

TOPIC: PROBABILITY

SECTION: EXPRESSIONS OF PROBABILITY AND PREDICTION

OBJECTIVES

Learners should be able to:

- Recognise the difference between the following terms: Event, outcome/result Recognise that probability is expressed using a scale that ranges between: 0 (events that cannot take place - impossible events) 1 or 100% (events that are certain to take place)
- Recognise that the probability of an event is expressed using fractions, percentages and decimal notation
- Work with situations involving probability, including:
 - Games that make use of coins and dice
 - Weather predictions
- Recognize the difference between the following terms: event and outcome/result
- Recognize that the probability of an event is expressed using fractions, percentages and decimal notation.
- Recognise that expressions of probability are only predictions about the outcome of an event (e.g. although there is always a chance that someone may win a lottery, this does not mean that there will always be a winner every time the lottery is played.)
- Understand the difference between the relative frequency and the theoretical probability of an event (e.g. The theoretical probability of a tossed coin landing on heads is $\frac{1}{2}$ (50%). However, it is possible to toss a coin 10 times and for the coin to land on heads all 10 times – this is the relative frequency of that event

**KEY CONCEPTS/
TERMINOLOGY/
VOCABULARY**

What is Probability?

Probability is a branch of mathematics that deals with calculating how likely it is that a given event occurs or happens. Probability is expressed as a number between 1 and 0. The words *chance* or *likelihood* is often used in place of the word probability.

- Tossing a coin is an *activity* or *experiment*. If both Heads (H) and Tails (T) have an equal chance of landing face up, it is called a *fair coin*



- Throwing a dice is an **activity** or **experiment**. If each number on the dice has an equal chance of landing face up, it is called a **fair dice**.
- When we talk about the probability of something happening, we call the something an **event**



- Getting tails when tossing a coin is an **event**.



Probability Scales

- Some events **always happen**. We say that they are **certain** to happen and give them a probability of 1.
- It is **certain** that the day after Monday is Tuesday
- The probability that the day after Monday is Tuesday is 1.
- Some events **never happen**. We say that they are **impossible** and give them a probability of 0.
 - If you throw an ordinary dice, it is **impossible** to get a 7. The probability of getting a 7 when you throw an ordinary dice is 0.
- Some events are **not certain**, but are **not impossible** either.
 - They may or may not happen. These probabilities lie between 0 and 1.
- If you toss a fair coin it may land on heads or it may not. The chances are **equally likely**.
- We say that there is a **50-50 chance** that it will land on heads.

We can write probabilities **in words** or as **common fractions**, **decimal fractions** or **percentages**.

The following number line shows words:

- To **compare probabilities**, we compare the sizes of the fractions, decimal fractions or percentages.

- The *less likely* an event is to happen, the *smaller* the fraction, decimal fraction or percentage.
- The *more likely* an event is to happen, the *larger* the fraction, decimal fraction or percentage

NOTES

WORKED EXAMPLES :

1. Mr Macashisa lost his son during the Easter holiday in April 201. In 2017 the number of fatalities in South African roads was 287 during Easter holidays. In 2018 number of fatalities was 193 and in 2019 the number increased to 287. Below is a table which shows the number of fatalities in South African roads in 2019 during Easter Holidays.

Source: www.citizen.co.za

Table 1: Number of road fatalities in South African roads during Easter holidays in 2019

Province	Number of fatalities
KwaZulu Natal	55
Limpompo	44
Gauteng	38
Eastern Cape	35
Mpumalanga	34
North West	28
Western Cape	26

1.1.1 Northern Cape and the Free State are not mentioned in the table above.
Determine the total number of fatalities that occurred in both provinces. (3)

1.1.2 Determine the probability that the total fatalities of two Provinces is less than 3 (2)

1.2 Determine the probability of total number of fatalities of Swaziland in 2019 as percentage (2)

[7]

SUGGESTED SOLUTIONS

1.1.1 $287 - 260 = 27$ for Northern Cape and Free State

1.1.2 $P(\text{less than } 30) = \frac{2}{9}$

1.1.3 $P(\text{Swaziland}) = \frac{0}{9} \times 100 = 0\%$

2. Mrs Ndelu conducted a survey each day for a week to determine the proximate number of minutes that her Grade 8 and Grade 12 learners watched television. She recorded the results (in minutes of her survey as follows:

GRADE 8

0	45	60	60	60
90	95	95	120	120
120	120	150	150	180

2.1.1 Determine the number of learners who did not watch television (2)

2.1.2 Determine the probability as decimal that randomly select a learner who spends two hours on watching television. (3)

2.1.3 Determine the probability that this learner spends 45 minutes daily watching television. (2) [7]

SUGGESTED SOLUTIONS

2.1.1 1 learner

2.1.2 $P(\text{learner who spends who hours on TV}) = \frac{4}{15} = 0.2666666667$

2.1.3 $P(\text{learner spends 45 minutes on TV}) = \frac{1}{15}$

ACTIVITIES

QUESTION 1 [18 Marks]

A private hospital in China provided the following information regarding the number of patients diagnosed with CORONAVIRUS (COVID - 19) stats. The data provided below was collected over a period of three weeks.

weeks	Age in years				TOTAL
	<30	30 – 49	50 – 69	≥ 70	
Week 1	90	140	250	300	
Week 2	70	120	160	270	
Week 3	50	90	140	220	
Total					

1.1 State the number of patients in the 50 – 69 years age group that were diagnosed with in COVID-19 in WEEK 2.(2)

1. 2 Calculate the number of patients who had COVID-19 in each week. (3)

1. 3 “The younger you are the less the risk of contracting COVID-19.” State whether this statement is true or false by justifying your answer with calculations (5)

1. 4 What is the probability that a patient selected from this table is 25 years old? (2)

1. 5 How many people contracted this disease over the period of three weeks according to the records from this hospital? (3)

1. 6 What is the probability that a patient chosen at randomly in the first week is 70 or more years old? Express your answer as fraction in a simplified form. (3)

QUESTION 2 [12 Marks]

Sindi has baked 48 vanilla biscuits, 39 lime biscuits and 33 raspberry biscuits and kept them in a tin.

- a) If she takes a biscuit from the tin without looking, what is the probability that the biscuit is a raspberry one? (4)
- b) She places the biscuit back in the tin because she realises that the lime biscuit is way more delicious. What are the chances that when she takes a biscuit from the tin without looking, that it will be the lime biscuit? (4)
- c) She tasted the lime biscuit and three additional lime ones before she finished baking. Thereafter she had to finish the baking she had started earlier. She had to bake the vanilla biscuits. What is the probability that when she next takes a biscuit out of the tin without looking, that it will be vanilla biscuits? (4)

QUESTION 3 [9 Marks]

Mr. Maseko, the Principal, did a survey to see how many junior boys play sport. He only had some of the values on his table. Assist him to determine how many junior boys play rugby and soccer in each grade by completing the table below.

	Soccer	Rugby	Total
Grade 8	A	B	35
Grade 9	10	C	28
Total	25	D	E

- 3.1 Calculate values of A, B, C, D and E. (5)
- 3.2 What is the probability that a Grade 8 boy chosen randomly will be a soccer player? (2)
- 3.3 What is the probability that a boy chosen randomly will be a ruby player? (2)