MATHEMATICS UNIT PLANNER

Topic: Algebra- Number and growing Patterns		Year Level: 3	Term:	Week:	Date:

Key mathematical understandings **(2-4 understandings only; written as statements believed to be true about the mathematical idea/topic):**	Key AusVELS Focus / Standard **(taken directly from AusVELS documents):**	
• Patterns can be described, extended, created and generalized by preforming both addition and subtraction. • Patterns help develop number sense, ordering, counting and sequencing.	**Content strand(s):** _Number and Algebra_ **Sub-strand(s):** Patterns and Algebra **Level descriptions:** • Describe, continue, and create number patterns resulting from performing addition or subtraction. **Proficiency strand(s):** _Understanding Problem Solving Reasoning_ • **Understanding:** Understanding that patterns can be described, extended and created by preforming both addition and subtraction. • **Problem Solving:** Solving the rule for both number and growing patterns, being able to continue the pattern and construct number and growing patterns.	

Key skills to develop and practise **(including strategies, ways of working mathematically, language goals, etc.) (4-5 key skills only):**	Key equipment / resources:	Key vocabulary **(be specific and include definitions of key words appropriate to use with students)**
• Solving the rule for the number/growing pattern using addition and subtraction. • Identifying the changes in patterns. • Generalising patterns. Solving the next item/number in the pattern. • Identifying the relationship between growing patterns and number patterns. • Using appropriate language when describing number/ growing patterns.	• Students math's books. • Students math's journals • Interactive whiteboard. • A3 pieces of paper. • Counters. • Large Hundreds chart • Hundreds chart worksheets x 30. • Calculators • Geometric tiles • Graph paper.	• **Patterns-** Patterns are things that are arranged by following a rule or rules. • **Growing Patterns-** A pattern that increases or decreases in size by following a rule or rules. • **Increasing-** becoming bigger/greater in size. • **Decreasing-** becoming smaller in size. • **Next-** coming immediately after the present one. • **Before-** in front of. • **Adding-** to bring two or more numbers or things together to make a new total. • **Subtracting-** take away a number or amount from another to calculate the difference. • **Take Away** • **Plus** • **(Algebraic) Rule-** is a method for describing the relationship between two numbers or objects.

Possible misconceptions (list of misconceptions related to the mathematical idea/topic that students might develop):	**Key probing questions** (focus questions that will be used to develop understanding to be used during the sequence of lessons; 3 – 5 probing questions):	**Links to other contexts** (if applicable, e.g., inquiry unit focus, current events, literature, etc.):
- Students have difficulties with describing and generalising patterns and identifying function rules (Wilkie, 2014). - Students find it difficult to describe patterns due to their lack of appropriate language that is needed to describe relationships and additive strategies (Warren and Cooper, 2007). - Students find it difficult working out growing patterns and find working out explicit generalisations more difficult than recursive generalisations (Wilkie, 2014 and Warren and Cooper, 2007).	• What is the pattern? • What is changing in your pattern? • Can you describe your pattern to me? • How did you work out the pattern? Show me how you did this? • How do you know the pattern is correct? • Did you use counters to help you? • Can you prove it to me? • Can you use materials to prove it to me? • What would the next number be? • How do you know? Can you prove it to me?	•

Learning strategies/ skills	Analysing Checking Classifying Co-operating Considering options Designing Elaborating	Estimating Explaining Generalising Hypothesising Inferring Interpreting Justifying	Listening Locating information Making choices Note taking Observing Ordering events Organising	Performing Persuading Planning Predicting Presenting Providing feedback Questioning	Reading Recognising bias Reflecting Reporting Responding Restating Revising	Seeing patterns Selecting information Self-assessing Sharing ideas Summarising Synthesising	Testing Viewing Visually representing Working independently Working to a timetable

