

Stage 3 Maths Program

Term 2 Week 2

NSW K-10 Mathematics Syllabus Outcomes

Multiplication and Division (1)

MA3-6NA - Selects and applies appropriate strategies for multiplication and division, and applies the order of operations to calculations involving more than one operation

- Use and record a range of mental and written strategies to divide numbers with three or more digits by a one-digit operator, including problems that result in a remainder
- Use the formal algorithm for multiplication by one- and two-digit operators

Volume and Capacity (1) – relate to 3D Space

MA3-11MG - Selects and uses the appropriate unit to estimate, measure and calculate volumes and capacities, and converts between units of capacity

- Use cubic centimetres and cubic metres to measure and estimate volumes
- Select and use appropriate units to measure volume
- Record volumes using the abbreviations cm^3 and m^3

Working Mathematically

- MA3-1WM - Describes and represents mathematical situations in a variety of ways using mathematical terminology and some conventions
- MA3-2WM - Selects and applies appropriate problem-solving strategies, including the use of digital technologies, in undertaking investigations
- MA3-3WM - Gives a valid reason for supporting one possible solution over another

Learning Goal - Multiplication and Division (refer to outcome)

Success Criteria - Multiplication and Division (refer to indicators)

TIB -

Learning Goal - Volume and Capacity (refer to outcome)

Success Criteria - Volume and Capacity (refer to indicators)

TIB -

Assessment

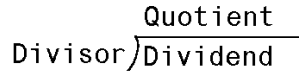
Mathematics Weekly Plan

Term – 1 2 3 4 Week – 1 2 3 4 5 6 7 8 9 10 11 Strands – Multiplication & Division (1)/ Volume & Capacity (1)

		Monday	Tuesday	Wednesday	Thursday	Friday
Key Ideas:		Multiplication and Division			Volume and Capacity	
Warm Up	Additional warm up activities: TEN: Using your PLAN Data, students will work on TEN based activities for 10 minutes. Activities are differentiated based on group needs (view PLAN Data/Clusters).	Mark Pre-test as a whole class and provide immediate feedback.	TEN/ Ninja Numeracy/ Quick Revision Mentals	TEN/ Five Minute Frenzy/ Quick Revision Mentals	TEN/ Five Minute Frenzy/ Quick Revision Mentals	Mark Post-test as a whole class and provide immediate feedback.
Problem of the Day		Pre-test: Multiplication & Division/ Volume and Capacity	<i>For the tinned food drive, 54 students each collected the same number of tins. They collected 3 tins in all. How many tins did each student collect? 18 tins</i>	<i>At the toy store, there are 102 model aeroplanes. The aeroplanes are evenly divided among 6 shelves. How many model aeroplanes are on each shelf? 17 shelves</i>	<i>A bread company makes 8 types of bread. A restaurant chain ordered 948 loaves of each kind of bread. How many loaves of bread in total did the restaurant chain order? 7584 loaves of bread</i>	Post-test: Multiplication & Division/ Volume and Capacity

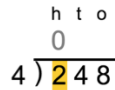
Main Focus + Language

- Revision: short division strategies: no remainders.
- Using hovercam, model to student's simple division problems using short division.
- Access student's prior knowledge of language:

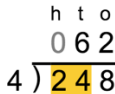


- Explicitly model simple division problems using 2 by 1-digit problems (formal algorithm):

Example:



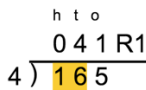
- 4 does not go into 2. You can put zero in the quotient in the hundreds place or omit it. But 4 does go into 24, six times. Put 6 in the quotient.



- The 2 of 248 is of course 200 in reality. If you divided 200 by 4, the result would be less than 100, so that is why the quotient won't have any whole hundreds. But then you combine the 2 hundred with the 4 tens. That makes 24 tens, and you CAN divide 24 tens by 4. The result 6 tens go as part of the quotient. Check the final answer: $4 \times 62 = 248$.

- Examples for students to complete:

- Revision: division with remainders:



- 4 does not go into 1 (hundred). So combine the 1 hundred with the 6 tens (160).
- 4 goes into 16 four times.

