

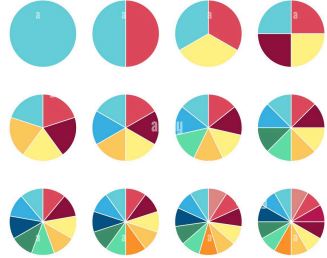
ANIMATED FLIPBOOK (LEVEL 3)

Description	Learners will explore patterns around them and make their own patterns using shapes, numbers and music. They will then make their own animated flipbook using a combination of patterns.
Leading question	Can you make an animated flipbook using patterns?
Subjects covered	Math, Art and Design
Total time required	40-60 min a day for 4 days
Resources required	Paper, pen/pencil, scissors, ruler, coloured pencils/pens (optional)
Learning outcomes:	<p>By the end of this project, learners will be able to:</p> <p>Knowledge-based Outcomes:</p> <ol style="list-style-type: none"> 1. Identify different kinds of patterns in daily life. 2. Explain the meaning of polygons and list their features. 3. Differentiate between regular and irregular polygons. 4. Identify and draw different types of polygons. 5. Identify patterns in number sequences (addition, subtraction, multiplication-based rules) 6. Create mathematical patterns and sequences using different rules. 7. Explain the meaning and significance of the Fibonacci sequence. <p>21st Century Skill Outcomes:</p> <ol style="list-style-type: none"> 1. Think critically while analyzing the patterns and rules of visual, musical, dance and mathematical patterns. 2. Be creative while making patterns and using them in their flipbook. 3. Collaborate effectively while receiving and implementing the feedback on patterns. 4. Communicate their ideas effectively while presenting their flipbooks.
Previous Learning	<ul style="list-style-type: none"> - Basic addition up to 50 - Skip counting by 2, 3, 4, 5 - Multiplication by 2-digit numbers - Division by single-digit numbers - Basic 2D shapes
Supervision required	Medium

Day 1 -

Today, you will understand what a pattern is, solve and create number patterns, and start thinking about how you would want to design your flipbook.

Time	Activity and Description
10 minutes	<p>Exploring Patterns</p> <p>Look around you and find 2-3 designs that repeat themselves! (Such as on clothes or brickwork on the wall)</p> <ul style="list-style-type: none"> - What is the design that repeats itself? - Where else do you see such designs that repeat themselves? <p>Such things that repeat themselves with certain rules/norms are called patterns.</p> <ul style="list-style-type: none"> - In this project, we will explore different types of patterns around us. We will learn about patterns in numbers, geometric shapes, letters and natural patterns and will use them to make a flip book. We will make the flipbooks by working in pairs. - The Leading Question for this project is: Can you make an animated flipbook using patterns?
5 minutes	<p>Sharing an Example of a Flipbook</p> <p>A flipbook is a small book with a series of images in different positions on each page that create the illusion of flowing movement when the thumb is placed so the pages flip quickly.</p> <p>Note: Show examples of a flip book using the images in Appendix 1 or show them this video: https://www.youtube.com/watch?v=A_cjNHudXvA&ab_channel=MrFlip</p>
15 minutes	<p>Exploring Different Types of Patterns</p> <p>Let us look at a few patterns in math! For each of these patterns:</p> <ul style="list-style-type: none"> - Find the rule (which number(s)/ shape(s) repeat themselves) - The next three terms in it. <p>Note: Share these patterns with learners (rules are in brackets for discussion/ explanation):</p> <ul style="list-style-type: none"> - Shapes: square, triangle, circle, square, triangle, circle, square... (rule: repeated after 2 shapes) - Addition: 2, 4, 6, 8, 10... (rule: add 2) - Subtraction: 100, 97, 94, 91, 88... (rule: minus 3) - Multiplication: 7, 14, 21, 28... (rule: multiples of 7) - Division: 5000, 1000, 200, 40... (each term is the previous term divided by 5) <p>Now, make four mathematical patterns of your own using clear rules! You can use shapes or one or more operations (add, multiply, divide, subtract) in each pattern.</p> <p>Tip: To challenge learners at a higher level, write more complicated patterns for the learners to solve and write the next 3 numbers in. For example:</p> <ul style="list-style-type: none"> - 575, 600, 650, 725, 825... (+25, +50, +75, +100 etc.) - 2999, 2988, 2977, 2966... (-11) - 1, 4, 9, 16, 25... (1 square, 2 square, 3 square etc.) - 81, 18, 64, 16, 49, 14... (square of a number, double the number e.g. (9*9), (9*2), (8*8), (8*2) etc.)

