

NCEA Numeracy Level 1 Number

Estimating answers to calculations

Content

This resource supports the teaching and learning of estimating answers to multiplication calculations. The sequence is suitable for learners in any context where multiplication calculations are used to solve problems. A numerate person is able to judge if a context requires an estimated answer or an exact answer and should always estimate the answer to a calculation solved using an algorithm or calculator. This sequence is also suitable where tutors are gathering naturally occurring evidence for the achievement of the Numeracy Level 1 Unit Standard 26623.

Alignment

The content aligns with Step 5 of the *Make Sense of Number to Solve Problems* strand of the Learning Progressions, in particular the *Multiplicative Strategies* Progression where reference is made to justifying the reasonableness of answers to problems solved using an algorithm or calculator. Before beginning this teaching and learning sequence learners should be able to multiply and divide by powers of 10.

Vocab

In maths an algorithm refers to a step-by-step process for completing a calculation.

Intent

After completing the teaching and learning sequence learners will be able to estimate answers to multiplication problems.

Sequence

There are four parts to this sequence. Learners will:

1. understand why estimating an answer to a calculation is an important skill
2. understand how to round a number in order to estimate an answer
3. use their knowledge of multiplying by powers of 10 to multiply rounded numbers
4. practise estimating answers to problems involving multiplication.

1. *Understand why estimating an answer to a calculation is an important skill*

Step one: Select a problem from your context which requires multiplication of multi-digit whole or decimal numbers or use the problem below.

A builder needs 1286 lengths of timber which measure 1.84 metres (m) each.

Step two: Ask learners whether the problem needs an exact or an approximate answer. Possibilities include that, if it is was for a one-off project using specialised timber, you may need an exact calculation. If, however, it was for a job for which you are always buying timber by the pallet load then you may only need an estimate to make sure you have enough timber on hand.

Step three: Ask learners how they would do the calculation if they were working out an exact answer. Listen for the responses of ‘using a calculator’ or ‘using a pen and paper’. Ask learners, if they were to use a calculator or pen and paper, how they would know the answer was correct. Listen for the response – or prompt if needed – that they need to be able to make a rough estimate of the answer.

2. *Understand how to round a number in order to estimate an answer*

Step one: Ask learners to discuss in pairs how they would make a rough estimate of 1286 lengths of 1.84m and share their strategies. These may include “it’s roughly 1000 lots of 2m” or “it’s roughly 1300 lots of 2m”. Discuss the key learning point below.

Key learning point

Usually, when rounding, the number is written with only the first digit and this digit is held in the right place by 0s. Rounding to two digits is possible, as in the example, and gives a more accurate estimate, but if the calculation becomes difficult with two digits, then one digit is preferable.

When rounding, look at the digit next to your first or second digit – if it is less than 5, the first or second digit stays the same. If it is 5 or more, the first or second digit increases by 1.

So, if we round 1286m to the first digit it becomes 1000m, because 2 is less than 5. If we round 1286m to two digits it becomes 1300m, because the next digit, 8, is more than 5.

Step two: Give learners lots of examples to practise.

Total length of 489 lengths of 2.3m ($500 \times 2\text{m}$ [1 digit] is probably easier than $490 \times 2\text{m}$ [2 digits])

Total cost of 365 bottles at \$7.77 per bottle ($400 \times \8)

Total weight of 764 pallets each weighing 922kg ($800 \times 900\text{kg}$)

Step three: Ask learners to discuss in pairs how they would make a rough estimate of 2496 lengths of 0.047m and share their strategies. The estimate should be 2000 or 2500×0.05 . Draw attention to the key learning point below.

Key learning point

Round to the first digit that is not 0.

If this point was not applied in the example the estimate would be 2000 or 2500 x 0 which gives an answer of 0.

Step four: Give learners examples to practise.

Total length of 262 tiles with a length of 0.85m (300 x 0.9)

Total cost of 39 tiles at \$0.043 per tile (40 x \$0.04)

Total amount of beer with 460 cans of beer each containing 0.25L (500 x 0.3L)

3. Use learners' knowledge of multiplying by powers of 10 to multiply rounded numbers

Step one: Ask learners to share how they multiply and divide by powers of 10. Suggest the use of a place value chart as a useful strategy. See the resource: [Multiplying and dividing by powers of 10 using a place value chart](#). Give learners some examples to practise.