- Continue revision of strategies: modelling division strategies, both written and mental with no remainders:

- dividing the hundreds, then the tens, and then the ones, e.g. $3248 \div 4$

$$3200 \div 4 = 800$$

$$40 \div 4 = 10$$

$$8 \div 4 = 2$$

- Add all the answers together.

$$\text{So, } 3248 \div 4 = 812$$

- Additional examples to model with no remainders:

$$5/355$$

$$8/168$$

- Model strategy dividing with remainders:

- dividing the tens and then the ones, e.g. $243 \div 4$

$$240 \div 4 = 60$$

- $3 \div 4 = \frac{3}{4}$ (becomes remainder, cannot divide 4 into 3)

$$\text{So, } 243 \div 4 = 60 \frac{3}{4}$$

- Additional examples to model this method with remainders:

$$6/634$$

$$5/854$$

- Additional methods to assist in division of larger numbers: The **Subway or Subtraction Ladder strategy**. Example: $144 \div 24 = 6$

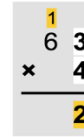
- Subway method: repeat addition of the divisor (24) until you reach the dividend (144). Count how many times you required to reach the dividend which will be the answer or the quotient of the dividend problem (6)

- Subtraction ladder: similar to subway method instead you take the divisor away from the dividend and continue until you reach 0. Modelled examples below:

- Model revision examples on the board and encourage students to write steps as you go in their books.

- **Example 1:**

$$63 \times 4:$$



- **Method:**

- Multiply the ones: $4 \times 3 = 12$
- Place 2 in the ones place, but write the tens digit (1) above the tens
- column as a little memory note. You are *regrouping* (or carrying).



- Then multiply the tens, **adding** the 1 ten that regrouped.
- $4 \times 6 + 1 = 25$
- Write 25 in front of the 2.
- **Note** that 25 tens mean 250.

- Additional examples to model:

$$76 \times 8$$

$$26 \times 7$$

$$98 \times 9$$

- Revise multiplication of 3-digit by 2-digit numbers using the extended form (long multiplication). Explain that the multiplication of a digit in the tens place value is multiplying by a multiple of ten and that is why we put the 0-place holder in the algorithm.

- **First step:** Multiply the ones digit of the bottom factor (multiplier) by the top factor (multiplicand) and write the result on the line below.

$$\begin{array}{r} 781 \\ \times 95 \\ \hline 3905 \end{array}$$

- **Volume and Capacity:** Brainstorm with students their understanding or prior knowledge on topic.
- **Define each:** Volume: refers to the amount of liquid or how much space the liquid takes up in a container.

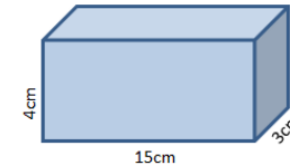
- **Capacity:** refers to the amount of space of a container for holding liquid.

- View simple YouTube video to demonstrate meaning. Students note definitions in workbooks.

<https://www.youtube.com/watch?v=GKCE8ohIBqE>

- Demonstrate to students how to find the volume of solids modelling the formula: length x width x height = volume cm³.

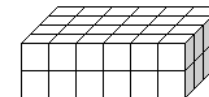
- Example: Draw or find an image of a 3D space and model on the board:



- Step 1: multiply the length and the width: $15 \times 3 = 45$

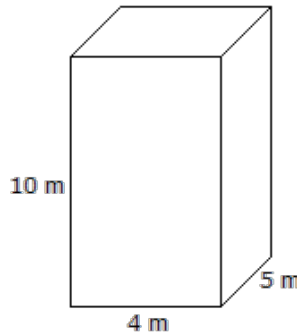
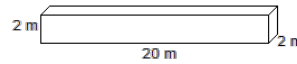
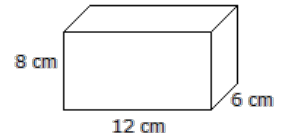
- Step 2: multiply the answer by the height: $45 \times 4 = 180$ cm – explain that a **cubic unit** is the measure of volume. It is equal to the volume of a **cube**, which is 1 unit tall, 1 unit wide and 1 unit long.

- Using interlocking/connecting cube, create the rectangular prism below, model using hovercam. Ask the students: *How many cubes are in this rectangular prism (cuboid)?*



- Ask students to explain what volume is.
- Display a variety of images on the board for students to solve the volume of as quick revision.

- Examples:



- Explicitly model how to create a range of measurements using volume numbers only e.g. 24cm³:

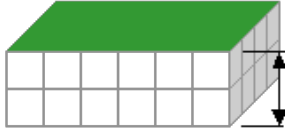
- Draw a cube on the board and model possible measurements for th high, width and length e.g. $24 \text{ cm}^3 = h = 2, w = 2, l = 6$
- $2 \times 2 = 4 \times 6 = 24 \text{ cm}^3$.