	- 4, 16, 36, 64... (rule: square of each of the even numbers e.g. (2*2), (4*4), (6*6) etc.)
10 minutes	<p>Planning the Flipbook</p> <p>Note: Learners should think about what kinds of patterns they want to include in their flipbook. They must note how they wish to use number patterns in their flipbook. E.g. have a shape increasing in number by 2 on every page or have a shape divided progressively.</p> <p>This idea is just a draft, to begin with. We can add/change our flipbook ideas as we progress each day.</p> 
At-home activities	Make 3 more mathematical patterns using a combination of operations. Once done, challenge a friend or a family member to solve them!

Day 2 –

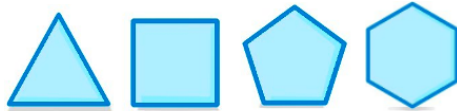

Today, you will learn about the Fibonacci sequence and its application in nature, explore patterns around you, and start making your flipbook.

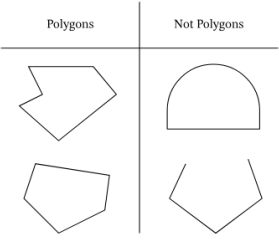
Time	Activity and Description
10 minutes	<p>Fibonacci Sequence</p> <p>Note: Write this sequence on the board: 0, 1, 1, 2, 3, 5, 8, 13. Ask learners to independently identify the rule of the pattern and predict the next 2 terms.</p> <ul style="list-style-type: none"> - In the previous class, we saw how we can identify and create patterns with numbers. - This is a special number pattern called the Fibonacci sequence that was discovered many years ago by a mathematician from Italy called Leonardo, also known as Fibonacci. - Starting with 0 and 1, each next term is the sum of the previous two terms. - This is called the golden ratio found in shells, plants, flowers and animals that are often used in art. <p><i>Note: Show learners examples of how the Fibonacci sequence can be seen in nature using images from Appendix 2.</i></p>
10 minutes	<p>Patterns in Life</p> <p>As we saw, patterns exist all around us in clothes, plants, and numbers.</p> <ul style="list-style-type: none"> - Patterns also exist in the events around us. - For example, day and night the sequence of day and night keeps repeating. No matter what, every 24 hours, the sun rises and gives us a day, and then it sets and gives us night. <p>Think about 3 patterns in events around you.</p> <p>Note: If this is too challenging, share a few themes for learners to identify the patterns e.g.</p>

	<ul style="list-style-type: none"> - Day-night-day, - Seasons: spring-summer-autumn-winter, - Traffic lights: Red follows green, amber/ yellow follows red, and green follows amber/ yellow. - Phases of the moon: We see the moon follow a cycle from no moon to full moon and back, every 15 days.
10 minutes	<p>Patterns in Music</p> <p>One of the most common areas in which we find patterns is music! There are patterns in the beats of music. Let us make our own song with beats as a pattern (e.g. repetition of clap + clap + snap + stamp)!</p>
10 minutes	<p>Preparing Sheets for the Flipbook</p> <p>Let us prepare sheets for our flipbooks! To do this:</p> <ul style="list-style-type: none"> - Cut out 30-40 small sheets of paper to make your flipbook with. - Keep these sheets safe with you, we will use them to make a flipbook in further classes!
At-home activities	Find out any three patterns that you can identify in songs!

Day 3

Today, you will explore geometric patterns and learn about polygons, their features and types. Once done, you will work on including patterns with polygons in your flipbooks.

Time	Activity and Description
10 minutes	<p>Introduction to Polygons</p> <p>Let us start with trying to find patterns in shapes!</p> <p>Note: Share the sequence of shapes shown below with the learners, and ask them to draw the next shape in the sequence and share the rule.</p>  <p>The next shape would be a heptagon (with 7 sides) and the rule is that each shape has one side more than the previous one.</p>  <p>Such closed figures that are made up of combinations of line segments are called polygons. A geometrical figure is called a polygon if:</p> <ul style="list-style-type: none"> - It is made up only of line segments joined together, and has no curved sides. - It has at least three sides.

