

PROBABILITY MATTERS (LEVEL 1)

Description	The learner will explore the concept of chances and probability and learn how to calculate probability. They will use these concepts to design and build a game club to include games based on probability.
Leading Question	Can you design a game using probability?
Total Time Required	5 hours over 4 days
Supplies Required	A4 papers, Cardboard, pencil, colors, ruler, any dish or tray in the shape of a medium or big circle, glass, 4 buckets, scissors, and colored balls.
Subjects	Math, Art and Design, Social Sciences, Science
Supervision	Medium
Learning Outcomes	By the end, the learner will be able to: <ol style="list-style-type: none"> 1. Calculate the probabilities of tossing a coin. 2. Calculate the probabilities of spinning a spinner. 3. Collect data on the chances of an outcome. 4. Understand the types of animals (that live on sea or land) 5. Understand the difference between equal and unequal outcomes. 6. Understanding the difference between likely and unlikely outcomes. 7. Write some words related to probability (likely, unlikely)
Previous Learning	Read and write numbers up to 50. Draw using household items. Determine the appearance of different animals.

DAY 1

Today you will learn about what chances and probability are.

Suggested Duration	Activity and Description
10 minutes	<ul style="list-style-type: none"> ● Introduce the concept of chances and probability ● Here are some questions to learn about probability. Note that: <ul style="list-style-type: none"> - Some of the questions have one answer

	<ul style="list-style-type: none"> - Some answers are either true or false - Some questions have multiple choices, which means you must choose the correct answer. - Some have no right or wrong answers. <p>Some of the questions could be:</p> <ol style="list-style-type: none"> 1- What is your name? 2- How many sisters/brothers do you have? 3- How many wings does a bird have? 4- How many tails does a cat have? 5- Do fish live in the desert? True or False 6- Can snakes run? True or False 7- Does an elephant have a trunk? True or False 8- Do aeroplanes need railways to travel on? True or False 9- Choose the correct answer: Falcons can (fly, walk, swim) 10- Choose the correct answer: A football team has (3 11 14) players. 11- If I have two pencils, one is red and one is green, which one would you choose? 12- If there are three pieces of biscuits with the same taste but different shapes: one is shaped like a circle, one is shaped like a car, and one is shaped like a flower, which one will you choose? 13- If there are two storybooks, one about Batman (or any hero that you are familiar with) and one about travelling around the world, which one would you choose? <ul style="list-style-type: none"> ● Reflect on questions 11, 12, and 13. <ul style="list-style-type: none"> - There are outcomes (the possible result of an experiment or trial) in life that there are no rights or wrongs. - By the end of this project you will learn how to calculate possibilities or probability for each outcome. - Probability is how likely something is to occur; for example, how confident can we be that it is going to rain tomorrow?
<p>15 minutes</p>	<ul style="list-style-type: none"> ● Coin Creation: Design your own two coins <ul style="list-style-type: none"> - Find any household item shaped like a small circle then use it to draw two circles on cardboard. Cut out those two circles. - Draw two animals: one lives in the sea (dolphin, shark, etc.) and the other animal lives on land (sheep, cow, fox, etc.) - On one side draw the head of the animal and on the other side draw the tail of the same animal for each coin. - Color the animals as well with any colours of your choice, you are going to play some games with those coins.

15 minutes

Understanding Chance

- Choose one of the two coins to toss 6 times and each time write which side it landed on: heads or tails.
- Count how many times the coin landed on heads or tails out of the six times. This data can be captured in a table like the one in the example below for easy understanding.
- Then calculate the probability or chances of getting one outcome e.g., the probability of a coin toss landing on the head of the coin.

For example, if you get heads 4 times out of 6, explain how we calculate the probability or chances of heads falling 4 out of 6. Older learners with knowledge of writing fractions can write:

- $P(H) = \frac{4}{6}$ or P (H) is 4 out of 6 times.