- This can be used as whole class with differentiation. Note: model basic ones to allow revision group to solve then place extension questions:

- Revision group: 38 cm³
- Middle group: 124 cm³
- Main group: 863 cm³ 5273 cm³

- Encourage students to use whitboards to assist working out/interlocking cubes to help investiage possible answers.

- Modelled examples:
- 9 cm³ h=3, w=3, l=3

		<ul style="list-style-type: none"> 4 goes into 5 once, leaving a remainder of 1. <p style="text-align: center;"> th h t o $\begin{array}{r} 0400R7 \\ 8 \overline{) 3207} \end{array}$ </p> <ul style="list-style-type: none"> 8 does not go into 3 of the thousands. So combine the 3 thousands with the 2 hundreds (3,200). 8 goes into 32 four times ($3,200 \div 8 = 400$) 8 goes into 0 zero times (tens). 8 goes into 7 zero times, and leaves a remainder of 7. 	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-right: 1px solid black;"> $\begin{array}{r} 24 \text{ (1)} \\ +24 \text{ (2)} \\ \hline 48 \\ +24 \text{ (3)} \\ \hline 72 \\ +24 \text{ (4)} \\ \hline 96 \\ +24 \text{ (5)} \\ \hline 120 \\ +24 \text{ (6)} \\ \hline 144 \end{array}$ </td> <td style="width: 50%;"> $\begin{array}{r} 144 \\ -24 \text{ (1)} \\ \hline 120 \\ -24 \text{ (2)} \\ \hline 96 \\ -24 \text{ (3)} \\ \hline 72 \\ -24 \text{ (4)} \\ \hline 48 \\ -24 \text{ (5)} \\ \hline 24 \\ -24 \text{ (6)} \\ \hline 0 \end{array}$ </td> </tr> </table> <p style="text-align: right;">answer is 6</p> <ul style="list-style-type: none"> Examples to model using either strategy: $90 \div 15 =$ $56 \div 14 =$ $175 \div 25 =$ 	$\begin{array}{r} 24 \text{ (1)} \\ +24 \text{ (2)} \\ \hline 48 \\ +24 \text{ (3)} \\ \hline 72 \\ +24 \text{ (4)} \\ \hline 96 \\ +24 \text{ (5)} \\ \hline 120 \\ +24 \text{ (6)} \\ \hline 144 \end{array}$	$\begin{array}{r} 144 \\ -24 \text{ (1)} \\ \hline 120 \\ -24 \text{ (2)} \\ \hline 96 \\ -24 \text{ (3)} \\ \hline 72 \\ -24 \text{ (4)} \\ \hline 48 \\ -24 \text{ (5)} \\ \hline 24 \\ -24 \text{ (6)} \\ \hline 0 \end{array}$	<p>If we multiply 781×95, the first thing to do is to multiply by 5, which is in the ones place of 95, by each one of the digits of the top factor from right to left, and place the result, 3905, on the line below, as shown in the image.</p> <ul style="list-style-type: none"> Second step: Multiply the digit in the tens place of the bottom factor by the top factor and write the result on the line below, but place a 0 in the ones place, since this part of the multiplication is a number of tens. $\begin{array}{r} 781 \\ \times 95 \\ \hline 3905 \\ 7029 \\ \hline \end{array}$ <ul style="list-style-type: none"> We continue with the example. Now we multiply the 9, given that it is in the tens' place of the bottom factor 95, by the top factor 781. The result, 7029, will have to be written under 3905 but moved one place to the left. Third step: Add the products. $\begin{array}{r} 781 \\ \times 95 \\ \hline 3905 \\ 7029 \\ \hline 74195 \end{array}$ <p>Add the products and the result of the multiplication is 74,195.</p> <p>Additional examples:</p> <ul style="list-style-type: none"> 243×26 239×76 936×98 	<ul style="list-style-type: none"> Explain that we can count the cubes although it is quicker to take the length, width, and height and use multiplication. The rectangular prism above has a volume of 48 cubic units. Model examples of calculating the area of the rectangular prism: We need to do two multiplications to work out the volume. We calculate the area of one face (or side) and multiply that by its height. The examples below show how there are three ways of doing this. <div style="text-align: center;">  </div> <p>Length = 6 Width = 4 Height = 2 Model answer: Volume = $6 \times 4 = 24 \times 2 = 48$ cubic units (volume units).</p> <ul style="list-style-type: none"> Create other examples using cubes to model to students. 	<ul style="list-style-type: none"> $12 \text{ cm}^3 \text{ h}=2, \text{ w}=3, \text{ l}=2$ $27 \text{ cm}^3 \text{ h}=3, \text{ w} = 1, \text{ l}=9$ $36 \text{ cm}^3 \text{ h}=3, \text{ w}=6, \text{ l}=2$ $100 \text{ cm}^3 \text{ h}= 2, \text{ w}=5, \text{ l}=10$ $138 \text{ cm}^3 = \text{h}=3, \text{ w}=1, \text{ l}=46$ Extension: students create their own volume measurement and model on the board their possible answers. Display the following examples on the board and answer with students during guided session. Mark answers as a whole class: http://www.commoncoresheets.com/Math/Volume/Finding%20Volume%20of%20Rectangular%20Prisms/English/1.pdf - provide students with worksheet for revision or draw in books.
$\begin{array}{r} 24 \text{ (1)} \\ +24 \text{ (2)} \\ \hline 48 \\ +24 \text{ (3)} \\ \hline 72 \\ +24 \text{ (4)} \\ \hline 96 \\ +24 \text{ (5)} \\ \hline 120 \\ +24 \text{ (6)} \\ \hline 144 \end{array}$	$\begin{array}{r} 144 \\ -24 \text{ (1)} \\ \hline 120 \\ -24 \text{ (2)} \\ \hline 96 \\ -24 \text{ (3)} \\ \hline 72 \\ -24 \text{ (4)} \\ \hline 48 \\ -24 \text{ (5)} \\ \hline 24 \\ -24 \text{ (6)} \\ \hline 0 \end{array}$							