10 minutes	<p>Identifying Polygons How will you identify if a given shape is a polygon or not?</p> <p>Note:</p> <ul style="list-style-type: none"> - Use the worksheet in Appendix 3 to share different shapes with learners. - Ask them to identify if the given shapes are polygons or not. - Once done, remind learners that polygons: <ul style="list-style-type: none"> - are closed shapes, and - must only be made up of straight lines. 
10 minutes	<p>Features of a Polygon Now that we know what a polygon is and how to identify a polygon, let us learn about some features of a polygon.</p> <p>Note: Teach/ revise the features of a polygon:</p> <ul style="list-style-type: none"> - Sides/Edges: Line segments that form the boundary of the polygon - Vertices/corners: The corners or points where 2 sides meet - Angles: the figure formed at the corners of the polygon. - Types of Polygons: <ul style="list-style-type: none"> - Regular: All sides and angles are equal - Irregular: Sides are unequal or angles are unequal or both sides and angles are unequal. - Refer to Appendix 4 for examples of regular and irregular polygons. <p>Now, draw the following shapes on your own:</p> <ul style="list-style-type: none"> - A polygon with 6 vertices (Identify how many angles it has) - A polygon with 4 angles (Identify how many sides it has)
10 minutes	<p>Including Polygons in the Flipbook Look back at your flipbook designs and:</p> <ul style="list-style-type: none"> - Choose 3 or 4 polygons to include in the patterns that you will draw in your flipbook. - Once done, draw the first page and the last page of your flipbook.
At-home activities	Ask a friend or a family member to share feedback with you on how you plan to build your flipbook (based on the first and the last pages) and share ideas that they have, if any.

Day 4 –

Today, you will finish your flipbooks and present them to your friends and family!

Time	Activity and Description
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25 minutes	<p>Completing the Flipbook</p> <p>Complete your flipbooks by:</p> <ul style="list-style-type: none"> - Drawing the progressive patterns on each sheet; and - Once done tying/ fastening the pages together.
10 minutes	<p>Presenting the Flipbooks</p> <p><i>Note: Ask learners to bring their friends and family to the class today so that they can present their flipbooks to them.</i></p> <p>Present your flipbooks and explain how you used number patterns and polygons in them. Once done, ask your audience to share feedback with you on:</p> <ul style="list-style-type: none"> - What they like; and - What could have been better
5 minutes	<p>Reflection</p> <p>Think and answer:</p> <ul style="list-style-type: none"> - Which part of this project did you enjoy the most and why? - Which part did they enjoy the least and why? - What did you do, if anything, to make the less enjoyable part more fun?

Additional enrichment activities:	Further, increase the difficulty level of the numerical patterns by including negative integers and more complex operations. Teach learners the names of different regular polygons depending on the number of sides. (refer to Appendix 5)
Modifications for simplification	Simplify any of the numerical patterns shared and increase practice in more basic patterns.

ASSESSMENT CRITERIA

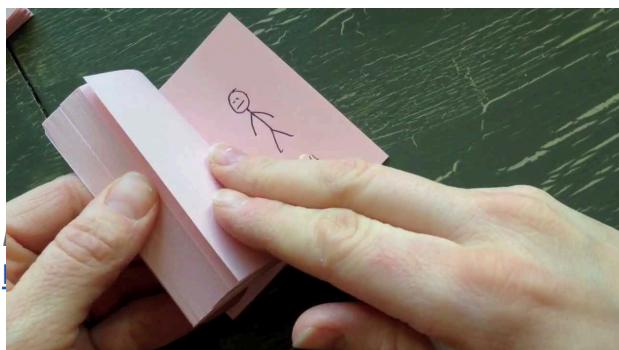
A majority of my learners were able to:

- Create 5 mathematical patterns following clear rules.
- Differentiate polygons and non-polygons and regular and irregular polygons.
- Identify, name and draw regular polygons with a different number of sides.
- Create a flipbook using numerical and geometric patterns.

