"><i>40 cm because I added them and subtracted</i></p>
<p>Student 3.</p> <p style="margin-top: 20px;"><i>40 cm. Frill neck is 6 geckos so <math>6 \times 8 = 48</math>. Difference is <math>48 - 8 = 40</math></i></p>	<p>Student 4.</p>  <p>The diagram shows three horizontal bars. The top bar is labeled '8 cm' and 'Gecko' and is divided into six segments, each containing the number '8'. The middle bar is labeled 'Frill-neck = 48' and is a single solid bar. The bottom bar is labeled 'Gecko' and is a single solid bar. A double-headed arrow between the end of the bottom bar and the end of the middle bar is labeled 'difference' and '<math>5 \times 8 = 40</math>'.</p>

#### Scoring Rubric:

0	No response or irrelevant response
1	Correct (40 cm) but no reasoning or explanation provided
2	Correct, incomplete reasoning or an operational description given
3	Correct, correct reasoning using words, diagram or symbols

## Using the Assessment Option

**Distribute the booklets.** Stress that the purpose of doing this is to inform future teaching – it is in the student’s best interests to do as well as they can and not copy. Go through the instructions on the second page of the assessment booklet.

**Encourage working** - Students are expected record all of their work in the Assessment Option booklet so there is **no need** for scrap paper or jotters etc. Encourage students to explain their reasoning using words, diagrams, or equations.

Additional space should not be needed but if so, advise students to use the back of the previous page (if booklets single sided) or find another space but make sure work is labelled. A single line should be placed through any rejected work (i.e. not obliterated or rubbed out) as it could provide some clues to students’ thinking.

**Student support** - The object of the exercise is not that students get the right answer, but that they are given an opportunity to demonstrate what they actually do know and can do largely on their own.

Teachers can support students by answering questions without telling them what to do. Avoid providing so much support that students are able to complete the task with little understanding of what they are doing or why.

Teachers may:

- read the task to any student with reading problems
- scribe an oral explanation for students whose thinking may not otherwise be fairly represented
- explain unusual words as required.

Keep unfinished Option booklets in a safe place and ensure as far as possible that all students have an opportunity to attempt all tasks.do as much as they possibluy can

## After using the Assessment Option

**Collect booklets** – Before collecting the booklets for the final time, make sure that each student has had sufficient time to do as much as they possibly can – this is about determining what they know and can do – it should not be what they can do in a set period of time.

**Mark student work** – wherever possible work with colleagues to do this using the option-specific Scoring Rubrics (included with each Assessment Option). Record student scores on the Student Score Sheet, noting any interesting responses/observations in the comments column.

**Match to LAF** - When the marking is completed, the student’s total score can be compared to the option-specific Raw Score Translator (included with each Assessment Option). This will assign the student’s performance to a Zone in the Learning Assessment Framework for Multiplicative Thinking.

**Note:** There may be a small number of students who receive a zero score or a perfect score. Assuming this represents the best they can do, all that can be said about these students is that they are either below Zone 1 or above Zone 8.

## Where to next?

Refer to the teaching advice, that is, the **Learning Assessment Framework for Multiplicative Thinking 2021 (LAF)** to determine a starting point for teaching and/or targeted intervention. See below for a description and link to this and the related resources.

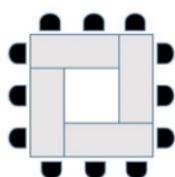
## Student work samples

The following responses are provided as a guide to the use of the Scoring Rubrics.

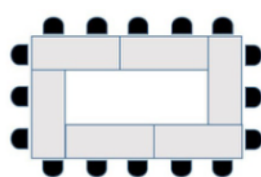
### Board Room Tables ...

The diagrams below show how these tables can be arranged for different numbers of people.

(No one sits inside the arrangement.)



Size 1  
4 tables  
12 people



Size 2  
6 tables  
16 people



Size 3  
8 tables  
20 people

[ABRT2]

How many tables are in a Size 4 arrangement? 10 tables

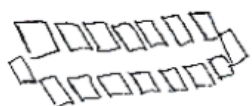


This item is scored on a 0,1 basis. The response is correct, so it is scored as a 1

[ABRT3]

How many tables are in a Size 7 arrangement? 16 tables

Explain your reasoning.



There are 7 tables on each side  $(2 \times 7 = 14)$  + the two tables at each end which connect them = 16.

This item is scored on a 0,1,2 basis. The response is scored as a 2 as although a diagram is not mentioned in the rubric, it is supported by words

(A874)

Write down in words or symbols a rule for working out the number of tables when you know the Size number.

Size number  $\times 2 =$  ans  
ans  $\div 2 =$  number of tables.

This item is scored on a 0,1,2 basis. The response is "correct, evidence of multiplicative thinking expressed in words (e.g., *two times the Size number plus two*) or in symbols (e.g.,  $N = 2 \times \text{size} + 2$ )" so it is scored as a 2.

(A875)

Write down in words or symbols a rule for working out the table Size given the number of tables.

$\frac{\text{Number of tables}}{2} = \text{ans}$   
ans  $\times 2 =$  table size

This item is scored on a 0,1,2 basis. It is scored as a 2 as there is evidence of multiplicative thinking expressed in words. However, it is worth noting that this student appears to have difficulty constructing/expressing a pattern more formally

(A876)

John said he needed 13 tables to set up for his meeting. Could John be correct? Explain how you know.

No, he could not as the amount of tables need for a size of 6 would be 14 and the tables needed for a size of 5 is 12, there is no inbetween.

This item is scored on a 0,1,2,3 basis. It is scored as a 3 as it recognises the relationship between table size and number of tables

(A877)

What Size arrangement is needed to seat 72 people? Explain your reasoning.

~~72 - 4 = 68~~  
 ~~$\frac{68}{2} = 34$~~

$$72 - 4 = 68$$

$$\frac{68}{2} = 34$$

size 34 is needed.

This item is scored on a 0,1,2,3 basis. It is scored as a 1 as although it is incorrect, it is not entirely irrelevant. This response is worth investigating, it appears as though the student has used an inappropriate generalisation. Note also, the two-step solution rather than the use of a pattern

(A878)

Write down in words or symbols a rule for working out the Size of the arrangement when you know the number of people.

Number of people  $- 4 =$  ans  
 $\frac{\text{ans}}{2} =$  size of arrangement.

This item is scored on a 0,1,2,3 basis. It is scored as a 1 as although it is incorrect, it recognises that division and subtraction are involved. This response is worth investigating for the same reasons as above