Group Activities	<p>Revision Group - Names</p>	<p>Work with group using following worksheets to provide further scaffold and support to solve a range of division problems with and without remainders.</p> <p>Encourage students to example the steps out loud to monitor levels of understanding.</p> <p>http://www.k5learning.com/worksheets/math/grade-4-long-division-3x1-digit-no-remainder-a.pdf</p> <p>http://www.k5learning.com/worksheets/math/grade-4-long-division-3x1-digit-with-remainder-a.pdf</p>	<p>Work with this group to complete simple problems of Division Scoot game. Solve in workbooks using a variety of strategies:</p> <p>https://www.teacherspayteachers.com/Product/Division-Scoot-Bundle-700550</p>	<p>Using dice, students take turns and roll two dice to create problems to multiply. Begin by creating 2 by 1-digit multiplication problems. Extend students when ready, complete 3 by 1-digit problems.</p> <p>Play game similar to middle and main groups using dice. Students roll and the first person to get close to 100 wins.</p>	<p>5/6M Town Groups - Based on Continuum Clusters</p>	<ul style="list-style-type: none"> • Work with these students to create a variety of 3D prisms and solve volume-using formula. • Students make a rectangular prism using 24 cubes and record the dimensions (length, breadth, height). Determine the volume is 24 cubic units. Look at the relationship between the volume, length, breadth and height. • <i>What is the volume of each prism? 24 cubic units/cubic centimeters</i> • <i>How can we calculate the volume using the length, breadth and height of the prism?</i> • <i>Can you make other rectangular prisms with a volume of 24 cubic units?</i> • Students must draw their prisms in their workbooks and label their measurements for the length, width and height. Encourage students to work out the volume of each of their shapes.
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Main Group – Names

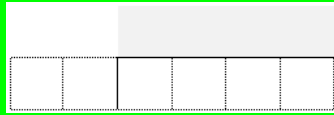
Dicey Operations

Stage: 3

<https://nrich.maths.org/6606>

Each student draws a multiplication grid like this:

Each student draws a division grid like this:



Throw the dice six times each until all the cells are full.

Whoever has the answer closest to 100 wins.

There are two possible scoring systems:

- A point for a win. The first person to reach 10 wins the game.
- Each player keeps a running total of their "penalty points", the difference between their result and 100 after each round. First to 500 loses. You can vary the target to make it easier or more difficult.

Students complete larger Division scoot problems: 2 by 4-digit division. Extend students to 3 by 4-digit problems.

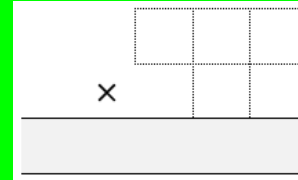
<https://www.teacherspayteachers.com/Product/Division-Scoot-Bundle-700550>

Dicey Operations

Stage: 3

<https://nrich.maths.org/6606>

Each student draws a multiplication grid like this:



Throw the dice five times each until all the cells are full.

