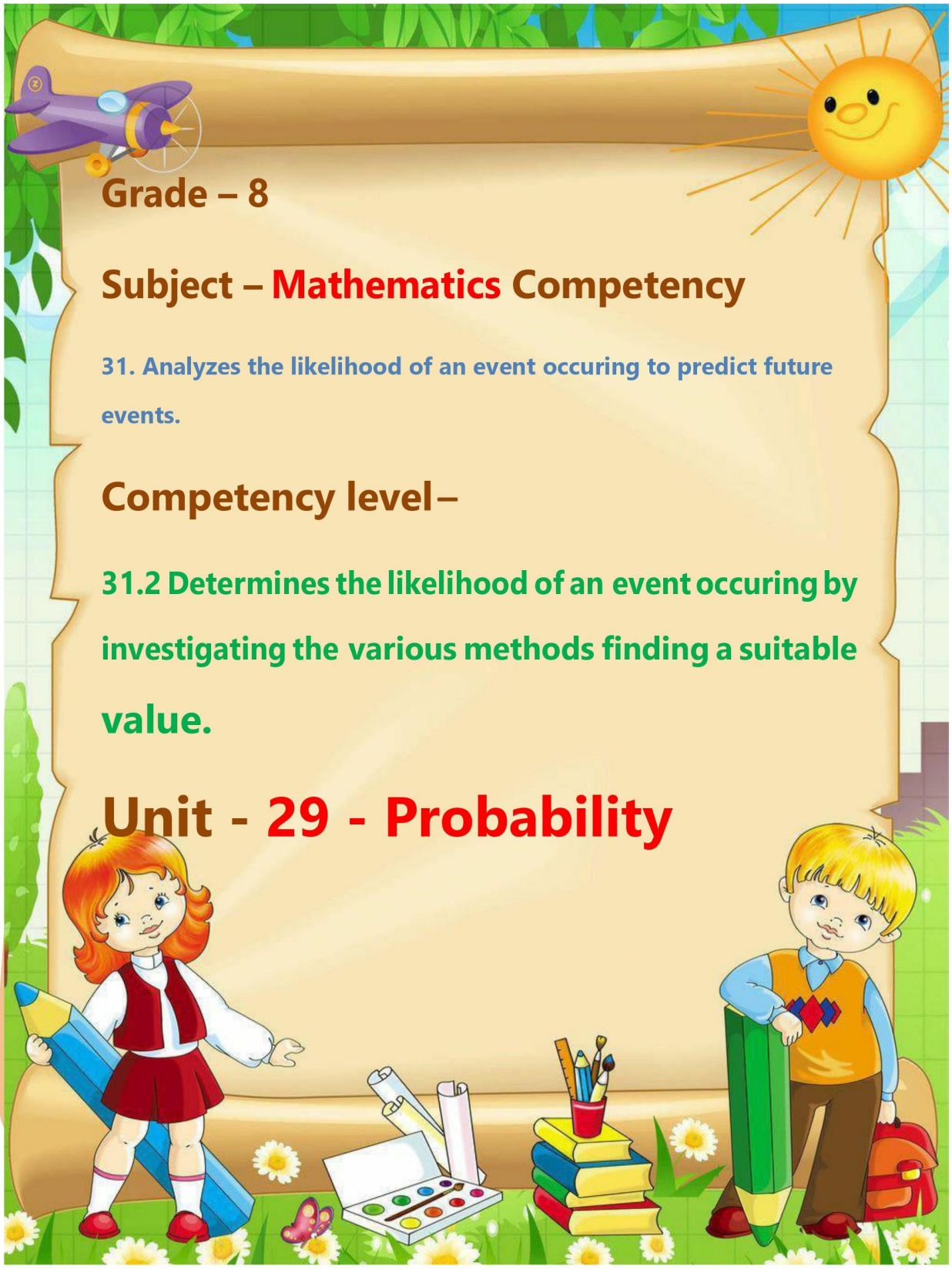
Grade 8

MATHEMATICS



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By studying this unit you will be able to

- **identify what the fraction of success of an outcome of a random experiment is**
- **identify what the experimental probability of an event is**
- **identify what the theoretical probability of an event is**

29.1 Introduction

Probability is built up upon the events.

29.2 Likelihood of an event occurring

Example – You have learned this when you are in grade 07

- "The sun rising from the East" is an event which **definitely occur.**
- "A tortoise is flying in the sky" is an event which **definitely do not occur.**
- "Finding a Rs. 100/= note which had fallen" is a **random** event

Color the following table related to the occurrence of the events according to the given color cord to categorize them under above mentioned events.

