PROBABILITY MATTERS

Ages 4 to 7 (Level 1)

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?
Age group:	4-7
Subjects:	Mathematics, Art and Design, Social Sciences, Science
Total time required:	5 hours over 4 days
Self-guided / Supervised activity:	Medium supervision
Resources required:	A4 papers, Cardboard, pencil, colors, ruler, households any dish or tray in shape of medium or big circle, glass, 4 buckets, scissors, color balls.

Day	Time	Activity and Description
1	10 minutes	Introduce the concept of chances and probability Ask the learner some questions but make sure that • Some of the questions have one answer • Some answers are either true or false • Some questions have multiple choices that means students must choose the correct answer. • Some have no right or wrong answers. Bank of the questions (use some, not all). 1- What is your name? 2- How many sisters/brother 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 airplanes 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, one is shaped like a flower, which one will you choose? 13- If there are two storybooks one about batman (or any hero that the learner is familiar with) and one about traveling around the world which one would you choose?

		Ask the learner to reflect on questions 11, 12, and 13. - Explain to the learner that there are outcomes in life that there are no rights or wrongs. - By the end of this project the learners will learn how to calculate possibilities or probability for each outcome.
	15 minutes	Activity 1 Ask the learner to design his/her own two coins as the following: • Learner needs to find any household 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 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. • Ask the learner to color the animals as well, because they are going to play some games with those coins
	15 minutes	Activity 2 • Ask the learner to draw 2 columns and write numbers from 1 to 6 in the first column (number of tosses of the coin) • Choose one of the two coins to toss 6 times and each time write which side it landed on: heads or tails. • Ask the learner to count how many times the coin landed on heads or tails out of the six times. • Example if the learner got heads 4 times out 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. 1 | H 2 | T 3 | H 4 | H 5 | H 6 | T 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 the learner tosses the coin. For example: | | Dolphin | Rabbit | | 1 | H | T | | 2 | H | H | | 3 | T | H | | 4 | H | H |

<table>
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<table>
<tr><td>5</td><td>T</td><td>T</td></tr>
<tr><td>6</td><td>H</td><td>H</td></tr>
</table>
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 P(HH)=3 P(TT)=1 P(HT)=2
So this is how we calculate the probability P(HH)=$\frac{3}{6}$ P(TT)=$\frac{1}{6}$ P(HT)=$\frac{2}{6}$
- 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 dominator which equal 1.

20 minutes
Game 1 :
Learners can teach other siblings and friends.
The design creative coins and compete tossing the two coins for 8, 10, and 12 times and record those outcomes in their tables.
They can declare the one who got more HH as the winner in first round
Players can repeat different rounds with different outcomes as the winner.</td>
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<td>2</td>
<td>25 minutes</td>
<td>Ask the learner to draw a circle on cardboard, and cut out this circle.
• 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.)
• 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.)
• Assist the learner in developing a table for this experiment. Spin the pointer and write down the color the learner got each time.
• Learner will find out what the chances are for each color if they repeat it for 10 and 20 times
<table>
<tr><td>1</td><td>Red</td></tr>
<tr><td>2</td><td>Green</td></tr>
<tr><td>3</td><td>Blue</td></tr>
<tr><td>….</td><td></td></tr>
</table>
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) = $\frac{6}{10}$
Learners will now 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 second one.</td>
</tr>
</table>

	25 minutes	 **<u>Challenge Question :</u>** **What is the probability the pointer will land on yellow?** **P(y)=0** • **When an outcome cannot happen because there is no probability that it will happen then:** **Probability = 0. It is unlikely to happen.** **Game 2:** Learner teaches and guides friends or family members to build their own spinners and play: Players need to have the same colors so they can record and count who got highest number of the same colors when they spin the pointer for 10 times, 20 times, etc… They can do many rounds and whoever gets highest number of a specific color in each round wins Or Learner develops his/her own spinner examples (that means circle 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.
3	5 minutes 10 minutes	Revision: - Use one coin for an experiment. What are the possible outcomes that can happen? - Answer: Heads or Tails. There are only two possible outcomes. In this case the probabilities of outcomes are equal Activity 1 Ask the learner: Are the following outcomes likely to happen or unlikely to happen? 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