MATHEMATICAL FOCUS (what you want the children to come to understand as a result of this lesson – *short, succinct statement*)	**'TUNING IN' (WHOLE CLASS FOCUS)** (a short, sharp task relating to the focus of the lesson; sets the scene/ context for what students do in the independent aspect. e.g., It may be a problem posed, spider diagram, an open-ended question, game, or reading a story)	**'INVESTIGATIONS SESSION' (INDEPENDENT LEARNING)** (extended opportunity for students to work in pairs, small groups or individually. Time for teacher to probe children's thinking or work with a small group for part of the time and to also conduct roving conferences)	**'REFLECTION & MAKING CONNECTIONS SESSION' (WHOLE CLASS FOCUS)** (focused teacher questions and summary to draw out the mathematics and assist children to make links. NB. This may occur at particular points during a lesson. Use of spotlight, strategy, gallery walk, etc.)	**ADAPTATIONS** - Enabling prompt (to allow those experiencing difficulty to engage in active experiences related to the initial goal task) - Extending prompt (questions that extend students' thinking on the initial task)	**ASSESSMENT STRATEGIES** (should relate to objective. Includes what the teacher will listen for, observe, note or analyse; what evidence of learning will be collected and what criteria will be used to analyse the evidence)

Session 1 • Describing patterns by skip counting by 2's, 5's and 10's. • Using a calculator to follow a rule.	**Find the Pattern:** Show the 100's chart to students. Ask student: - What is a number pattern? - What pattern do you think we would have if we coloured in every second number? - Where would we start colouring? - Give students time to discuss their thinking with students around them. **Skip Count with the 100's chart:** Students are going to skip count by 2's, 5's and 10's referring to a 100s chart. To make it more challenging ask children to skip count backwards. **Calculator Count:** Students will sit in a circle with their calculators. Show students how to skip count forwards by 1's and then backwards with their calculators. As a class, skip count by 10's, 5's and 2's.	**Creating patterns on hundreds chart activity & 100's chart (See Appendix 1).** Students will select a rule and follow the rule by colouring the numbers on their hundreds chart. **Questions:** Can you describe your pattern to me? Is your pattern increasing/decreasing?	**Sharing Time** A range of students will be asked to describe their patterns with the class. - What number did you start with? -What is your number pattern increasing or decreasing by? **Ask students:** How can counting by 2's be helpful in everyday life? • Get students to write in their maths journals on how they feel after the maths lesson (See Appendix 2).	**Enabling prompts:** - What is a number pattern? - What do you notice about this pattern? - What is the difference between the first and second number in the pattern? - Can you describe the pattern to me? - If you started at number two and you wanted to create a number pattern that increases by two, what would the next number be? Continue the pattern using your calculator. **Extending prompts:** - If you started at 108 and you were counting by 3's, what would be the next number? Continue the number pattern. - If you started at 108 and you were counting down by 3's what would be the next number? Continue the pattern.	Teacher will take anecdotal notes on children (See Appendix 3). The teacher will rove around the classroom asking students questions to help them know what the student is thinking and their understanding of the task. Teacher will reflect and write notes on the following: • Were students able to skip count on the calculators? If not, what was confusing? • Were students able to describe how numbers changed in a skip counting pattern? • Which students were able to skip count without calculators? • Did I help students use what they know about patterns to recognise their own mistakes in hundred chart patterns?	**Comment [JV1]:** The use of the enabling and extending prompts cater for different students and their capabilities in maths. Students who are finding the content challenging and are unable to complete the task are given enabling prompt to support students thinking. Students who are able to complete the task confidently are given extending prompts to extend their thinking. This demonstrates my ability to differentiate teaching to meet the specific learning needs of students.

