Stage 3 Maths Program Term 1 Week 5

NSW K-10 Mathematics Syllabus Outcomes

Patterns and Algebra (1) (relate to Fractions and Decimals)

MA3-8NA - Analyses and creates geometric and number patterns, constructs and completes number sentences, and locates points on the Cartesian plane

- Identify, continue create and describe increasing and decreasing number patterns with fractions, decimals and whole numbers

Position (1)

MA3-17MG - Locates and describes position on maps using a grid-reference system

- Use grid-referenced maps to locate and describe positions

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

Assessment

PLAN Data Due

Pre – Test – See program

Post – Test – See program

Learning Goal – Patterns and Algebra (refer to the outcome)

Success Criteria – Patterns and Algebra(refer to the indicators)

Learning Goal – Position (refer to the outcome)

Success Criteria – Position (refer to the indicators)

TIB – We will use mapping skills in everyday life. For example, locating places and landmarks, planning trips, comparing aerial views of countries etc

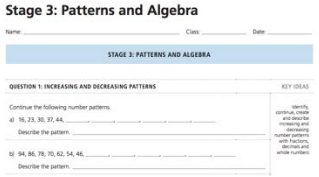
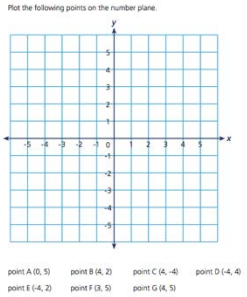
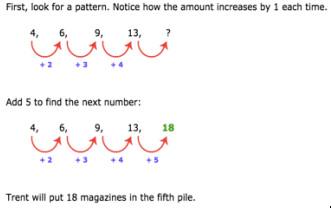
Homework:

Introduce Prodigy

Alliera Carroll and Mel Reskic – Shell Cove Public School

Mathematics Weekly Plan

Term – 1 2 3 4 **Week –** 1 2 3 4 5 6 7 8 9 10 11 **Strands –** Pattern and Algebra (1)/Position

		Monday	Tuesday	Wednesday	Thursday	Friday
Key Ideas:		**Whole Number**			**Position**	
Warm Up		Maths Game	Ninja Maths	Ninja Maths	5 Minute Frenzy	5 Minute Frenzy
Problem of the Day		http://www.numeracyskills.com.au/resources/Stage_3_Diagnostics_Task_Job.pdf **Pre-Test: Patterns:**  Stage 3: Patterns and Algebra STAGE 3: PATTERNS AND ALGEBRA QUESTION 1: INCREASING AND DECREASING PATTERNS KEY IDEAS **Pre-Test: Position:**  Plot the following points on the number plane. point A (0, 5) point B (4, 2) point C (4, -4) point D (-4, 4) point E (-4, 2) point F (3, 5) point G (4, 5)	*While organizing the magazines at the doctor's office, Trent put 4 magazines in the first pile, 6 magazines in the second pile, 9 magazines in the third pile, and 13 magazines in the fourth pile. If this pattern continues, how many magazines will Trent put in the fifth pile?*  First, look for a pattern. Notice how the amount increases by 1 each time. 4, 6, 9, 13, ? +2 +3 +4 Add 5 to find the next number: 4, 6, 9, 13, 18 +2 +3 +4 +5 Trent will put 18 magazines in the fifth pile.	*The Bike Shop rents bicycles. The cost is $8.50 for 1 hour, $13.65 for 2 hours, $18.80 for 3 hours, and $23.95 for 4 hours. If the pattern continues, it will cost $29.10 for 6 hours.* *Yes, $5.15 is added to each hour:* *$8.50 + $5.15 = $13.65* *$13.65 + $5.15 = $23.95* *$23.95 + $5.15 = $29.10.* **Rule:** add 5.15.	*Continue the following fraction pattern:* *6/12, 9/12, 1 2/12, 1 5/12, ___, ___, ___, ___.* **Rule:** Increasing by 3/12	**Post-Test: Patterns:** Students create; a decimal pattern and include the rule as well as a fraction pattern and include the rule. **Post- Test: Position:** Provide students with a blank Cartesian plane. Students are to plot points in each Quadrant and write the coordinates for each point that they have plotted.