	10-20 minutes	Activity 2 • Ask the learner to draw two circles and label one circle 'likely' and the other circle 'unlikely'. 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 unlikely to happen e.g. a bird with three wings. or • Ask the learner to play a game with a friend or sibling. Draw two big circles on floor: 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: - 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.
	10 minutes	Activity 3 Draw 6 circles and color them 3 different colors (for example: 3 red, 2 blue and 1 green) or get 6 different colored balls and place them in a bag. Close your eyes and pull out one ball. - Which ball is most likely to be withdrawn? - Pulling out a red ball is a likely outcome because there are more red balls in the bag. - Which ball is likely to be withdrawn the least? Green because it is only one ball. - Pulling out a green ball is an unlikely outcome because the chance of it happening is low. - In the colored balls experiment the outcomes are unequal outcomes because there are 3 Reds, 2 Blues and 1 Green.
	20 minutes	**Game 3:** • Line up some household items (for example 4 buckets, 3 large and one small). Place the buckets in a 3 meter line. • Each player should throw a ball 5 times while recording the targeted bucket. • Whoever targets the small bucket most wins. • Ask the learner to develop a game that they can use likely/unlikely outcomes Be creative!
4	20 minutes	Ask the learner to think about the 4-5 games they have played and created in the last 3 days that you use all the concepts they have learned.

	40 minutes	Ask the learner to design and build a “game club” to put all the games that they have developed. • Invite friends/siblings to visit the club and play the games. • The learner can put a price on each game they want to play so that the learner can gain skills of how to start a business
Assessment Criteria:		- Creativity in designing the coins and using drawings of 2 animals’ for heads and tails. - Creativity in designing their spinner and poster. - Calculate accurately the probabilities of different basic outcomes in different experiments or games. - Creativity in designing the “game club”.

Learning outcomes:	- Calculate the probabilities of tossing a coin. - Calculate the probabilities of spinning a spinner. - Collect data on the chances of an outcome. - Understand the types of animals (that live on sea or land) - Understand the difference between equal and unequal outcomes. - Understanding the difference between likely and unlikely outcomes. - Write some words related to probability (likely, unlikely)
Required previous learning:	- Read and write numbers up 50. - Draw using household items. - Determine the appearance of different animals.
Inspiration:	
Additional enrichment activities:	If students have internet they can play this game online http://www.scootle.edu.au/ec/viewing/L2384/index.html#

Ages 8 to 10 (Level 2)

Description:		The learner will explore the concept of the chances and probability and learn how to calculate probability.
Leading question:		Can you design a game using probability?
Age group:		8 to 10
Subjects:		Mathematics, Art and Design, Social Sciences, Science, Physical Education
Total time required:		5 hours over 5 days
Self-guided / Supervised activity:		Medium supervision
Resources required:		A4 papers, cardboard, pencil, colors, ruler, household items: any dish or circle shaped tray, glass, scissors, glue, empty plastic bottles.
Day	Time	Activity and Description
1	10 minutes	Introduce the concept of chances and probability - Ask the learner some questions but make sure that • Some of the questions have one answer • Some answers are either true or false • Some questions have multiple choices that means students must choose the correct answer. • Some have no right or wrong answers. Bank of the questions (use some, not all). 1- What is your name? 2- How many sisters/brother 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 airplanes 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, one is shaped like a flower, which one will you choose? 13- If there are two storybooks one about batman (or any hero that the learner is familiar with) and one about traveling around the world which one would you choose? Ask the learner to reflect on questions 11, 12, and 13.

- Explain to the learner that there are outcomes in life that there are no rights or wrongs.
- By the end of this project the learners will learn how to calculate possibilities or probability for each outcome.

20 minutes

Activity 1

Ask the learner to design his/her own two coins as the following:

- Learner needs to find any household 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 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.
- Ask the learner to color the animals as well, because they are going to play some games with those coins.

20 minutes

Activity 2

One coin experiment

- Ask the learner to draw 2 columns and write numbers from 1 to 6 on the first column (number of tosses of the coin)
- Choose one of the two coins to toss 6 times and each time write which side it landed on: heads or tails.
- Ask the learner to count how many times the coin landed on heads or tails out of the six times.
- Example if the learner got heads 4 times out 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.