Session 2 • Describing patterns using addition and subtraction.	The teacher will give each student a multiple of two. The students have to put the numbers in order from smallest to largest without speaking. **Questions:** What is the number pattern? How do you know? Can you explain your thinking to the class?	Describe the number pattern activity (See Appendix 4). • Teacher will go around to each pair, ask them questions and observe their mathematical thinking. **Questions** - Can you describe this number pattern to me? - What is the rule? - How do you know? - Can you prove it by using counters?	**Reflection time.** What did you learn today? How did you work out the number patterns? (Allow students time to describe their strategies- students can learn from one another). • Get students to write in their maths journals on how they feel after the lesson (See Appendix 2).	**Enabling prompts:** - What is the difference between the first and second number in the number pattern? - How did you work out the difference between the first and second number? - Can you see any changes in the pattern? What are they? - Can you use counters to show me the pattern? **Extending prompts:** - How do you know this number pattern is correct? Can you prove it? - What will come next in this pattern? - How do you know that is correct? Prove it to me using counters.	Assessment will be taken in a checklist for this lesson. (See Appendix 5). • Where there any students that needed teacher assistance? • Which students used counters to assist them? • Were students using addition and subtraction to work out the number patterns? • Which students were able to explain the number patterns verbally? • Which students were able to write their description clearly in their maths books?
Session 3 • Continuing the number pattern and growing pattern.	**Continuing the number pattern:** As a class work out the next few numbers in the number pattern using the scootle website that is below. Allow students to come up and click on the numbers.	**Think, Pair, Share** The teacher will put on the interactive whiteboard three growing patterns (See Appendix 7). • Growing pattern activity (See Appendix	**Reflection time.** Ask students to sit in a circle. The teacher will get a soft volleyball. When the student receives the ball they have to	**Enabling prompts:** - Can you describe your pattern to me? - Can you see any changes in the pattern? What are the changes you see? - What number is	Assessment was taken through anecdotal notes for this lesson (See Appendix 3). - Where the students able to identify the growing pattern? - Where the

	Complete five –six number patterns with students. **Scootle website:** http://www.scootle.edu.au/ec/viewing/L6551/asset1.html **Questions:** -What is the number pattern? -What strategies did you use to work it out? -What is the next number in the pattern? **Growing patterns** Teacher will put a growing pattern on the interactive whiteboard (See Appendix 6). **Questions:** -What is a growing pattern? -What will come next in this growing pattern? • Allow students to have a discussion with the students around them. • As a class draw the next three objects and write the number sequence.	8).	answer one of the following questions: -What is something you learnt/enjoyed from the lesson? -What strategies did you use? -What is something you felt challenging and why? When a student receives the ball they have to answer a question then they have to roll the ball to another student. • Give students an opportunity to write in their maths journals on how they feel about the lesson (See Appendix 2).	<mark>your pattern increasing/decreasing by?</mark> **<mark>Extending prompts:</mark>** - <mark>What will come next in this pattern? How do you know?</mark> - <mark>Can you use counters to prove this to me?</mark>	students able to use addition and subtraction to work out their growing pattern? - Which students needed further assistance? - Where the students able to generalise the seventh pattern? Did they have to use counters to assist them?

	The students will all sit in a circle. The teacher will tell the students that today we are going to be creating our own growing patterns. Teacher will ask a student to grab a small handful of counters. Whatever the amount is will be our rule we have to follow. Students can choose if they want to create an increasing or decreasing pattern. *Repeat this process three times. **Ask students:** -Are we doing to create an increasing/decreasing pattern? -What number did you want to start with? -What would come next in our growing/decreasing pattern? -How did you work it out?	• Students will create their own growing pattern using counters. (Make sure students leave the pattern on their tables). • Students will then draw their growing pattern into their books and identify the rule. • Students will then find a partner, their partner needs to draw their growing pattern in their maths book, they need to identify the rule and then continue the pattern three more times. *Teacher will rove around the classroom questioning students. -What is the growing pattern? -Is it increasing or decreasing? -What will the fifth object look like? -Can you prove it to me using counters?	**Gallery walk** Students display their patterns at their tables and students walk around the classroom observing the different patterns their peers have made. **Questions:** - What strategies did you use to create your growing patterns? - What is something you learnt from the lesson? • Give students an opportunity to write in their maths journals on how they feel about the lesson (See Appendix 2).		Students will be assessed through a checklist (See Appendix 9). - Where students able to create their own growing pattern? - Where students able to identify their partners growing pattern? - Where they able to continue the growing pattern? - Where students able to write the number sequence?
	The teacher will ask students to get into groups of five. The teacher will tell students a rule. Students have to work together to create a growing pattern following the rule.	**Open Task** Students will be creating both growing and decreasing patterns using geometric tiles. (See Appendix 10).	**Reflection/Revision** The students will be asked to sit in a circle. The teacher will put an A3 piece of paper in the middle and ask students to write anything they learnt/		Assessment with be through a rubric based on the open task (See Appendix 11). - Where students able to create a range of growing