Alliera Carroll and Mel Reskic – Shell Cove Public School

Explicit Teaching

Main Focus + *Language*

What is a pattern? Discuss with students and write definition. Example: A **pattern** of numbers is an arrangement of numbers that follows a specific rule or set of rules.

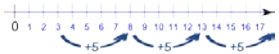
Increasing Number Patterns:
If numbers rise by a regular amount, we can describe these as increasing number patterns. We could use addition or multiplication to make numbers get bigger. Counting up by two's is an example of an addition pattern because each number is 2 bigger than the last.

This is an **increasing** sequence, where we add 2 at every step. We can describe these numbers as following a rule. In this case, the rule would be described as; Rule: Add 2.

Explicitly model more examples using addition:
1, 8, 15, 22, 29 = Rule: Add 7
17, 25, 33, 41, 49 = Rule: Add 8
9, 15, 21, 27, 33 = Rule: Add 6
18, 21, 24, 27, 30 = Rule Add 3
22, 30, 38, 46, 54, 62, 70 = Rule: Add 8
24, 31, 38, 45, 52, 59, 66 = Rule: Add 7

Alternative method: Explicitly model how to solve patterns using a number line:

Example: 3, 8, 13, 18, 23, 28, 33, 38, ...
This sequence has a difference of 5 between each number.
The pattern is continued by **adding 5** to the last number each time, like this:



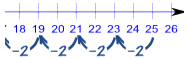
Decreasing Number Patterns:
If numbers reduce by a regular amount, we can describe these as decreasing number patterns. We could use subtraction or division to make numbers get smaller.

This is a **decreasing** sequence, where we subtract 3 at every step. Rule: Subtract 3.

Explicitly model more examples using subtraction:
50, 45, 40, 35, 30 = Rule: Subtract 5
65, 59, 53, 47, 41 = Rule: Subtract 6
71, 69, 67, 65, 63 = Rule: Subtract 2
64, 56, 48, 40, 32 = Rule: Subtract 8
51, 44, 37, 30, 23, 16, 9 = Rule: Subtract 7
71, 65, 59, 53, 47, 41, 35 = Rule: Subtract 6

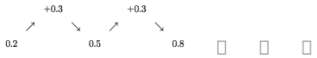
Alternative method: Explicitly model how to solve patterns using a number line:

Example: 25, 23, 21, 19, 17, 15, ...
This common difference is **–2**
The pattern is continued by **subtracting 2** each time, like this:

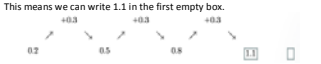


Increasing Patterns with decimals:
If numbers rise by a regular amount, we can describe these as increasing number patterns. We are going to focus on increasing number patterns using addition.
Let's consider an example:
0.2 0.5 0.8 ___ ___ ___
Our pattern is increasing. How much is it increasing each time?
Let's consider the first two terms, 0.2 and 0.5. The difference between these two numbers is 0.5−0.2=0.3. This means it goes up by 0.3 between 0.2 and 0.5, as shown below.

It seems the pattern is going up by 0.3 each time. Is the pattern always going up by 0.3? Let's check. Let's look at the second and third terms, 0.5 and 0.8. The difference between these two numbers is 0.8−0.5=0.3. This means it goes up by 0.3 between 0.5 and 0.8, as shown below.



As it goes up by 0.3 on both occasions, we've found the pattern, and can continue adding 0.3 to finish the pattern. What is 0.8+0.3? 0.8+0.3=1.1. This means we can write 1.1 in the first empty box.

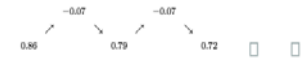


We can apply the same rule to the last two boxes.
1.1+0.3=1.4 and 1.4+0.3=1.7.