1	H
2	T
3	H
4	H
5	H
6	T

b) Two coin experiment

- 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 the learner tosses the coin. For example:

	Dolphin	Rabbit
1	H	T
2	H	H

3	T	H
4	H	H
5	T	T
6	H	H

- 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 P(HH)=3 P(TT)=1 P(HT)=2

So this is how we calculate the probability P(HH)= $\frac{3}{6}$ P(TT)= $\frac{1}{6}$ P(HT)= $\frac{2}{6}$

- 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 dominator which equal 1.

c) Three coin experiment

Repeat tossing three coins 6 times

- On a table of 4 columns, write down what the outcomes are of each trial

	Dolphin	Rabbit	falcon
1	H	H	H
2	H	H	T
3	H	T	H
4	H	H	H
5	T	T	H
6	T	T	T

For example the three coins landed on heads 2 out of 6 trials

That means P(HHH)= $\frac{2}{6}$

Learner also needs to calculate the following outcomes:

-All three coins landed on tails TTT

-Coins landed on two tails and one heads TTH or HTT or THT

-Coins landed on two heads and one tails HHT or THH or HTH

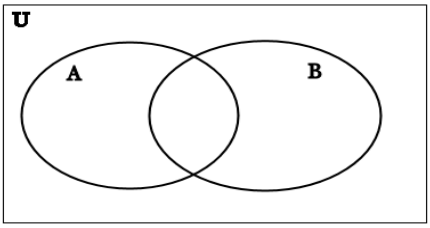
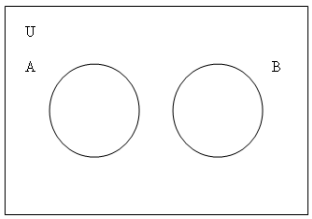
Remember that the sum of all the probabilities will eventually equal to one

- Ask the learner to reflect on the three experiments, what are the expected outcomes in each experiment?

Solution:

Learner discovers that

- One coin experiment has 2 possible outcomes 2 x 1 (T or H)
- Two coin experiment has 4 possible outcomes 2 x 2 (HH,HT,TH,TT)
- Three coins landed eight possible outcomes $2 \times 2 \times 2 = 8$ (HHH, HHT, HTH, HTT, THH, THT, TTH, and TTT)

		• Some of outcomes will not happen so there is no right or wrong. The calculation of the outcome equals to zero. previous example P(THT)= 0
2	10 minutes	Ask the learner to draw two circles to represent the following: - In a classroom, there are 10 students who like football, 6 students who like basketball and 4 students who like both basketball and football.  -Circle A represents students that like football, circle B represents students that like basketball and the center where the two circles intersect, represents the students that like both football and basketball. We call this a VENN diagram. We use it to represent probability. • Calculate the probability of students that like football. P(f)=$\frac{10}{20}$= $\frac{1}{2}$ • Calculate the probability of students that like basketball. P(b)= $\frac{6}{20}$= $\frac{3}{10}$ • Calculate the probability of students that like basketball and football P (fb) = $\frac{4}{20}$= $\frac{1}{5}$ always simplify fractions.
	10 minutes	Activity 1 • Ask the learners to draw a Venn diagram to represent their favorite colors and his/her friend's favorite colors. • If there are common colors, the diagram will be similar as the above diagram. • Calculate probability of the learner favorite colors and of his friend favorite colors. • If there are no common favorite color the diagram will be two separate circles  • Calculate the probability of his/her own favorite colors • Calculate the probability of his friend favorite colors
	10 minutes	Activity 2 Use the Venn diagram to separate shapes. It could be different items in different shapes or 2D shapes and 3D.

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<tr>
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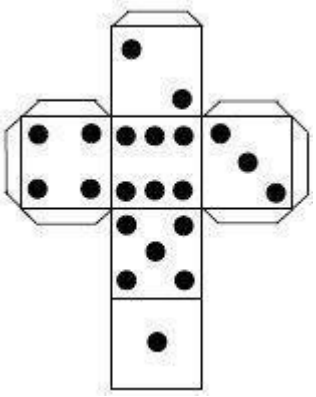
<td>10 minutes</td>
<td>Draw your Venn diagram and calculate the probability of each shape.