patterns.	Students will have to describe their pattern with the class. **Questions the teacher will ask.** - Can you describe your growing pattern to the class? - What is the number sequence to your growing pattern? - What would the next object look like?		know about number patterns and growing patterns. Allow students time to have a discussion with the students around them. Teacher will prompt students: -What is a number pattern? -What is a growing pattern? -What strategies did we learn?	<mark>in your pattern?</mark> <mark>**Extending prompts:**</mark> - <mark>What would the 8th, 9th, 12th object look like in your growing pattern?</mark> - <mark>How do you know?</mark> - <mark>Can you prove it ?</mark> - <mark>What is the rule for your growing pattern?</mark>	tasks? - How many were students able to create? - What strategies did students use to create their growing patterns? - Did they use addition, subtraction, halving, doubling? - Who needed further assistance in helping them create a growing pattern?

APPENDICES

APPENDIX 1:   Creating patterns on hundreds chart activity.

- Students need to get a hundreds sheet.
- The students are going to create colourful patterns by following a rule.
- After they have selected a rule, the students should colour each square with the numbers that follow the rule.
- Students will use their calculators to assist them.
- Students can start at any number they like.
- Students can create as many patterns as they like. They must use different colours for each rule.

1. Increasing **or** decreasing by two.
2. Increasing **or** decreasing by three.
3. Increasing **or** decreasing by four.
4. Increasing **or** decreasing by five.

Hundred-Board Wonders (Cuevas and Yeatts, 2005).

100 Chart

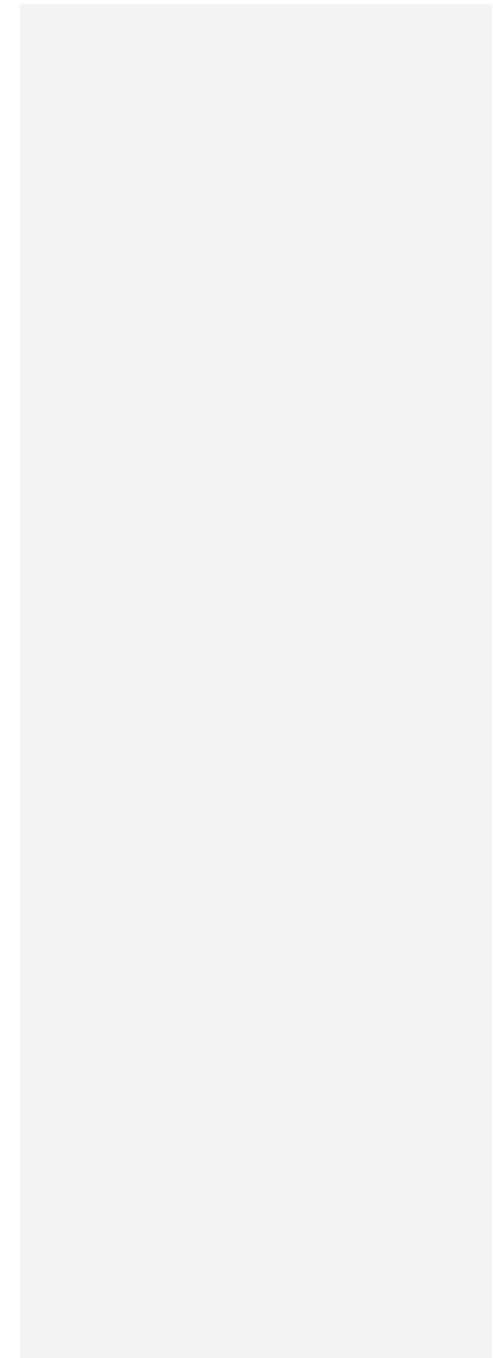| 1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

APPENDIX 2: Students maths journal.

- Draw a face that describe how you felt today after your maths lesson.

  (Is it a happy face, a sad face, a confused face, a crying face?)

