Example assessment task
Level 3 – Mathematical modelling

Overview

Mathematical modelling is a process in which mathematics is used to express a real-life situation and solve related problems, interpreting the solutions in context. The selection of relevant mathematics is central to the solution process. In this assessment task the context is estimating and calculating quantities, costs and time for a ‘Taco Tuesday’ dinner with a small group of friends, and involves additive and multiplicative situations.

Multiplication may be considered as repeated addition. Division is the process of partitioning a finite set into subsets of equal size and can be expressed in terms of the number of groups (partitioning) or the number within each group (quotient). Multiplication and division are inverse operations and at times may be applied to the same context.

This example assessment task requires students to model a practical problem, drawing on their understanding of multiplication in a financial context. This includes:

* making estimates in the problem context
* modelling situations and formulating problems involving multiplicative situations
* making and testing assumptions about the practical problem
* expressing a practical problem as a number sentence, using known facts
* representing thinking using diagrams, arrays and number sentences
* using a variety of calculation strategies to find a solution
* solving practical problems using these processes and interpreting solutions in context.

Curriculum connection (Victorian Curriculum Mathematics Version 2.0)

|  |  |
| --- | --- |
| Level 3 achievement standard (linked sentences) d | Level 3 content descriptions |
| They use a range of strategies to apply mathematical modelling to solve practical problems involving single-digit multiplication and division, recalling multiplication facts for twos, threes, fours, fives and tens. | use mathematical modelling to solve practical problems involving additive and multiplicative situations, including financial contexts; formulate problems using number sentences and choose calculation strategies, using digital tools where appropriate; interpret and communicate solutions in terms of the situationVC2M3N08 |
| They make estimates and determine the reasonableness of financial and other calculations. | estimate the quantity of objects in collections and make estimates when solving problems to determine the reasonableness of calculationsVC2M3N06 |

Equipment and duration

The example assessment task is designed to be completed individually or in small groups and completed over 1 to 2 lessons of 60-minute duration. Students can access manipulatives and digital tools as appropriate.

Assessment task, with teacher notes

Taco Tuesdays

**Part A: Estimating servings**

Henry is planning a ‘Taco Tuesday’ night with friends and is wondering how much it might cost.

Help Henry estimate the number of servings.

1. How many tacos might each person eat?
2. Will everyone want some cheese, black beans and salsa?
3. How many cans of drink might each person have?
4. Are there other items Henry might need to consider when planning this meal for his friends?

Three friends have confirmed they are coming to dinner.

1. Use your estimates from above to complete the table below.

|  |  |
| --- | --- |
| Item | Total number needed |
| taco shells |  |
| taco meat filling (serves) |  |
| black beans (cans) |  |
| shredded cheese (packets) |  |
| salsa (jars) |  |
| soft drink (cans |  |

**Teacher notes**

This part of the task addresses the VC2M3N06 content description ‘estimate the quantity of objects in collections and make estimates when solving problems to determine the reasonableness of calculations’ through the requirement to identify what and how much people will eat or drink and use this assumption to develop an estimate for the number of items needed.

Before implementing this task with your class, take some time to set the scene and context. Encourage students to ask questions about the scenario to determine relevance to the context, and to ensure students understand the different variables they may need to consider (time, hunger levels, dietary requirements etc.).

If required, students may need to be guided to recognise that Henry is to be included in the count. For example, if 3 friends were coming to dinner Henry would be preparing a meal for 4. The number of friends coming to the dinner can be adjusted to suit the cohort.

This task involves:

making estimates

identifying and understanding the practical aspects of the context

using single-digit multiplication for fours facts.

**Part B: Estimating and calculating the cost**

Henry has chosen a recipe and now needs to go shopping for the ingredients and drinks.

He looks through 2 grocery store catalogues, from Greens and Corner Store, and records the following information.

|  |  |  |
| --- | --- | --- |
| Items | Greens | Corner Store |
| taco shells | $6.00 (8-pack) | $3.50 (6-pack) |
| taco meat filling  | $1.50 per taco | $1.75 per taco |
| black beans (can) | $2.00  | $1.80  |
| shredded cheese (packet) | $5.00  | $4.00  |
| salsa (jar) | $4.50 | $4.50 |
| soft drink (cans) | $15 (12-pack) | $8 (6-pack) |

1. Estimate the approximate cost of the dinner based on your answers to **Part A**.
2. Calculate the total cost if Henry shopped at Greens.
3. Calculate the total cost if Henry shopped at Corner Store.
4. Was your estimate reasonable? Explain your thinking.

**Teacher notes**

This part of the task addresses the aspects of the achievement standard ‘use a range of strategies to apply mathematical modelling to solve practical problems involving single-digit multiplication’ and ‘make estimates and determine the reasonableness of financial and other calculations’.

Students could represent their calculations using repeated addition, arrays, bar models and algorithms. It is intended that students express their calculations as number sentences for part **ii.** and part **iii.** and understand the purpose of translating the problem context into a mathematical equation (VC2M3N08 ‘formulate problems using number sentences and choose calculation strategies’). Using a combination of strategies might demonstrate areas or gaps in thinking that may not otherwise be observed, or indicate steps for further learning.

The prices of items have been developed to encourage students to use known facts for twos, threes, fours and fives. This can be adjusted to suit the student cohort.

Part **i.** and part **iv.** are included here to meaningfully apply estimation before calculating the total cost of items to purchase. These 2 aspects address the content description VC2M3N06 ‘estimate the quantity of objects in collections and make estimates when solving problems to determine the reasonableness of calculations’.

This task involves:

applying mathematical modelling to a practical problem

using single-digit multiplication facts for twos, fours, fives and tens

making estimates

using a range of calculation strategies

solving practical problems.

**Part C: Determining the best place to shop**

Explain which store Henry should choose to shop from and why.

**Teacher notes**

This part of the task addresses the aspect of the VC2M3N08 content description ‘interpret and communicate solutions in terms of the situation’ through the requirement that students justify their decision-making in relation to the total cost of items. They may consider the advantages and disadvantages of shopping at either store before determining a final outcome.

This task involves:

solving practical problems and interpreting solutions in context

using mathematical models to report a solution about the problem context.

**Part D: Estimating time to prepare**

If Henry has told his friends to come over at 6pm, when should he begin to make the tacos? Think about how long it will take to prepare any of the ingredients as well as the number of tacos needed.

**Teacher notes**

This part of the task addresses the aspects of the achievement standard ‘use a range of strategies to apply mathematical modelling to solve practical problems’ and ‘make estimates and determine the reasonableness of financial and other calculations’.

Encourage students to consider different variables that may (or may not) affect the time needed to prepare the tacos. The purpose of this question is to see whether students can identify and understand the practical aspects of the context and then estimate and develop a model using a range of calculation strategies. This may include noting when Henry returns from the store, how much time is needed to prepare one taco, what Henry will do if someone arrives early, and leaving enough time to clean up before his friends arrive for dinner, to name a few.

This task involves:

identifying and understanding the practical aspects of the context

making estimates

using single-digit multiplication facts for twos, fives and tens.

**► A student version of the assessment task has been included in the following pages.**

Assessment task: Mathematical modelling

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| salsa (jars) |  |
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**Part B: Estimating and calculating the cost**

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**Part C: Determining the best place to shop**

Explain which store Henry should choose to shop from and why.

**Part D: Estimating time to prepare**

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