- definitely occurring events - **red color**
- events which definitely do not occur – **blue color**
- random events – **green color**

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	Event	Definitely occurring events	Events which Definitely do not occur	Random events
1	Sun setting from the west			
2	Falling down a stone when it is tossed upwards			
3	Appearance of the moon on a poya day			
4	A student winning the game			
5	Leafing the pestle			
6	Tyres of a bus are circular in shape			
7	There will be rain on tomorrow			
8	The lion eats grass			
9	Obtaining the tail when tossing a coin			
10	There are three prime numbers from 2 to 5			

We can provide marks as shown below for the occurrence of an event

- an event which definitely do not occur 0 marks
- an event which definitely occur 1 mark
- random event marks between 0 and 1

02. Allocate marks for the following events.

	Event	Marks
1.	Sun sets from the west	
2.	Falling down a stone when it is tossed upwards	
3.	Appearance of Moon on a poya day	
4.	A student winning the game	
5.	Tender leafing the pestle	

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6.	Tyres of a bus are circular in shape	
7.	There will be rain on tomorrow	
8.	The lion is eating grass	
9.	Obtaining the tail when tossing a coin	
10.	There are three prime numbers from 2 to 5	

Random experiments.

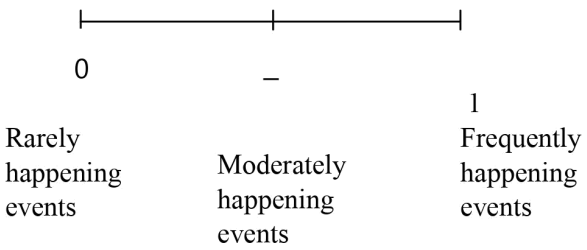
A random event can be categorized into three groups as follows

- rarely happening events
- moderately happening events
- frequently happening events

Allocating marks for the random experiments.

We can follow the following scale to allocate marks for the above events.

- rarely happening events $= 0 - \frac{1}{2}$
- moderately happening events $= \frac{1}{2}$
- frequently happening events $= \frac{1}{2} - 1$



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Example: -

- "The team who won several matches successively will be lost in the next match that they are facing"

an event which happens rarely = 0 - $\frac{1}{2}$

- "Obtaining the tail when tossing a coin"

an event which can happen moderately = $\frac{1}{2}$

- "Getting a number less than 5 when tossing an unbiased die numbered from 1 to 6"

as event which frequently happens = $\frac{1}{2}$ - 1

Give marks for the for the happening of the given random events

	Random event	Marks
1	Obtaining the value of 2 when tossing an unbiased die numbered from 1 to 6	
2	When tossing an unbiased die numbered from 1 to 6, obtaining any value of 2, 3, 5 or 6ක් ට 6	
3	Getting the number 2, 4 or 6 when tossing an unbiased die numbered from 1 to 6	
4	Winning the team A from a match against the teams A and B	
5	Happening of an earthquake	
6	The lifespan of a person is 110 years	
7	A boy will be born as the first baby in December 31st	

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Outcomes of an experiment

An experiment which we can express all the possible outcomes but unable to assume the outcome of the experiment before conducting the experiment is called as a random experiment.

Following are the common properties of a random experiment

- We can repeat the experiment for any number of times under the same conditions.
- We cannot assume the outcome before conducting the experiment.
- Before doing that experiment, we can express all the possible outcomes of the experiment.
- There is no pattern in the outcomes that we gain.

Exercise 01 Complete the table given below

	Experiment	Possible Outcomes	Number of outcomes
1	Tossing a coin	Head, Tail	2
2	The side that showing up when tossing a die numbered from 1 to 6		
3	Taking out a card randomly from a pack of cards written as A, B, C, D and E		
4	Tossing a tetrahedral die numbered from 1 – 4 and observed the side which touch the table		

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5	Taking out a ball from a parcel which contain 5 balls with the same size and the shape but in colors Blue, Yellow, Green, Red and Orange		
6	A student is sitting for the exam		
7	Tossing an octahedral die numbered from 1 – 8 and observe the side touched with the table		

- By looking at the seeds we cannot assume whether the seeds will be germinated or not. For that it is required to plant those seeds and observe the germination of the seeds. This is an experiment. The probability that we obtain through an experiment is called as the experimental probability.

Fraction of Success (Relative frequency)

Number of seeds planted	**Number of seeds germinated**	$\frac{Number\ of\ seeds\ germinated}{Number\ of\ seeds\ planted}$
20	18	$\frac{18}{20}$
40	37	$\frac{37}{40}$
60	55	$\frac{55}{60}$
80	72	$\frac{72}{80}$
100	91	$\frac{91}{100}$

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$$\text{Fraction of Success} = \frac{Number\ of\ seeds\ germinated}{Number\ of\ seeds\ planted}$$

$$\text{Fraction of Success of A} = \frac{Number\ of\ times\ the\ outcome\ A\ occurs}{Total\ number\ of\ times\ the\ experiment\ is\ conducted}$$

When the number of times of the experiment are conducted is gradually increased, the fraction of success is reaching to a certain constant value.