Game 1:
• Ask the learner to teach their friends and family members how to design 3 creative coins and play different rounds of the game, for example:
1. Toss 2 coins, 20 times. Players will draw their table and record the outcomes. Then the player who has the highest number of the two coins landed Heads P (HH) wins.
2. Tossing 2 coins, 30 times. The player who has the highest number of two coins landed on heads and tails P(HT) wins
3. Tossing 3 coins, 20 times. Each player will draw their table and record the outcomes. The player who has the highest number of 3 coins landed with two heads and one tails P(HHT) wins</td>
</tr>
<tr>
<td>3</td>
<td>20 minutes</td>
<td>Activity 1
• Ask the learner to find a circle shaped household item, the bigger the better (dish, tray, bicycle wheel) to draw a circle on cardboard paper, then cut out this circle
• 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.)
• 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.)
 

• Assist the learner in creating a table for this experiment. Spin the pointer and calculate the probability for each color if they repeat it for six times
<table><tr><td>1</td><td>R</td></tr><tr><td>2</td><td>G</td></tr><tr><td>3</td><td>B</td></tr><tr><td>4</td><td>G</td></tr><tr><td>5</td><td>B</td></tr><tr><td>6</td><td>R</td></tr></table></td>
</tr>
</table>

		Calculating Probability: E.g. If you use the spinner 6 times, and the pointer lands on green 2 times out of 6: P(G)= $\frac{2}{6}$ And if the pointer landed on red 2 times out of 6: P(R) = $\frac{2}{6}$ and so on Learner should reflect and find out that the addition of the probability of all four colors in each experiment will be $\frac{6}{6}$.
	20 minutes	**Game 2:** • Draw a new circle and cut it out. Divide it into 8 parts. • Draw 8 different items with the same theme like school stationary, kitchen items, food items, clothes, etc. • Teach your friends and family to create their own spinner with same theme. • Each player spins the spinner 20 times and writes it down in their own piece of paper and then find out the outcomes. Example: If they are using the food theme, the one who has highest pointer landed on bread will be the winner.
	15 minutes	Activity 3 Ask the learner: If a friend sent you a message saying "I heard that probability is very interesting topic, I wish I knew more about it", could you write a paragraph to explain what you have learnt with simple examples.
4	10 minutes	Ask the learner to reflect on the last 3 days. - What did you like the most? What did you not like? - What did you learn?
	20 minutes	**Game 3:** Design a cube: - Ask the learner to 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. 

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<td>10 minutes

20 minutes</td>
<td>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.

Example of the table:

<table><tr><th>Roll</th><th>Number on Dice</th></tr><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></table>

Game 3: who will get to the end first
• Ask the learner to 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.</td>
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<tr>
<td>5</td>
<td>5 minutes

10 minutes</td>
<td>Reflect on how we calculated the probability of outcomes for the experiments you have done in the last 4 days.

Activity 1
Make a second dice and color it.

Challenge:
• Ask the learner to 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)….
<table><tr><th></th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th></tr><tr><td>1</td><td>(1,1)</td><td>(1,2)</td><td>(1,3)</td><td>(1,4)</td><td>(1,5)</td><td>(1,6)</td></tr><tr><td>2</td><td>(2,1)</td><td>(2,2)</td><td>(2,3)</td><td>(2,4)</td><td>(2,5)</td><td>(2,6)</td></tr><tr><td>3</td><td>(3,1)</td><td>(3,2)</td><td>(3,3)</td><td>(3,4)</td><td>(3,5)</td><td>(3,6)</td></tr><tr><td>4</td><td>(4,1)</td><td>(4,2)</td><td>(4,3)</td><td>(4,4)</td><td>(4,5)</td><td>(4,6)</td></tr><tr><td>5</td><td>(5,1)</td><td>(5,2)</td><td>(5,3)</td><td>(5,4)</td><td>(5,5)</td><td>(5,6)</td></tr><tr><td>6</td><td>(6,1)</td><td>(6,2)</td><td>(6,3)</td><td>(6,4)</td><td>(6,5)</td><td>(6,6)</td></tr></table>
- Roll the two dices 20 times. Draw a table and calculate the probability of P (6, 3), P (5, 1), and P (3, 2).</td>
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</table>