- I feel like this because……..

- Next lesson I can………
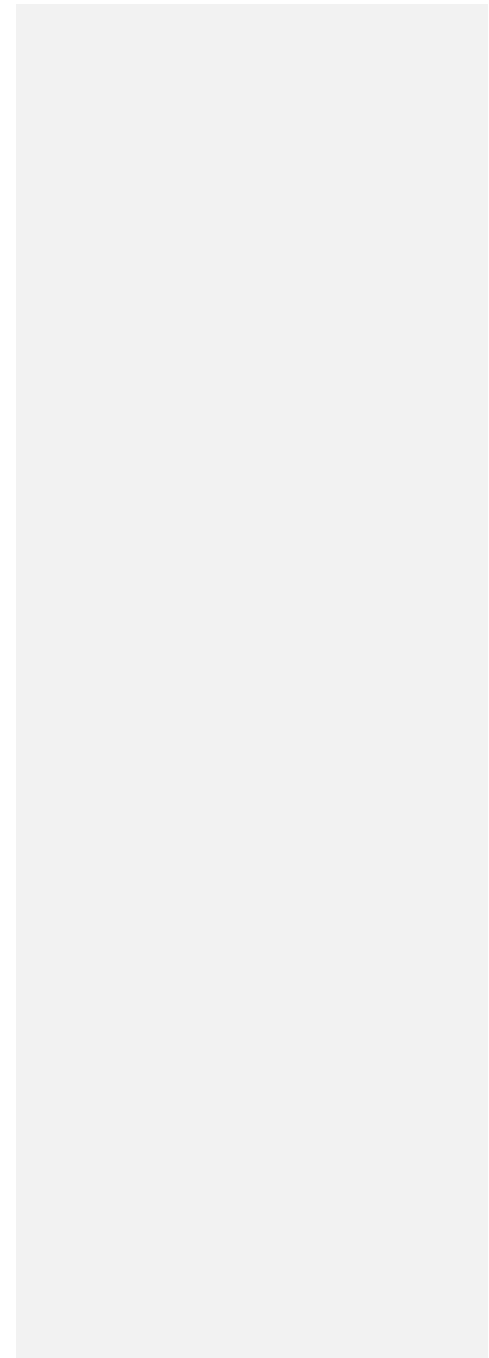
APPENDIX 3: Anecdotal notes.

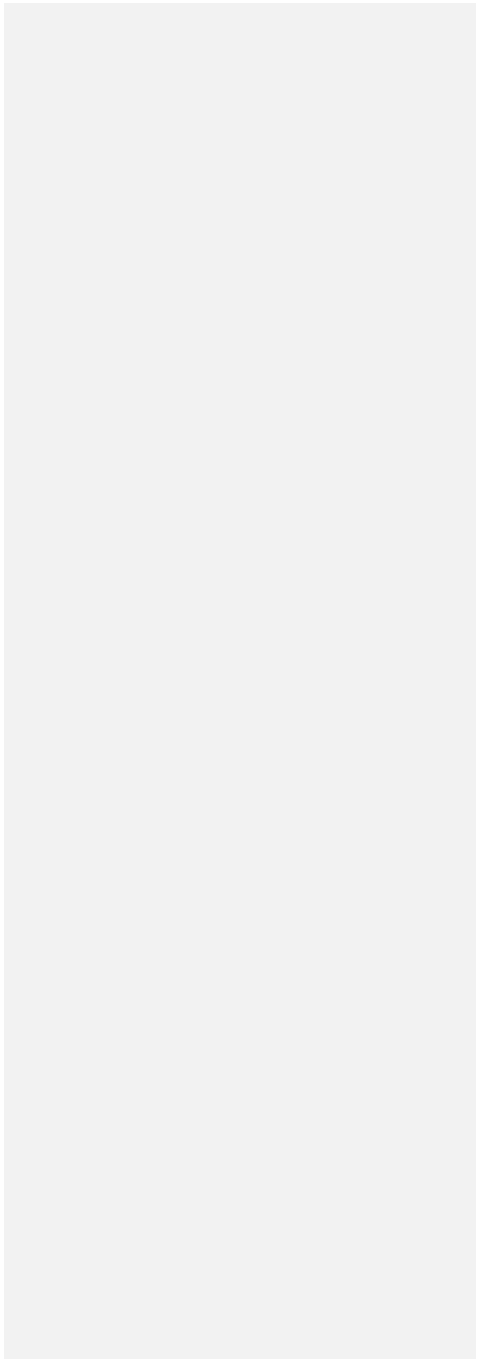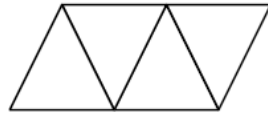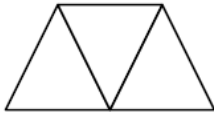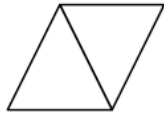| Students Name / Date:	Notes (Difficulties/misconceptions)	Action required	Action taken: (When, How)