Number of tosses	Dolphin Coin
1	H
2	T
3	H
4	H
5	H
6	T

Draw a similar table for your own coin toss and calculate:

- The probability of the coin landing on the head
- The probability of the coin landing on the tail

Repeat the same activity with two coins by tossing the two coins and on a table of three columns write what the outcomes are each time you toss the coin. For example

Number of tosses	Dolphin Coin	Rabbit Coin
1	H	T
2	H	H
3	T	H
4	H	H
5	T	T

	<table border="1"> <tr> <td>6</td> <td>H</td> <td>H</td> </tr> </table> <ul style="list-style-type: none"> • How many times did we toss a coin? How many times did both coins land on heads (HH)? How many times did both coins land on tails (TT)? How many times did the coins land heads and tails (HT) or (TH)? • In the above table (HH)=3 (TT)=1 (HT)=2 and the total number of tosses = $2 \times 6 = 12$ times • So this is how we calculate the probability $P(HH) = \frac{3}{6}$ $P(TT) = \frac{1}{6}$ $P(HT) = \frac{2}{6}$ <ul style="list-style-type: none"> - Add the probability of HH, TT, HT - Explain that when we add the probabilities of the 6 tosses, it will equal $\frac{6}{6}$ and this is for all outcomes when we add all the probabilities the numerator will be equal to the denominator which is equal to 1. 	6	H	H
6	H	H		
20 minutes	<p>Optional:</p> <p>Draw a similar table for your own two-coin tosses and calculate:</p> <ul style="list-style-type: none"> - The probability of both coins landing on the head, P(HH) - The probability of both coins landing on the tail, P(TT) - The probability the coins land on heads and tails P(HT or TH) 			
15 minutes	<ul style="list-style-type: none"> • Teach your siblings and friends. • Design creative coins and compete by tossing the two coins 8, 10, and 12 times and record those outcomes in your tables. • Declare the one who got more HH as the winner in first round • Players can repeat different rounds with different outcomes as the winner. 			

DAY 2

Today you will build a spinner and play a probability game.

Suggested Duration	Activity and Description
25 minutes	<ul style="list-style-type: none"> • Draw a circle on cardboard and cut out this circle. <ul style="list-style-type: none"> - Divide the circle into four equal parts by drawing two lines that intersect in the center of the circle. Color each part with a different color (red, green, blue, yellow, etc. or any other colors of your own choice) - Draw a line and cut it out to use as a pointer.

- In the center of the circle, make a hole with a pencil and use a thread to locate this pointer to the center of the circle. It should not be too tight and not too loose but easy to spin it. (Use a pin instead of thread if that does not work.)
- Develop a table for this experiment. Spin the pointer and write down the color you got each time.

1	Red
2	Green
3	Blue
....	

- Find out what the chances are for each color if your repeat it for 10 and 20 times.
- For example: let's say out of 10 times the pointer landed on green 3 times so $P(G) = \frac{3}{10}$ and so on.
- If the pointer landed on red 6 times out of 20 times $P(R) = \frac{6}{10}$
- Reflect on and find out that the addition of probability of all the four colors in each experiment will be $\frac{10}{10}$ in the first one and $\frac{20}{20}$ in the second one.



25 minutes

- Teach and guide your friends and family members to build their own spinners and play.
 - Players need to have the same colors so they can record and count who got the highest number of the same colors when they spin the pointer 10 times, 20 times, etc... They can do many rounds and

	<p>whoever gets the highest number of a specific color in each round wins</p> <p>OR</p> <ul style="list-style-type: none"> - Develop your own spinner examples (still circular shape, but it has more than 4 equal parts (draw 6 or 8 equal parts) and instead of colors he/she could draw different items like a flower, ball, car, etc.) - Develop a poster that presents the tables and probability calculations.
15 minutes	<p>Critique and revision: Present all of the day's work to your parents or family members for feedback and suggestions for improvement. The parents or family members should provide feedback using the following format:</p> <ul style="list-style-type: none"> ● Praise: What did you like about the learner's work? ● Question: Any questions or clarifications you have about the work? ● Suggestions: In what areas does the learner need to improve their work?