(01) Take a coin and toss it according to the number of turns given in the following table.

Number of times the coin is tossed	Number of occasions obtained the head	Number of occasions obtained the tail	Fraction of Success of getting Head	Fraction of Success of getting Tail
10				
20				
30				
40				
50				
100				

Through this activity, the fraction of success that you gain will be a value near to $\frac{1}{2}$

When increasing the number of times the experiment is repeated the success fraction approaches to a constant value. Then that value is called the experimental probability.

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01. Following table shows the number of times that each side is obtained when tossing a die numbered from 1 to 6 for 60 times

Number	Number of times obtained	Fraction of Success
1	12	
2	8	
3	9	
4	10	
5	11	
6	10	

i. Complete the above table.

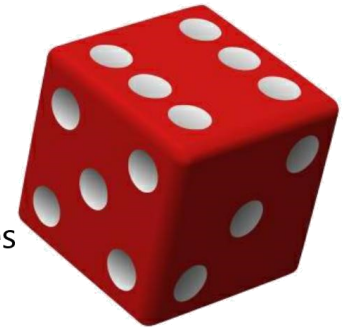
ii. Write the fraction of success of obtaining 4.

iii. What is the fraction of success of getting an even number?

iv. Find the success fraction of having a square number.

Theoretical Probability

The probability that we obtained based on the theories is called as the **theoretical probability**.



Example: -

When tossing an unbiased die numbered from 1 to 6, the values that we can see in the top of the die are,

Number 1, Number 2, Number 3, Number 4, Number 5 and Number 6

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Therefore, the total number of possible outcomes is 6. If we expect to obtain 2,

The theoretical probability of obtaining 2 = $\frac{Number\ of\ sides\ marked\ as\ 2}{Total\ number\ of\ sides}$

$= \frac{1}{6}$

Theoretical Probability =

$$\frac{Number\ of\ times\ the\ expected\ outcome\ obtained}{Total\ number\ of\ outcomes\ of\ the\ experiment}$$

Exercise 02

01. In a bag, there are 3 Red beads, 2 Blue beads and 4 Black beads which are equal in size and shape. A child takes out a bead randomly from that bag. Calculate the following probabilities regarding the bead that the child takes.

i. The bead is being Red.

ii. The bead is being Black.

iii. The bead is being Blue.

iv. The bead is being Red or Blue.

v. The bead is being Red or Black.

vi. The bead is being Black or Blue.

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02. There are 5 orange flavored toffees, 7 pineapple flavored toffees and 3 tamarind flavored toffees in the pocket of a boys trouser. He randomly takes out a toffee from the pocket and put it in his mouth. Calculate the probability of the toffee that taken out is being

(i) the orange flavored

(ii) the pineapple flavored

(iii) the tamarind flavored

(iv) orange or tamarind flavored

(v) orange or pineapple flavored

(vi) pineapple or tamarind flavored

03. The family doctor assigned tablets to Mr. Jorson, Mrs. Jorson and their son 10, 15 and 20 respectively for three different sicknesses. When taking them to home they medicines were shuffled. All these medicines are in the same size, shape and color. Calculate the probability of the tablet taken by Mr. Jorson is being

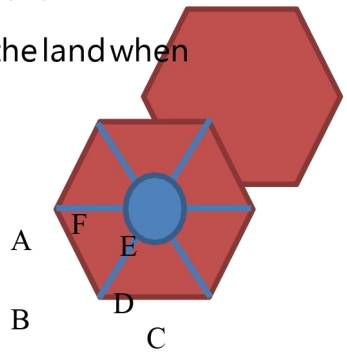
(i) his own medicine.

(ii) a medicine of his wife.

(iii) a medicine of the son.

04. A wheel was created by joining two regular hexagons to the extreme edges as shown in the figure. The hexagons had named as A, B, C, D, E, and F. After spinning that wheel, we observe the side which touch with the land when its

stopped the spinning. Calculate the probability of followings.



(i) the side A is being touched

(ii) the side A or B is being touched

(iii) the sides D, E or F is being touched the land and stopped.