Key learning point

On a place value chart:

To multiply by 10, move the number one place to the left

To multiply by 100, move the number two places to the left

To multiply by 1000, move the number three places to the left

Step two: Model the calculations below using a place value chart.

Total cost of 365 bottles at \$7.77 per bottle (400 x \$8)

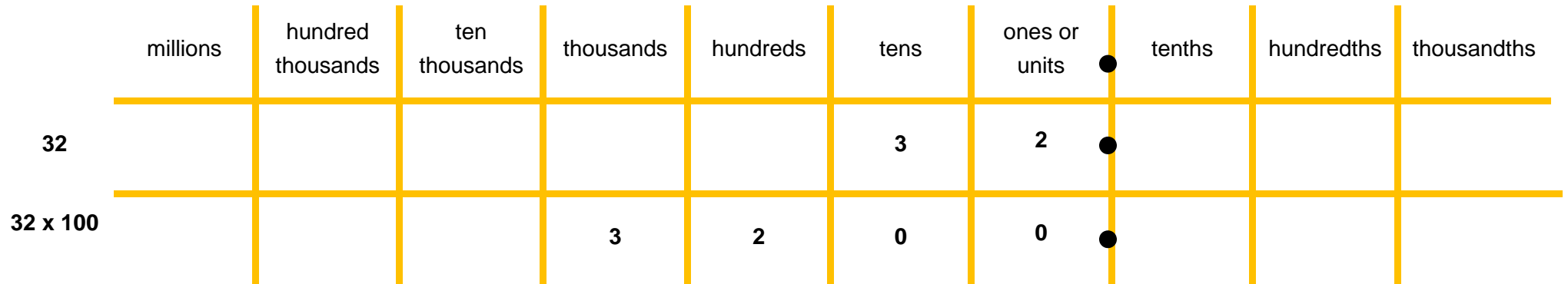
Total weight of 764 pallets each weighing 922kg (800 x 900kg)

Total length of 262 tiles with a length of 0.85m (300 x 0.9)

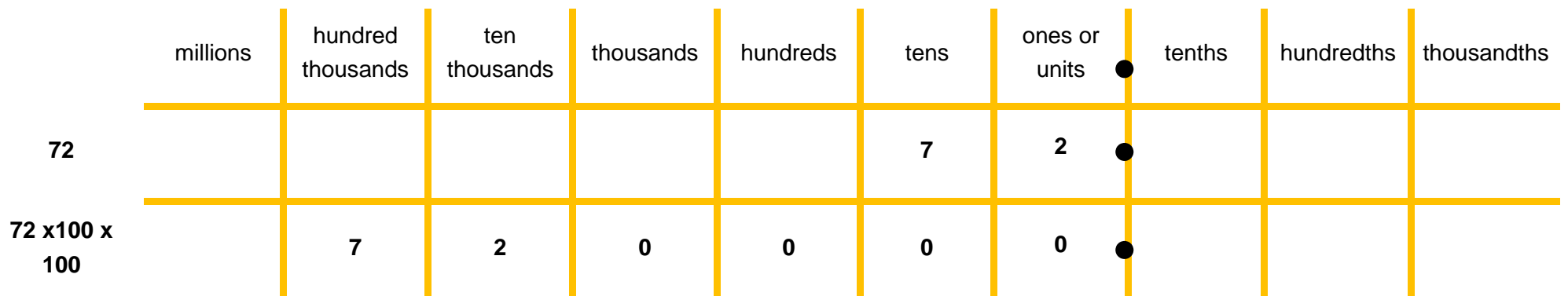
Total cost of 39 tiles at \$0.043 per tile (40 x \$0.04)