DAY 3

Today you will learn about likely and unlikely outcomes

Suggested Duration	Activity and Description												
5 minutes	<ul style="list-style-type: none"> ● Revision: <ul style="list-style-type: none"> - Use one coin for an experiment. What are the possible outcomes that can happen? - It can only be Heads or Tails. There are only two possible outcomes. In this case, the probabilities of outcomes are equal. 												
10 minutes	<ul style="list-style-type: none"> ● Are the following outcomes 'likely' to happen or 'unlikely' to happen? <table style="width: 100%; border: none;"> <tr> <td style="width: 80%;">1. Fish can walk.</td> <td style="text-align: right;">Unlikely</td> </tr> <tr> <td>2. Train flies.</td> <td style="text-align: right;">Unlikely</td> </tr> <tr> <td>3. Cats have 4 legs</td> <td style="text-align: right;">Likely</td> </tr> <tr> <td>4. Lion lays eggs</td> <td style="text-align: right;">Unlikely</td> </tr> <tr> <td>5. Human has two eyes</td> <td style="text-align: right;">Likely</td> </tr> <tr> <td>6. Square has 5 sides.</td> <td style="text-align: right;">Unlikely</td> </tr> </table> 	1. Fish can walk.	Unlikely	2. Train flies.	Unlikely	3. Cats have 4 legs	Likely	4. Lion lays eggs	Unlikely	5. Human has two eyes	Likely	6. Square has 5 sides.	Unlikely
1. Fish can walk.	Unlikely												
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6. Square has 5 sides.	Unlikely												

<p>10-20 minutes</p>	<ul style="list-style-type: none"> ● Draw two circles on a sheet of paper or on the floor. Label one circle 'likely' and the other circle 'unlikely'. ● Think about the different activities/outcomes that are likely or unlikely to happen or not happen in your life and take note of them. ● Inside the 'likely' circle, draw outcome/s that are likely to happen, e.g. a bird with two wings. ● Inside the 'unlikely' circle, draw outcome/s is unlikely to happen, e.g. a bird with three wings. <p>Alternatively,</p> <ul style="list-style-type: none"> ● Play a game with a friend or sibling. Draw two big circles on the floor: <ul style="list-style-type: none"> ● On one circle write 'Yes' and on the other circle write 'No' ● Ask one of the players to shout one letter of the alphabet. ● If: <ul style="list-style-type: none"> - It is one of the letters in the word 'likely', players should jump into the 'yes' circle - It is not one of the letters in the word 'likely', players should jump into the 'no' circle.
<p>10 minutes</p>	<ul style="list-style-type: none"> ● Draw 6 circles/balls and color them with 3 different colors (for example: 3 red, 2 blue and 1 green), and place them in a bag. ● Close your eyes and pull out one circle or ball out of the bag. <ul style="list-style-type: none"> - Which circles/balls are most likely to be withdrawn? Why do you think it is the most likely to be withdrawn? <i>In this example pulling out a red ball is a likely outcome because there are more red balls in the bag.</i> - Which ball is least likely to be withdrawn the least? <i>In this example pulling out a green ball is an 'unlikely' outcome because there is only 1 green ball.</i> - In the colored balls experiment the outcomes are unequal outcomes because there are 3 Reds, 2 Blues and 1 Green.
<p>20 minutes</p>	<ul style="list-style-type: none"> ● Line up some household items (for example: 4 large buckets, 3 medium and 1 small). Place the buckets in a 3-meter line in the order of large -> medium -> small or vice versa. ● Each player should throw a ball 5 times while recording the targeted bucket. ● Whoever targets the small bucket most, wins. ● Develop a game that you can use likely/unlikely outcomes ● Some questions to use for likely/unlikely outcomes:

	<p>What is the likelihood that-- What object is more likely to appear.... The object that is least likely to appear is...</p> <p>Be creative!</p>
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DAY 4

Today you will create a game club with your new games!

Suggested Duration	Activity and Description
20 minutes	<ul style="list-style-type: none"> Think about the 4-5 games you have played and created in the last 3 days that you use all the concepts you have learned.
40 minutes	<ul style="list-style-type: none"> Design and build a 'game club' to put all the games that you have developed. <ul style="list-style-type: none"> Invite friends/siblings to visit the club and play the games. Put a price on each game that you want to play so you can gain skills on how to start a business.
15 minutes	<p>Think about all the exercises you have done for the past 3 days and take note of "TWO" of the following:</p> <ul style="list-style-type: none"> What is the most important thing that you have learnt through this project? What did you find challenging, puzzling or difficult to understand? What question would you most like to discuss? What is something you found interesting?

Additional enrichment activities:	<p>If students have internet they can play this game online: http://www.scootle.edu.au/ec/viewing/L2384/index.html#</p>
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ASSESSMENT CRITERIA

Majority of my learners were able to:

- Creatively design the coins and using drawings of 2 animals' for heads and tails.
- Demonstrate creativity in designing their spinner and poster.
- Calculate accurately the probabilities of different basic outcomes in different experiments or games.
- Demonstrate creativity in designing the "game club".