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**
1. Calculate the probabilities in daily life.
2. Calculate the probability of rolling specific numbers in one or two dices.
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**
- 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.

<table>
<thead>
<tr>
<th>Suggested Duration</th>
<th>Activity and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 minutes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- What is your favorite sport?</td>
</tr>
<tr>
<td></td>
<td>- Make sure it is a match-based sport played with two teams (football, American football, volleyball, Cricket, basketball, etc.)</td>
</tr>
<tr>
<td></td>
<td>- Write an essay describing your favorite sport in details using diagrams. Make sure it includes all the details such as: how</td>
</tr>
</tbody>
</table>
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

![Tree Diagram](image)

- 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.

<table>
<thead>
<tr>
<th>Suggested Duration</th>
<th>Activity and Description</th>
</tr>
</thead>
</table>
| **20 minutes**      | ● Draw a table with two rows  
                       ● 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**       | ● 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.

<table>
<thead>
<tr>
<th>Roll</th>
<th>Number on Dice</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>...</td>
</tr>
<tr>
<td>... 10</td>
<td>...</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Suggested Duration</th>
<th>Activity and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 minutes</td>
<td>Reflect on the last two days. What have you learnt? What did you enjoy the most? Why?</td>
</tr>
<tr>
<td></td>
<td>Record today’s weather to complete the weather table.</td>
</tr>
</tbody>
</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
  \( (1, 2), (1, 1), (1, 3), (1, 4) \ldots \)

\[
\begin{array}{ccccccc}
1 & 2 & 3 & 4 & 5 & 6 \\
1 & (1,1) & (1,2) & (1,3) & (1,4) & (1,5) & (1,6) \\
2 & (2,1) & (2,2) & (2,3) & (2,4) & (2,5) & (2,6) \\
3 & (3,1) & (3,2) & (3,3) & (3,4) & (3,5) & (3,6) \\
4 & (4,1) & (4,2) & (4,3) & (4,4) & (4,5) & (4,6) \\
5 & (5,1) & (5,2) & (5,3) & (5,4) & (5,5) & (5,6) \\
6 & (6,1) & (6,2) & (6,3) & (6,4) & (6,5) & (6,6) \\
\end{array}
\]

- 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.

<table>
<thead>
<tr>
<th>Suggested Duration</th>
<th>Activity and Description</th>
</tr>
</thead>
</table>
| 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: |
- 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.

---

**DAY 5**

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

<table>
<thead>
<tr>
<th>Suggested Duration</th>
<th>Activity and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 minutes</td>
<td>● Weather prediction</td>
</tr>
<tr>
<td></td>
<td>● Calculate the probability of each outcome: sunny, rainy, and cloudy in the last 4 days?</td>
</tr>
<tr>
<td></td>
<td>● To calculate it use however many times each outcome occurs in the 4 days and divide it by the number of days.</td>
</tr>
<tr>
<td></td>
<td>● Example:</td>
</tr>
<tr>
<td></td>
<td>- If it was sunny for 2 days out of 4 days that means the probability is</td>
</tr>
<tr>
<td></td>
<td>- $\frac{2}{4}$ and calculate the percentage by multiplying it by 100</td>
</tr>
<tr>
<td></td>
<td>- $\frac{2}{4} \times 100 = 50%$</td>
</tr>
<tr>
<td></td>
<td>- So we can predict that for next week’s weather, the probability it will be sunny is 50%.</td>
</tr>
<tr>
<td></td>
<td>● Conclusion</td>
</tr>
<tr>
<td></td>
<td>- Probability is very important in predicting the weather through the year so we can:</td>
</tr>
<tr>
<td></td>
<td>- Know what season to plant our crops</td>
</tr>
<tr>
<td></td>
<td>- What to wear for the next week</td>
</tr>
<tr>
<td></td>
<td>- when to travel to certain areas or places</td>
</tr>
<tr>
<td></td>
<td>- Know in advance the chances of floods, hurricanes for protective measures</td>
</tr>
<tr>
<td>15-20 minutes</td>
<td>● Go to your community and count how many people have diabetes (or any other inherited disease)</td>
</tr>
<tr>
<td></td>
<td>- Calculate the percentage of diabetics in the community.</td>
</tr>
</tbody>
</table>
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.

30 minutes
• 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=sY3ZRxhBaM
• Mendel genes and inheritance: https://www.youtube.com/watch?v=jVlfbQdrmhE