		- Remember that if one of the outcomes did not happen the probability equals zero.
	20 minutes	Create your own game using one or two dices. Be creative! Try the game and play it with other players. Remember to write down and draw the details of your game.
	30 minutes	**OR Another idea** **Game 4 :** Learner looks around the house to collect 3 empty, equal sized, plastic bottles Ask the learner: How can we get rid of any item made of plastic? Make sure that the discussion includes the definition of recycling and what other different materials need to be recycled. - Fill two plastic bottles halfway with water. - Flip both bottles at the same time. What are the possible outcomes of this experiment? They are top, bottom and side of the bottle. - Which outcome has more chances of happening? Which outcome has less chances of happening? Why? - The chances of the bottle landing on its side has more chances to happen, so we would say this outcome is 'likely' to happen. - The chances of the bottle landing on its top has less chances to happen, so we would say this outcome is 'unlikely' to happen. - Tell the learner to ask friends and family members to each fill 2 bottles halfway with water. Make sure all bottles are the same size. - Each player flips the two water bottles at the same time 10 times - The one who lands the bottles on the bottom most wins. - Add more difficult levels after if the learner wants to continue playing.
	30 minutes	Now ask the learner to create their own "game club" and display all the games they have created. Invite friends or siblings to join and play all the games they have created.
Assessment Criteria:		- Creativity in designing the coins using drawing of animals (heads and tails) - Creativity in designing spinner and poster. - Accurately calculating the probabilities of different basic outcomes in different experiments. - Creativity in designing the game club. - Drawing accurate squares. - Building accurate 3d shape (cube).

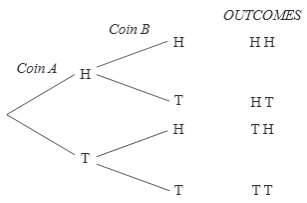
	- Creativity in developing new games using probability.

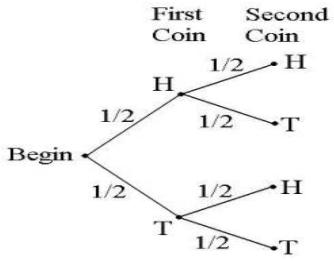
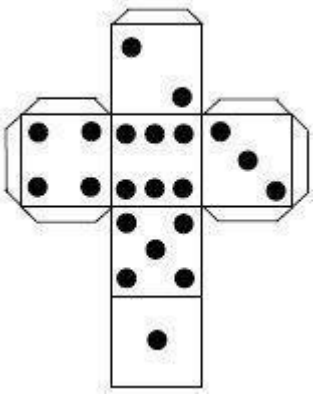
Learning outcomes:	- Calculate the probabilities of tossing a coin/coins. - Calculate the probabilities of spinning a spinner. - Calculate the probability of rolling one dice and two dices. - Collect data on the chances of an outcome using tables. - Draw a square. - Draw and create a 3D cube. - Defining the process of recycling materials. - Understanding how to use a Venn diagram to represent and calculate the probability of outcomes.
Required previous learning:	- Counting up to 100. - Drawing a straight line. - Multiplication tables - Knowledge of the different types of animals (live in sea or land)
Inspiration:	
Additional enrichment activities:	Learner can develop more games using probability and add to their club. Play this game online: https://www.youtube.com/watch?v=4IQpe3J-2AU

Ages 11 to 14 (Level 3)

Description:	Learner will explore the concept of the chances and probability and learn how to calculate probability. Learner will also recognize the importance of probability in daily life.
Leading question:	What is the importance of probability in our daily life?
Age group:	11 to 14
Subjects:	Math, Art and Design, Social Sciences, Science, Physical Education
Total time required:	6 hours over 5 days
Self-guided / Supervised activity:	Medium supervision
Resources required:	Papers, cardboard, pencils, colors, rulers, glue.

Day	Time	Activity and Description

1	25 minutes	Ask the learner what their favorite sport is. - Try to ensure that the chosen sport is a match-based sport composed of two teams (football, American football, volleyball, Cricket, basketball, etc.) - Ask the learner to write an essay describing his/her favorite sport in details using diagrams. Make sure it includes all the details such as: how many players are needed to play, what are the rules, who wins in the match, etc. Ask the learner: • How does the match kick-off? (mostly they toss a coin) • Why do you think they need to toss a coin? Explain
	20 minutes	Ask the learner to 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	Ask the learner what the outcomes are if you toss one coin. What are the outcomes if you toss two coins? Ask the learner to draw: - A diagram that represents flipping one coin. - A diagram that represents tossing two coins. Give the learner feedback and clarify why did his/her diagrams work or not work.
	20 minutes	Tell the learner they can 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  • Explain to the learner how to 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)= $\frac{1}{2}x\frac{1}{2}=\frac{1}{4}$ or P(HT)= $\frac{1}{2}x\frac{1}{2}=\frac{1}{4}$ • Ask the learner to draw a tree diagram of tossing 3 coins and calculate the probability of all outcomes. • Ask the learner to create their own experiment. - Draw the tree diagram - Calculate the probability of all outcomes.
2	20 minutes 20 minutes	**Task 1** Ask the learner to 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. **Task 2** Today we are going to make dice/dices to develop games. Design a cube: - Ask the learner to 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.  Color your dice.