Place Value Chart

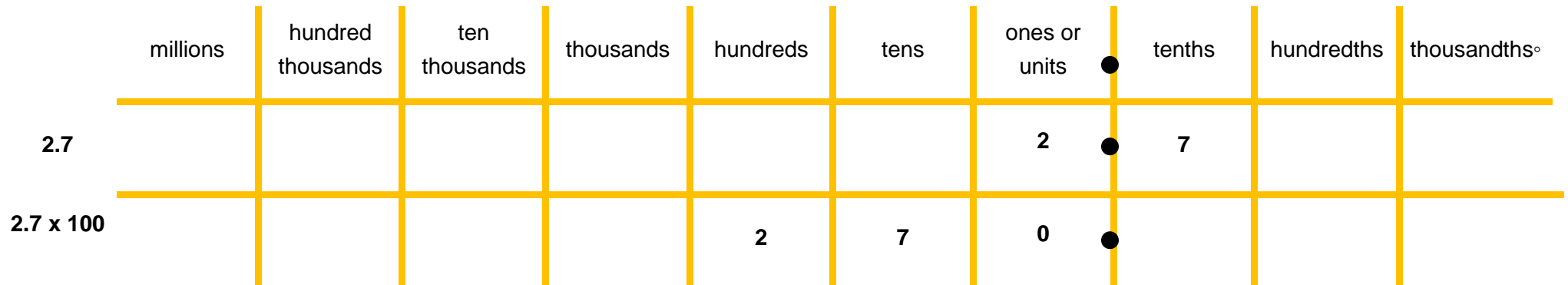
1. Total cost of 365 bottles at \$7.77 per bottle is approximately $400 \times \$8 = \$4 \times 8 \times 100 = 32 \times 100 = \mathbf{3200}$



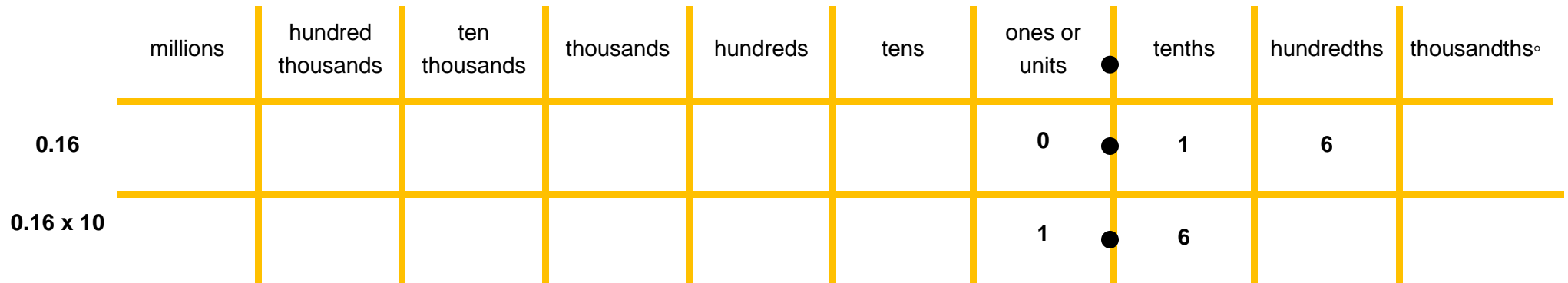
2. Total weight of 764 pallets each weighing 922kg is approximately $800 \times 900\text{kg} = 8 \times 9 \times 100 \times 100 = 72 \times 100 \times 100 = \mathbf{720\ 000\text{kg}}$



3. Total length of 262 tiles with a length of 0.85m is approximately $300 \times 0.9 = 3 \times 0.9 \times 100 = 2.7 \times 100 = \mathbf{270m}$



4. Total cost of 39 tiles at \$0.043 per tile is approximately $40 \times \$0.04 = 4 \times \$0.04 \times 10 = \$0.16 \times 10$



4. Practise estimating answers to problems involving multiplication

Give learners the problems below to practise or choose some from your context.

Total cost of 942 packets at \$21.46 per packet (900 x \$20 is \$1800)

Total weight of 1550 boxes each weighing 862kg (2000 x 900kg is 1800000kg)

Total length of 84 tiles with a length of 0.062m (80 x 0.06 is 4.8m)

Total cost of 485 bars of chocolate at \$0.75 per bar (500 x \$0.8 is \$400)