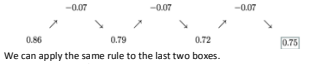
Further examples to model:
1.7, 2.1, 2.5, 2.9, 3.3, 3.7, 4.1 = Rule: add 0.4
4.5, 4.7, .9, 5.1, 5.3, 5.5, 5.7 = Rule: add 0.2

Decreasing Patterns with decimals:
If numbers reduce by a regular amount, we can describe these as decreasing number patterns. We are going to focus on decreasing number patterns using subtraction.
Let's consider an example, this time using two decimal places:
0.86 0.79 0.72 ___ ___ ___
As the numbers reduce by a regular amount, we have a decreasing pattern. How much do they decrease by every time?
Let's consider the first two terms, 0.86 and 0.79. The difference between these two numbers is 0.86-0.79=0.07. This means it goes down by 0.07 between 0.86 and 0.79, as shown below. Notice that there is a minus sign in front of the 0.07 to show that it is going down, and that we need to subtract as we move along the pattern.

It seems the pattern is going down by 0.07 each time. Is the pattern always going down by 0.07?
Let's check. Let's look at the second and third terms, 0.79 and 0.72. The difference between these two numbers is 0.79−0.72=0.07. This means it goes down by 0.07 between 0.79 and 0.72, as shown below.



As it goes down by 0.07 on both occasions, we've found the pattern, and can continue subtracting 0.07 to finish the pattern.
What is 0.72−0.07? 0.72-0.07=0.65. This means we can write 0.65 in the first empty box.



We can apply the same rule to the last two boxes.
0.65−0.07=0.58 and 0.58-0.07=0.51.

Further examples to model:
What is the pattern?
0.3, 0.5, 0.7, __, __, ___. = What is the difference between, say, the first two numbers, 0.3 and 0.5? Increasing by 0.2.

Additional examples:
Try putting the numbers in a place value table and adding the digits.

Units	.	Tenths
0	.	7
0	.	2
0	.	9

= 0.9, 1.1, 1.3.

6.2, 14.2, 22.2, __, __, __. = What is the difference between the first two numbers, 6.2 and 14.2 = increasing by 8.
Try putting the numbers in a place value table and adding the digits.

Tens	Units	.	Tenths
2	2	.	2
0	8	.	0
3	0	.	2

= 6.2, 14.2, 22.2, 30.2, 38.2, 46.2.

View YouTube video: Fraction Patterns:
https://youtu.be/38OmHF9T0ko

Review adding like fractions to create a simple addition pattern involving fractions e.g. Rule: Add 1/10.

6/10, 7/10, 8/10, __, __, __.

6/10 + 1/10 = 7/10 + 1/10 = 8/10 + 1/10 = 9/10. This is a simple number pattern using like patterns. Rule = Add 1/10.

Equivalent fraction patterns:
2/14, 3/21, 4/28, __,__,__, ___.

Ask what is the difference between 2/14 and 3/21 = 1/7. Add 1/7 to 3/21 to see if this is the rule. 1/7 + 3/21 = 4/28.
Continue the pattern using the Rule: Add 1/7: 5/35, 6/42, 7/49, 8/56. If you notice, the fractions are multiples of 7 e.g. 6/42 = 6x7 =42.

Continue equivalent fraction patterns:
2/16, 3/24, 4/32, __, __, __.

Ask what is the difference between 2/16 and 3/24 = 1/8. Add 1/8 to 3/24 to see if this is the rule. 1/8 + 3/24 = 4/32.
Continue the patter using the Rule: Add 1/8:
5/40, 6/48, 7/56. If you notice, the fractions a multiples of 8 e.g. 5/40 = 5x8 =40.

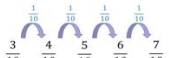
Continue explicit modelling using mixed numerals:
What is the rule for finding the next number in the pattern?
3/10, 9/10, 1 5/10, __, __, __,

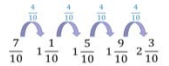
What is the difference between the first two numbers, 3/10 and 9/10? How much do we add to get from 3/10 to 9/10? Rule: Increasing by 6/10.

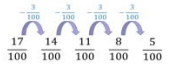
Complete the pattern by adding 6/10 each time.
To find 1 5/10 + 6/10, first *add* the two fractions (the numerators). If the fraction exceeds a whole, *add* 1 to the whole number and leave the remainder.

For example: 1 2/10 + 9/10 = 2 1/10.
Hint: 1 2/10 can be explained as 12 – the 1 represents a whole (10) and the 2 represents the unit (the numerator).
12 + 6 = 21. In the above answer, 2 1/10, the 2 represents 2 wholes (20) and the 1 represents the units in 21 (the numerator).
Completed pattern:
3/10, 9/10, 1 5/10, 2 1/10, 2 7/10, 3 3/10.