APPENDIX 4: Describe the number pattern activity.

- Students will work in pairs for this task.

- Each pair will be given the following five number patterns and counters to assist them.

  1. 8,12,16,20,24,28,30.
  2. 28, 25,22,19,16,13.
  3. 19, 24, 28, 34, 39, 44.
  4. 10, 20, 40, 80, 160, 320
  5. 61, 59,58, 55, 53, 51

- Students have to work together to identify if the number patterns are correct or not. If the number pattern is correct they have to describe the number pattern. They then have to write the number pattern and description in their maths books.

- If the pattern is incorrect students have to work out what the pattern is and identify which number is incorrect in the pattern.

- Students then need to write the correct number pattern in their books and write their description in their maths book.

APPENDIX 5: Checklist

Students Name								
Used counters or other material to assist them.								
Used addition and subtraction to solve the number patterns.								
Ability to describe the pattern verbally.								
Ability to describe the number pattern in writing.								
Needed further assistance from the teacher.								

APPENDIX 6: Growing Pattern

APPENDIX 7: Growing patterns for students.
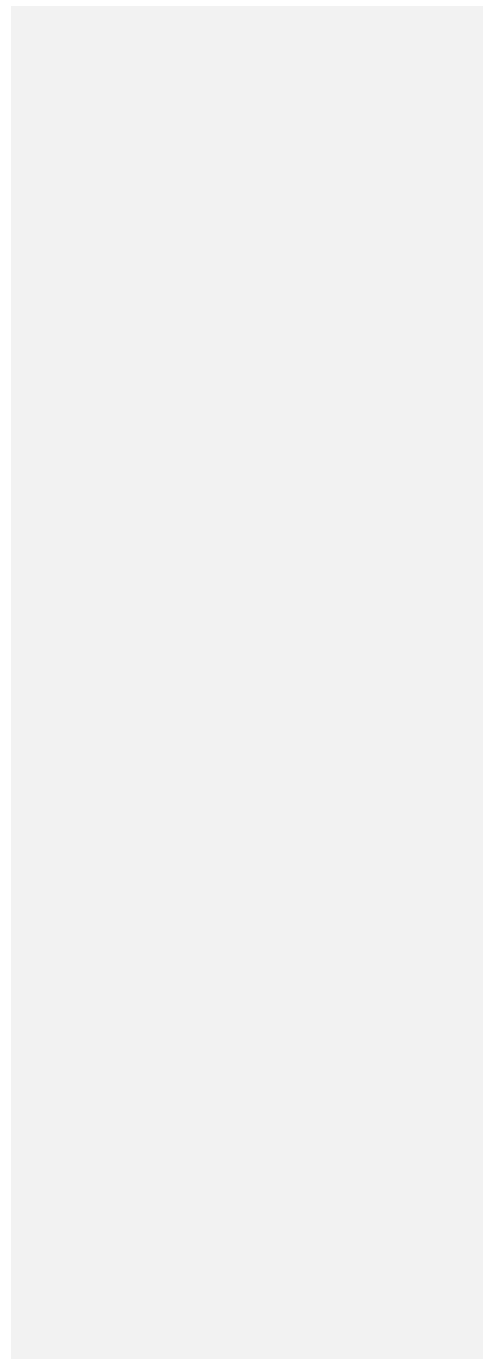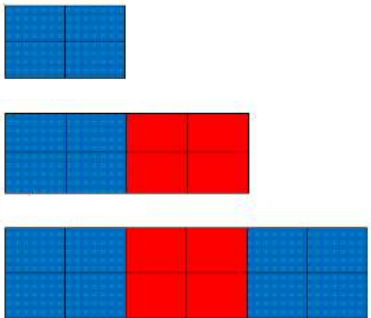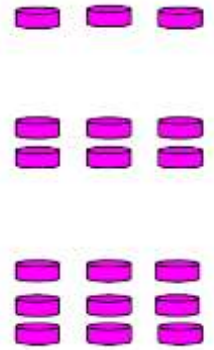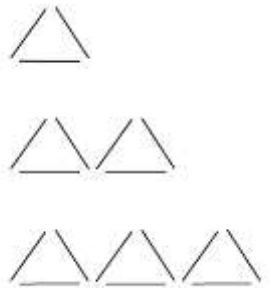
APPENDIX 8: Growing pattern activity explanation.