<table>
<tr>
<td></td>
<td>15 minutes</td>
<td>
What are the chances for rolling the dice?
How do you calculate the probability of which side the dice will land on? (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.

Example of the table:
<table>
<tr><th>Roll</th><th>Number on Dice</th></tr>
<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>
</table>
Game 1: who will get to the end first?

Ask the learner to 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.

</td>
</tr>
<tr>
<td>3</td>
<td>10 minutes

10 minutes</td>
<td>

Teacher asks learner to reflect on last two days. What did you learn? What did you enjoy most? Why?
Remind learner to record today’s weather to complete the weather table.

Challenge:
Ask the learner to 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)….
<table>
<tr><th></th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th></tr>
<tr><td>1</td><td>(1,1)</td><td>(1,2)</td><td>(1,3)</td><td>(1,4)</td><td>(1,5)</td><td>(1,6)</td></tr>
<tr><td>2</td><td>(2,1)</td><td>(2,2)</td><td>(2,3)</td><td>(2,4)</td><td>(2,5)</td><td>(2,6)</td></tr>
<tr><td>3</td><td>(3,1)</td><td>(3,2)</td><td>(3,3)</td><td>(3,4)</td><td>(3,5)</td><td>(3,6)</td></tr>
<tr><td>4</td><td>(4,1)</td><td>(4,2)</td><td>(4,3)</td><td>(4,4)</td><td>(4,5)</td><td>(4,6)</td></tr>
<tr><td>5</td><td>(5,1)</td><td>(5,2)</td><td>(5,3)</td><td>(5,4)</td><td>(5,5)</td><td>(5,6)</td></tr>
<tr><td>6</td><td>(6,1)</td><td>(6,2)</td><td>(6,3)</td><td>(6,4)</td><td>(6,5)</td><td>(6,6)</td></tr>
</table>
- Roll the two dices 10 times. D
- Draw a table and record all the outcomes.
Example:
<table>
<tr><td>Trial</td><td>Dice 1</td><td>Dice2</td></tr>
<tr><td>1</td><td>3</td><td>4</td></tr>
<tr><td>2</td><td>1</td><td>5</td></tr>
</table>
</td>
</tr>
</table>

	15 minutes 25 minutes	<table><tr><td>3</td><td></td><td></td></tr><tr><td>4….</td><td>..</td><td>..</td></tr></table> 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) Ask the learner to 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.
4	10 minutes 40 minutes	Ask the learner to reflect on last 3 days. What did you learn? What did you enjoy the most? • **Remind learner to record today's weather to complete the weather table.** Ask the learner to draw their family tree on a big poster (up to their 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…) The learner will now relate their own characteristics (skin color, height, eye color…) to their family tree. What are the chances of the learner's future children having a characteristic (eye color, hair style, 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**.**
5	15 minutes	Activity of weather prediction • Calculate the probability of each outcome: sunny, rainy, and cloudy in the last 4 days? • Explain that to calculate it they have to use however many times each outcome occurs in the 4 days and divide it by the number of days. Example: 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 $\frac{2}{4}$x100= 50% So we can predict that for next week's weather, the probability it will be sunny is 50%. <u>Conclusion</u> - Probability is very important in predicting the weather through the year so we can: - 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	Ask the learner to go to their communities and count how many people have diabetes (or any other inherited disease) - Calculate the percentage of diabetics in the community. - 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 life 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.

Learning outcomes:	- Calculate the probabilities in daily life. - Calculate the probability of rolling specific numbers in one or two dices. - Collect data of chances of daily life outcomes using tables. - Drawing a square. - Draw and create a 3D cube. - Understand the applications of probability in daily life - Developing games - Sports - Genetics - Draw tree diagram and calculate the probability of outcomes

Required previous learning:	- Calculation of probability for simple experiments (coins) - Draw 2D shapes (square, rectangle) - Drawing tables. - Writing skills. - Multiplication (mental math)
Inspiration:	
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