

PROBABILITY MATTERS (LEVEL 3)

Description	The learner will explore the concept of chances and probability and learn how to calculate probability.
Leading Question	Can you design a game using probability?
Total Time Required	6 hours over 5 days
Supplies Required	Papers, cardboard, pencils, colors, rulers, glue.
Learning Outcomes	<ol style="list-style-type: none"> 1. Calculate the probabilities in daily life. 2. Calculate the probability of rolling specific numbers in one or two dices. 3. Collect data of chances of daily life outcomes using tables. 4. Drawing a square. 5. Draw and create a 3D cube. 6. Understand the applications of probability in daily life 7. Developing games 8. Sports 9. Genetics 10. Draw tree diagram and calculate the probability of outcomes
Previous Learning	<ul style="list-style-type: none"> • Calculation of probability for simple experiments (coins) • Draw 2D shapes (square, rectangle) • Drawing tables. • Writing skills. • Multiplication (mental math)

DAY 1

Today you will learn about what chances and probability are.

Suggested Duration	Activity and Description
25 minutes	<ul style="list-style-type: none"> • What is your favorite sport? <ul style="list-style-type: none"> • Make sure it is a match-based sport played with two teams (football, American football, volleyball, Cricket, basketball, etc.) • Write an essay describing your favorite sport in details using diagrams. Make sure it includes all the details such as: how

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many players are needed to play, what are the rules, who wins in the match, etc.

- How does the match kick-off?
- Why do you think they need to toss a coin? Explain.

20 minutes

- Play a match of their own favorite sport with friends and family members. Before starting the match, ask what are the odds of their team winning? Why?
- Example: The odds of my team winning are $\frac{5}{6}$ because we have better goal keeper and striker. This means if my team plays 6 matches we will win 5 out of the 6 and we will lose 1. So the probability is $\frac{5}{6}$.
- Record the result of the game and set a prize for the correct match prediction.

Conclusion:

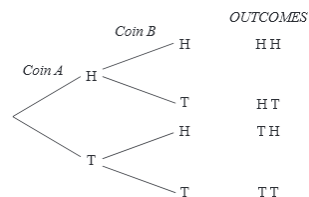
- Probability is very important in sports, some sports use probability in kick-off. The most popular use of probability in sports is through betting, which is a large profit industry.
- In probability there is no right or wrong, it is all about chances.

20 minutes

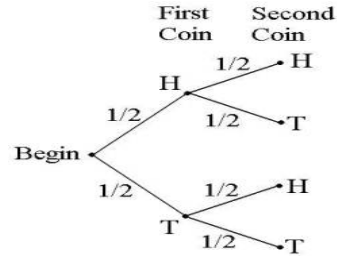
- What are the outcomes if you toss one coin? What are the outcomes if you toss two coins?
- Draw a diagram that represents flipping one coin and another diagram that represents tossing two coins.

20 minutes

- Use a tree diagram for probability.
- If you flip one coin once, the outcome will be either heads or tails
- If you toss two coins this is a **tree diagram** of outcomes of all the potential outcomes



- Calculate the probability of each outcome

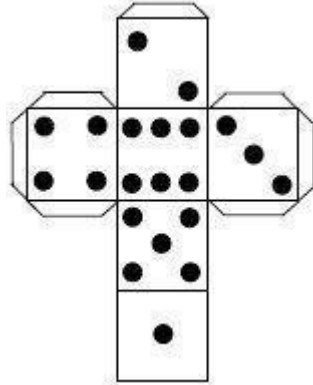


- The probability of heads or tails for one coin is $\frac{1}{2}$ because there are only two outcomes.
- The probability of the outcomes being either heads or tails is $\frac{1}{2}$ so if you are looking at the tree and calculate $P(HH) = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$ or $P(HT) = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$
- Draw a tree diagram of tossing 3 coins and calculate the probability of all outcomes.
- Create their own experiment.
- Draw the tree diagram
- Calculate the probability of all outcomes.

DAY 2

Today you will create your own dice and play a probability game with it.

Suggested Duration	Activity and Description
20 minutes	<ul style="list-style-type: none"> • Draw a table with two rows <ul style="list-style-type: none"> • In the first row: write the 5 days of the week. • In the second row: observe and record the weather for the next 4 days and show the weather with a drawing in each day.
15 minutes	<ul style="list-style-type: none"> • Design a cube: • Draw, cut and glue the below to make their own dice, the lines will be folded and stuck together in the shape of a cube.



10 minutes

- The outcomes of rolling a dice are (1, 2, 3, 4, 5, 6)
- Draw a table of two columns and roll the dice 10 times
- Record the outcome of each roll
- Calculate the probability of getting 4 or 1, $P(4)$ or $P(1)$
- Calculate the probability of all the outcomes you had in this experiment
- Add them all and reflect. The sum is 10/10 which is equal to 1.

• Roll	• Number on Dice
• 1	• 4
• 2	• 6
• 3	• ...
• ... 10	• ...