Students have to…

1. Choose one growing pattern.
2. Draw the growing pattern in their book.
3. Work out the rule.
4. Find the fifth object in the pattern.
5. Find the seventh object in the pattern.
6. Write the number pattern sequence of the object pattern.

- The teacher will write the steps on the whiteboard for students to follow.
- Counters will be on each table for students to use if they need to.

(National Council of Teachers of Mathematics, 2015).

APPENDIX 9: Checklist

Students Name:								
Student created a growing pattern using counters.								
Student described the rule of their growing pattern.								
Student continued their partners growing pattern successfully.								
Student identifies their partners rule to their growing pattern.								
Needed further assistance.								

APPENDIX 10: Open Task- Growing Patterns.

Growing Patterns

Directions:
Using graph paper and geometric tiles, make a series of growing patterns. You can make as many growing patterns as you like. Explain your growing pattern rule.

Fill out the following chart for you **best** two growing patterns on this chart.

Growing Pattern A: **Draw the first three figures of Growing Pattern A in the boxes below.**		
Explain the rule for Growing Pattern A:		
Write the number sequence for Pattern A:		

Growing Pattern B:
Draw the first three figures of Growing Pattern B in the boxes below.

Explain the rule for Growing Pattern B:	

Write the number sequence for Pattern B:	

Growing Patterns Open Task- Rubric

Goes beyond	Student is able to create six or more growing patterns by using the geometric tiles. They are able to choose two of their favourite growing patterns, and draw the first three figures of their pattern on the template given to them. Students demonstrate a clear understanding of the task by using one or more efficient mathematical strategies that is suitable for the task. (Example: uses addition and subtraction, doubling, halving). The student uses appropriate words to describe the rule and is able to write the number sequence for both growing patterns.
Task Accomplished	Student was able to create 5-6 growing patterns using the geometric tiles. The student was able to choose two of their favourite growing patterns, and draw the first three figures of their pattern on the template given to them. Student was able to display a clear understanding of the task by using one correct mathematical strategy such as addition, subtraction, halving, doubling. The student uses appropriate words to describe the rule and is able to write the number sequence for both growing patterns.
Substantial Progress	Student was able to create 3-5 growing patterns using the geometric tiles. They are able to choose two of their favourite growing patterns, and draw the first three figures of their pattern on the template given to them. Student was able to use a suitable strategy to create their growing patterns, such as adding, subtracting, doubling, halving. Student was not clear when explaining the rule of the growing pattern they had created and was unable to identity the number sequence.
Some Progress	Student was able to attempt the task by creating two growing patterns using the geometric tiles. They are able to draw the first three figures of both patterns on the template given to them. The student used a suitable strategy for creating their growing patterns such as adding, subtracting, doubling and halving. The student was unable to communicate the rules or the number sequences of both growing patterns.
Little Progress	Student made little or no evidence of engagement in the task. Student was able to complete one growing pattern. The student did not explain the rule of the growing pattern and did not write the number sequence for their pattern.