Additional examples to model:
1 ¼, 3 ¼, 5 ¼, 7 ¼, 9 ¼, 11 ¼
Rule: Add 2 wholes
42 ½, 38 ½, 34 ½, 30 ½, 26 ½, 22 ½
Rule: Subtract 4 wholes.



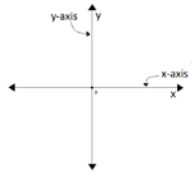




Teacher gives each student a sheet of 1 cm grid paper. The students fold the paper in half horizontally and then fold the paper in half again, so that when it is opened it is divided into four quarters (quadrants). Have students draw a green line over the vertical fold and a red line over the horizontal fold. Instruct students to write the numbers 1, 2, 3 ..... on the line to the right of the zero, one number per line as shown and -1, -2, -3 ..... on the line to the left of the zero.
Teacher explains that what we have now is called a "number line" or "coordinate line." It can be used to describe where a point is on the line. To give the exact "address" of a point, we just look at how far the point is from zero, using a minus symbol for numbers to the left of zero. These numbers are 'negative' numbers.
The teacher should be modeling this process and the students grid should look similar to the one above.

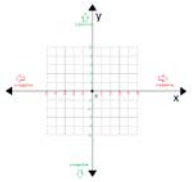
Explicitly explain: In mathematics, a plane is not something we see zooming around in the sky. It is a flat 2D surface. The top of your desk could be a plane, as could your wall or your roof. A number plane is created by two perpendicular lines that we call an x-axis and a y-axis.

The x-**axis** is the **horizontal** line.
The y-**axis** is the **vertical** line.

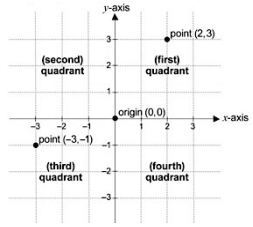


Where the two axes cross each other is labelled the **ORIGIN**. It has a zero value on both axes.

The x-axis is numbered with positive numbers increasing to the right.
The y-axis is numbered with positive numbers increasing vertically.
Teacher explains that to give an address for the points that are not on the number line we will need to label the vertical line with positive numbers above the horizontal number line and negative numbers below the horizontal number line. Explain that the horizontal number line is called the x-axis and the vertical number line is y-axis.
The teacher explains that the mathematical term for the address of a point is called **coordinates**.
The 'coordinates of a point' refers to the ordered pair (x,y) describing the horizontal position x first, followed by the vertical position y.



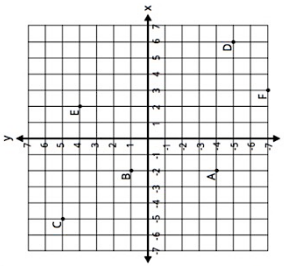
We can notice 2 things from the number plane we have created here:
The lines have created four distinct sections. We call these **QUADRANTS**. Labelling them anticlockwise from the top right corner.

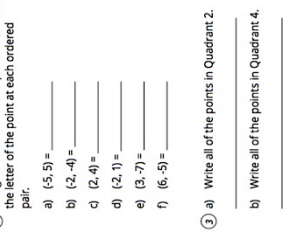


Place a blank plane on the board and explicitly model how to plot coordinates. Ensure to state that we always start on the x axis and then the y axis. Encourage students to assist in plotting coordinates during guided session and to look carefully at what negative and positive numbers positions along the axis you need to go across to plot the points.
Here are some examples the teacher can model. The first number in the coordinate represents the x axis and the second the y axis: (2,1) (-6,4) (-8,-3) (9,-9).

Project a Cartesian plane showing the 4 quadrants on the board. Continue to explicitly model how to answer position questions like the examples below. Ensure to refer which quadrant each point will be in by naming them e.g. I will end up placing a point in Quadrant ___.
a) Plot these ordered pairs on the Cartesian Plane. Ensure to continue modelling how to go across, the x axis first and then they y axis.
A: (3, 3)
B: (-3, 3)
C: (-3, -4)
D: (3, -4)
b) Draw a line to connect the points. What shape does it make?
c) Which point lies in Quadrant 1?