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05. In an animal farm there are 10 white color hens, 8 red color hens and 6 black color hens. One hen jumped out from the cage. Calculate the probability of that hen is being a

(i) White hen

(ii) Black hen

(iii) White or Black hen

(iv) White or Red hen

06. Calculate the probabilities following events, when tossing an unbiased die numbered from 1 to 6

(i) getting 1

(ii) getting 2

(iii) getting a prime number

(iv) getting a square number

07. In a certain bus root, there are 8 buses from the company A, 10 from the company B and 12 buses are from the company C which use to transport passengers. Saman is taking a bus from the bus stand. Calculate the following probabilities about selecting a bus by Saman is being a

(i) bus of the company A

(ii) bus of the company B

(iii) bus of the company C

(iv) bus from the companies A or B

(v) bus from the companies A, B or C

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08. 150 lottery tickets were sold which gives the prizes for only the first, second and third places. Kapila bought a lottery ticket of this lottery. Calculate the following probabilities on

(i) getting the first place

(ii) getting any place

(iii) not getting any place for the ticket of Kapila.

09. There are 15 identical cards numbered from 1 to 15 in a bag. Sumudu randomly take out a card from that bag. Calculate the following probabilities related to the card that she taken out is being

(i) 12

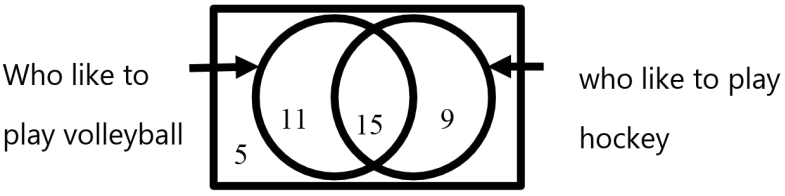
(ii) a multiple of three

(iii) an odd number

(iv) a triangular number

(v) a number which is divisible by 6

10. The following Venn diagram shows how 40 students in a certain class who like to play volleyball and hockey. According to the given diagram, calculate the following probabilities.



(i) a student who like to play volleyball.

(ii) a student who like only to play volley ball.

(iii) a student who like to play hockey.

(iv) a student who like only to play hockey.

(v) a student who like to play both games.

(vi) a student who do not like to play both games.

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Answers

Exercise 01

	Experiment	Possible outcomes	Number of outcomes
1	Tossing a coin	Head, Tail	2
2	Observing the side when tossing an unbiased die	Getting 1, Getting 2, Getting 3, Getting 4, Getting 5, Getting 6	6
3	Taking out a card randomly from a pack of cards written as A, B, C, D and E	Obtaining A, Obtaining B, Obtaining C, Obtaining D, Obtaining E	5
4	Tossing a tetrahedral die numbered from 1 – 4 and observed the side which touch the table	Getting 1, Getting 2, Getting 3 and Getting 4	4
5	Taking out a ball from a parcel which contain 5 balls with the same size and the shape but in colors Blue, Yellow, Green, Red and Orange	Taking a Blue ball, Taking a Yellow ball, Taking a Green ball, Taking a Red ball, Taking an Orange ball	5
6	A student is sitting for the exam	Passing the exam, Failing the exam	2
7	Tossing an octahedral die numbered from 1 – 8 and observe the side touched with the table	Getting 1, Getting 2, Getting 3, Getting 4, Getting 5, Getting 6, Getting 7, Getting 8	8

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Exercise 02

01.

i. $\frac{1}{3}$

ii. $\frac{4}{9}$

iii. $\frac{2}{9}$

iv. $\frac{5}{9}$

v. $\frac{7}{9}$

vi. $\frac{2}{3}$

02.

i. $\frac{1}{3}$

ii. $\frac{7}{15}$

iii. $\frac{1}{5}$

iv. $\frac{8}{15}$

v. $\frac{4}{5}$

vi. $\frac{2}{3}$

03.

i. $\frac{2}{9}$

ii. $\frac{1}{3}$

iii. $\frac{4}{9}$

04.

i. $\frac{1}{6}$

ii. $\frac{1}{3}$

iii. $\frac{1}{2}$

05.

i. $\frac{5}{12}$

ii. $\frac{1}{9}$

iii. $\frac{2}{3}$

iv. $\frac{3}{4}$

06.

i. $\frac{1}{6}$

ii. $\frac{1}{6}$

iii. $\frac{1}{2}$

iv. $\frac{1}{3}$

07.

i. $\frac{4}{15}$

ii. $\frac{1}{3}$

iii. $\frac{2}{5}$

iv. $\frac{3}{5}$

v. 1

08.

i. $\frac{1}{150}$

ii. $\frac{1}{50}$

iii. $\frac{147}{150}$

09.

i. $\frac{1}{15}$

ii. $\frac{1}{3}$

iii. $\frac{8}{15}$

iv. $\frac{1}{3}$

v. $\frac{2}{15}$

10.

i. $\frac{13}{20}$

ii. $\frac{11}{40}$

iii. $\frac{3}{5}$

iv. $\frac{9}{40}$

v. $\frac{3}{8}$

vi. $\frac{1}{8}$

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