20 minutes

- Who will get to the end first?
 - Teach a friend to draw and create a dice.
 - On the floor draw two mazes divided into steps with some cushions or chairs (make sure both mazes are the same difficulty)
 - Each player rolls his dice according to the number the dice lands on and moves that amount of steps.
 - The one who finishes first wins.

DAY 3

Today you will play with dices.

Suggested Duration

10 minutes

Activity and Description

- Reflect on the last two days. What have you learnt? What did you enjoy the most? Why?
- Record today's weather to complete the weather table.

10 minutes

- Make a second dice and color it.
- Challenge: Discover how many possible outcomes can happen when you roll two dices on the same time.
- The answer is 36 outcomes
(1, 2). (1, 1), (1, 3). (1, 4)....

	1	2	3	4	5	6
1	(1,1)	(1,2)	(1,3)	(1,4)	(1,5)	(1,6)
2	(2,1)	(2,2)	(2,3)	(2,4)	(2,5)	(2,6)
3	(3,1)	(3,2)	(3,3)	(3,4)	(3,5)	(3,6)
4	(4,1)	(4,2)	(4,3)	(4,4)	(4,5)	(4,6)
5	(5,1)	(5,2)	(5,3)	(5,4)	(5,5)	(5,6)
6	(6,1)	(6,2)	(6,3)	(6,4)	(6,5)	(6,6)

- Roll the two dices 10 times. Draw a table and record all the outcomes.

15 minutes

- Calculate the probability of the outcomes. How many times did each outcome happen in the 10 rolls of the dice?
- Add all the probabilities of all outcomes the sum will equal $\frac{10}{10}=1$
- What are the chances of rolling two dices and get (7,2)
- Answer: zero.
- Conclusion
 - One of the important applications of probability is developing games which require chances.
 - Some games are for entertainment and having fun.
 - Some games include profit and making money (clubs, casinos)

25 minutes

- List some games that require dice/s
- Develop your own game using one dice or two dices (be creative!)
- Play the game with friends/siblings

DAY 4

Today you will look at family characteristics.

Suggested Duration

Activity and Description

10 minutes

- Reflect on the last 3 days. What did you learn? What did you enjoy the most? Why?
- Record today's weather to complete the weather table.

40 minutes

- Draw your family tree on a big poster (up to your grandparents or great-grandparents) and write under each member the following:

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- Name
 - Age
 - Relation to the learner
 - Choose three characteristic such as (skin color, height, eye color, hair style...)
 - Now relate your own characteristics (skin color, height, eye color...) to your family tree
 - What are the chances of your future children having a characteristic (eye color, hair type, height...) that many people in the family have?
 - Conclusion:
 - Probability is very important in predicting the characteristics of the family tree.
 - It is also very important in disease diagnoses to improve the chances of protection and cure.
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DAY 5

Today you will look into the weather probability and probability of diseases.

Suggested Duration	Activity and Description
15 minutes	<ul style="list-style-type: none"> ● Weather prediction ● Calculate the probability of each outcome: sunny, rainy, and cloudy in the last 4 days? ● To calculate it use however many times each outcome occurs in the 4 days and divide it by the number of days. ● Example: <ul style="list-style-type: none"> - If it was sunny for 2 days out of 4 days that means the probability is $\frac{2}{4}$ and calculate the percentage by multiplying it by 100 - $\frac{2}{4} \times 100 = 50\%$ - So we can predict that for next week's weather, the probability it will be sunny is 50%. ● Conclusion <ul style="list-style-type: none"> - Probability is very important in predicting the weather through the year so we can: <ul style="list-style-type: none"> - Know what season to plant our crops - What to wear for the next week - when to travel to certain areas or places - Know in advance the chances of floods, hurricanes for protective measures
15-20 minutes	<ul style="list-style-type: none"> ● Go to your community and count how many people have diabetes (or any other inherited disease) <ul style="list-style-type: none"> - Calculate the percentage of diabetics in the community.

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<ul style="list-style-type: none"> - If the percentage is 20% that means there is a very low chance of diabetics in the next generation. We call this outcome 'unlikely' - If the percentage is above 50% that means there is a very high chance of diabetics in the next generation. We call this outcome 'likely' - Conclusion: Probability is important in measuring and curing. So that we know if we will have more diabetics in the next generation to prepare plans for cure and prevention. 	
<p>30 minutes</p>	<ul style="list-style-type: none"> ● Imagine our daily lives without probability or chances. ● Draw a table that compares our life with and without probability in it.

ASSESSMENT CRITERIA

- Creativity in designing posters to explain learning outcomes.
- Calculate accurately the probabilities of different basic outcomes in different experiments.
- Drawing accurate squares.
- Building accurate 3D cube.
- Creativity in developing new games using probability.
- Communication skills in presentation the knowledge.

ADDITIONAL ENRICHMENT ACTIVITIES

- Watch this video- application of probability: <https://www.youtube.com/watch?v=sY3ZRxBaM>
- Mendel genes and inheritance: <https://www.youtube.com/watch?v=jVlfbQdrmhE>