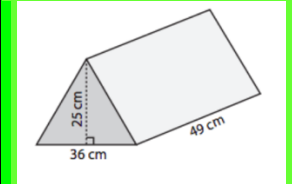
Whoever has the product closest to 10000 wins.

There are two possible scoring systems:

- A point for a win. The first person to reach 10 wins the game.
- Each player keeps a running total of their "penalty points", the difference between their result and 10000 after each round. First to 10000 loses.
- You can vary the target to make it easier or more difficult.
- You could introduce a decimal point. The decimal point could take up one of the cells so the dice would only need to be thrown four times by each player. You will need to decide on an appropriate target.

5/6M Town Groups - Based on Continuum Clusters

- Students create irregular 3D prisms and solve the volume using formula with interlocking cubes.
- Provide extension group with 'Thinker' questions to solve/word problems. Examples:
- The volume of a container is 400cm³, if the length is 10cm, the height 5cm, what is the width?
- A tissue box has a volume of 1600cm³. Work out the possible dimensions and draw a diagram to illustrate your dimensions.
- Extension: Encourage students to find the volume of triangular prisms.



$$\begin{aligned} \text{Volume} &= \frac{1}{2} \times b \times h \\ &= 36 \times 49 = 1764 \\ &= 1764 \times 25 = 44100 / 2 = 22050 \text{ cm}^3 \end{aligned}$$

Feedback/ Exit Slip	<p>Feedback – Use the thumb method after explicit modelling to determine students understanding and where they will be placed for group activities.</p> <p>Marking Exit Slips – Next to each students Exit Slip, the teacher will check students answers and will either write an: A = Achieved N/Y = Not Yet N/Y students will become your target group.</p>	<p>Revision: $104/4 = 26$</p> <p>Middle: $126/21 = 6$</p> <p>Main: $1020/68 = 15$</p>	<p>Revision: $264/22 = 12$</p> <p>Middle: $273/13 = 21$</p> <p>Main: 7384</p>	<p>Revision: $62 \times 7 =$</p> <p>Middle: $73 \times 16 =$</p> <p>Main: $8734 \times 56 =$</p>	<p>Students complete the following worksheet to demonstrate level of understanding:</p> <p>Revision: http://www.commoncoresheets.com/Math/Volume/Finding%20Volume%20of%20Rectangular%20Prisms/English/1.pdf</p> <p>Middle: http://bonlacfoods.com/images/volume-cubes-worksheets/volume-cubes-worksheets-3.jpg</p> <p>Main: https://www.math-drills.com/measurement/prisms_rectangular_volume_surfacearea_decimal_001.pdf?v=1384731872 Note: students do not have to complete surface area if they have not been extended for this yet, however they can be challenged.</p>	<p>Groups create possible measurements for the length, width and height for the following volume measurements:</p> <p>Revision: 24 cm³ e.g. of possible answer: l = 6, w = 2, h = 2. $6 \times 2 = 12 \times 2 = 24 \text{ cm}^3$ 52 cm³</p> <p>Middle: 98 cm³ 164 cm³</p> <p>Main: 345 cm³ 973 cm³</p>
Early Finishers/ Extension	<ul style="list-style-type: none"> Students will practice their times tables based on personal learning goals/needs. Students will work either in pairs/individually and use whiteboards to practice. Students can rotate between writing their tables out as well as reciting them aloud. Extension: Students use mental and/or written strategy learned throughout the week and multiply 4 by 4-digit numbers and beyond. Students solve and create word problems that encompass division and multiplication. Roll dice and multiply to 100. First student to reach wins. Differentiate for groups e.g. revision to 100, middle to 350 and main to 1000. Students that go over target number busts. Closest without busting over number wins. 					<ul style="list-style-type: none"> Extension Activity: Exploring higher-order thinking (QTF): Pose this problem. Imagine a box, which is 1 metre long, 1 metre wide and 1 metre high. Ask: <i>What is the volume of the box in cubic meters?</i> <i>What is the volume of the box in cubic centimeters?</i> <i>How did you work out this answer?</i> <i>How many centicubes would be needed to fill the box?</i> Work with a partner to create a variety of prisms using interlocking cubes and calculate the volume. Complete Mathletics/ iMaths worksheets. Draw city scapes/buildings in workbooks and calculate volume of buildings using grid paper and exact ruler measurements (Link to CAPA).
Reflection/ Registration/ Feedback						