APPENDIX

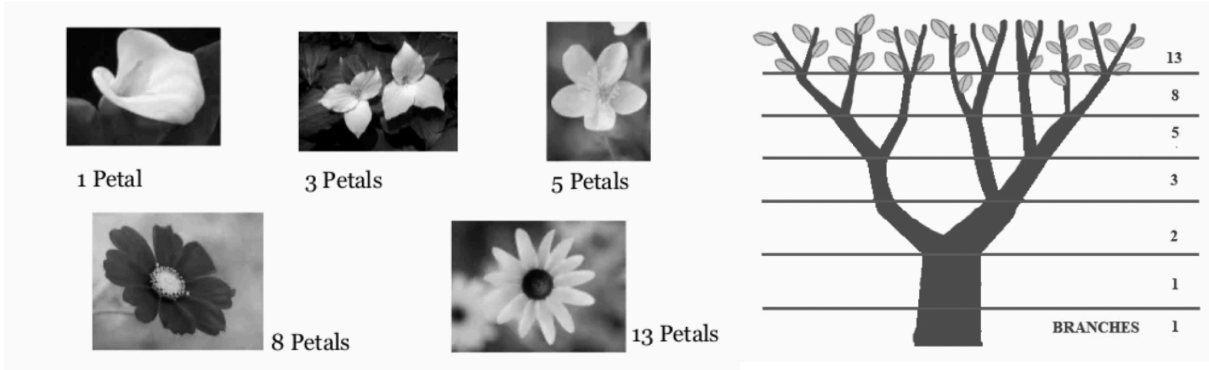
Appendix 1:

Flipbook Examples:



Appendix 2:

A printout showing how the number of petals in flowers is often a term in the Fibonacci sequence.



Appendix 3:

Polygon Worksheet (source: <https://www.mathworksheets4kids.com/polygon/identifying-1.pdf>)

Name: _____

Identifying Polygons Sheet 1

Write whether each figure is a polygon or not a polygon.

1) _____	2) _____	3) _____
4) _____	5) _____	6) _____
7) _____	8) _____	9) _____
10) _____	11) _____	12) _____

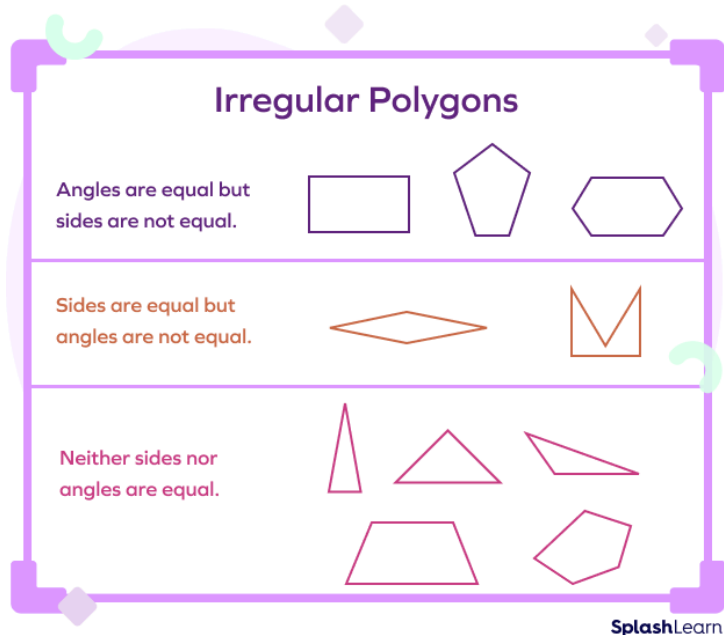
Answers:

- 1) Polygon
- 2) Not a polygon
- 3) Polygon
- 4) Polygon
- 5) Not a polygon
- 6) Not a polygon
- 7) Polygon
- 8) Polygon
- 9) Not a polygon
- 10) Not a polygon
- 11) Not a polygon
- 12) Polygon

Appendix 4:











Irregular Polygons Examples (source:

<https://www.splashlearn.com/math-vocabulary/wp-content/uploads/2023/01/What-are-Irregular-Polygons-2.png>)



Appendix 5:

Regular Polygons Chart (Source: <https://www.cuemath.com/geometry/types-of-polygon/>)

Polygon	Figure	Number of Sides
Triangle		3
Quadrilateral		4
Pentagon		5
Hexagon		6
Heptagon		7
Octagon		8
Nonagon		9
Decagon		10
Hendecagon		11
Dodecagon		12