Continue modelling examples of the Cartesian Plane and encourage students to assist by placing plots at various locations and modelling how to write the location for them. Ensure to always state, the first number in a coordinate is always the x axis.





Additional: Enlarge the image above and use as a whole class activity during modelling stage.

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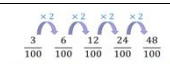
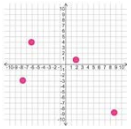
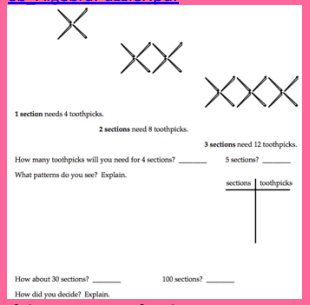
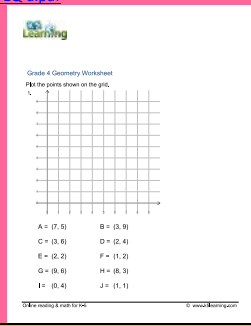
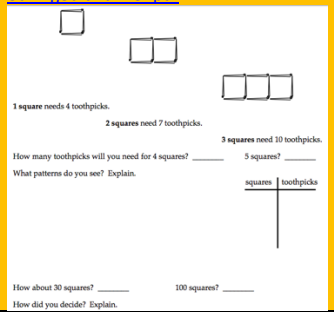
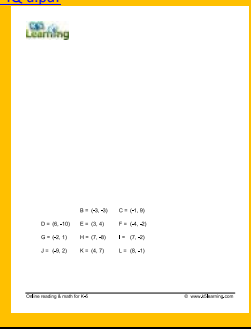
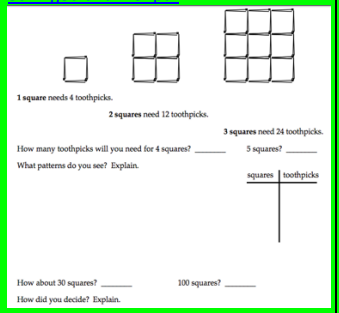
			Further examples to model: 6.3, 5.8, 4.8, 4.3, 3.8, 3.3 = Rule: subtract 0.5 7.8, 6.9, 6, 5.1, 4.2, 3.3, 2.4 = Rule: subtract 0.9			
Group Activities	**Revision Group - Names**	Work with this group: Building a Pattern: *Toothpick fence:* https://www.essentiallearningproducts.com/media/elp/teachers/content/pdf/05feb_AlgebraPuzzler.pdf  If this is too easy for the Revision Group, extend using the Middle Groups activity.	Work with this group to solve a variety of addition and subtraction decimal patterns. Use the link for suitable examples for this group. The students should work on whiteboards and note patterns in their books. When they appear confident, extend to middle group style questions. https://docs.google.com/viewerng/viewer?url=http://www.math4childrenplus.com/free/worksheetsnew/grade6/decimals/decimal-patterns-002.pdf	http://www.commoncoresheets.com/Math/Fractions/Equivalent%20Fractions%20Pattern/English/1.pdf Work with this group. Use the worksheet from the link to begin as a guide to complete simple number sequences involving equivalent fractions. Students use whiteboards to practice on as well as their books to take notes. Model again how to work out the rule for each fraction sequence.	**5/6M Town Groups- Based on Continuum Clusters**	Work with this group and focus plotting coordinates using one quadrant only. If students get this, move onto a four-quadrant grid and continue working with this group offering support. http://www.k5learning.com/worksheets/math/grade-4-geometry-plotting-points-coordinate-grid-1Q-a.pdf 
Group Activities	**Middle Group- Names**	Building a Pattern: *Toothpick train:* https://www.essentiallearningproducts.com/media/elp/teachers/content/pdf/05feb_AlgebraPuzzler.pdf 	Students complete the following sheet in their group. While working with the Revision Group, the Main Group can support these students. https://www.math-salamanders.com/image-files/decimal-worksheets-counting-back-by-decimals-3.gif	https://www.mathworksheets4kids.com/fractions/equivalent/missing-numbers-advanced-increasing1.pdf Students complete the following sheet. Once students have completed it, provide them with cards with simple fractions on them (e.g. 5/8) for them to complete a similar activity as the Main Group.	**5/6M Town Groups- Based on Continuum Clusters**	Student plot a range of coordinates onto a 4-quadrant plane. http://www.k5learning.com/worksheets/math/grade-5-geometry-plotting-points-coordinate-grid-4Q-a.pdf 

Group Activities	**Main Group - Names**	Building a Pattern: *Toothpick wall:* https://www.essentiallearningproducts.com/media/elp/teachers/content/pdf/05feb_AlgebraPuzzler.pdf  **1 square** needs 4 toothpicks. **2 squares** need 12 toothpicks. **3 squares** need 24 toothpicks. How many toothpicks will you need for 4 squares? _____ 5 squares? _____ What patterns do you see? Explain. squares | toothpicks How about 30 squares? _____ 100 squares? _____ How did you decide? Explain.	Using the link as an example, create cards for this group (*simply cut up the worksheet for the students to get the first example in their sequences*) where they are to complete decimal patterns by multiplying. The students in this group will be encouraged to write at least 6 decimals in each sequence e.g. Rule: x4: 3.7, 14.8, 59.2, 236.8, 947.2, 3788.8. https://www.superteacherworksheets.com/multiplication/decimal-multiplication-basic_DPOIN.pdf	https://talibiddeenjr.files.wordpress.com/2008/12/math-fractions-file-folder-improp-mixed.pdf Provide this group with mixed numeral fractions cards (*examples from link).* Students will select a card and create fraction patterns involving mixed numerals along with a rule explaining their pattern. They will need to create as least 8 fractions in their pattern sequence. E.g. Rule: Add 2/6: 3 4/6, 3 6/6, 3 8/6, 4 0/6, 4 2/6 etc. Encourage this group to extend themselves and multiply their fraction sequences instead of simple adding and subtracting.	**5/6M Town Groups- Based on Continuum Clusters**	Student complete the following worksheet independently and then move onto Extension Activities. http://www.math-aids.com/cgi/pdf_viewer_4.cgi?script_name=geometry_four_ordered_pairs.pl&language=0&memo=&answer=1&x=92&y=42
Exit Slip	**Feedback –** Use the thumb method after explicit modelling to determine students understanding and where they will be placed for group activities. **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.	Create a whole number pattern and write down the rule for your pattern e.g. Main Group Example: 56, 62, 66, 72, 76 Rule: first add by 6 then add 4.	Complete the following decimal patters. Revision: 7.5, 6.5, 5.5, _, _, _. Middle: 6.3, 10.3, 14.3, __, __, __. Main: 81.6, 73.6, 65.6, _, _, _.	Complete the following fraction patterns: Revision: 1/3, 1/6, 1/9, __, __, __. Middle: 4/5, 6/5, 8/5, __, __, __. Main: 1 1/3, 1 4/3, 1 7/3, __, __, __.	For each group: write 2 examples of things that you have learnt about the Cartesian Plane/ how to plot a point on the plane.	Revision: Write 2 examples of coordinates for Quadrant 1. Middle: Write 2 examples of coordinates for Quadrants 1-2. Main: Write 2 examples of coordinates for Quadrants 3-4.
Early Finishes/ Extensions Activities	• Using toothpicks, students work in pairs/small groups to create any number pattern they like. They can create examples for a partner to solve and work out their rule. • Students create a variety of number patterns using more than one number in the rule e.g. 6, 5, 7, 6, 8, 7, 9, 8 = Rule subtract 1 and add 2. • Students extend themselves by creating a number pattern (decimal/fraction) and create a rule where their sequence is being multiplied instead of adding and subtracting.				• Students work on solving a Cartesian Plan image. Example below. Note: Provide easy ones for students in Revision group to complete: https://www.slps.org/cms/lib/MO01001157/Centricity/Domain/8698/algebra%20%20-%20lncoln%20graph.pdf https://www.math-drills.com/geometry/coordinate_point_art_001.php • Using grid paper, students create a Cartesian Plane treasure hunt for a partner. They are to plot points and encourage their partner to write the locations for the items on their plane. They will need to check and mark the plane when their partner has completed it.	

Reflection/ Registration						