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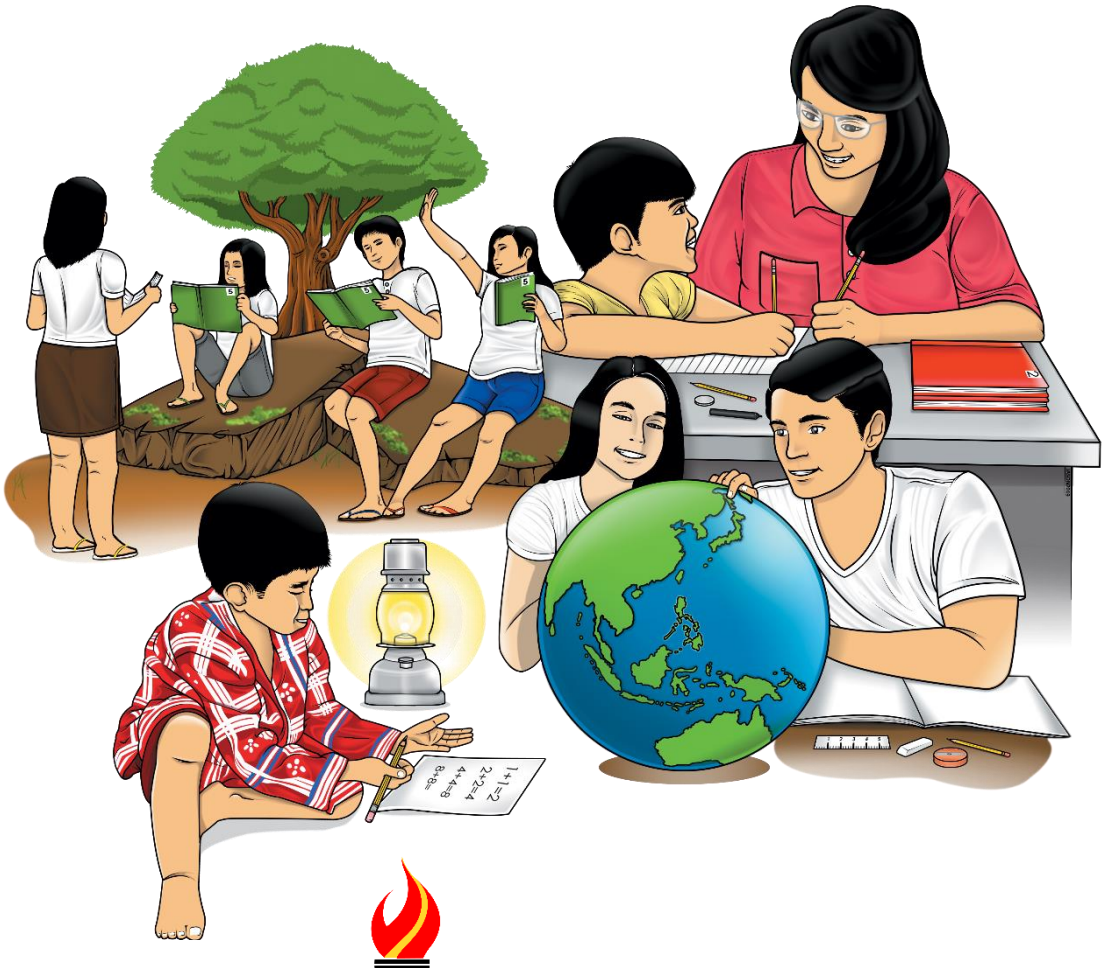
Mathematics

Quarter 3 – Module 30:
Probability of Mutually Exclusive and Not Mutually Exclusive Events



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Mathematics

Quarter 3 – Module 30:
Probability of Mutually Exclusive and Not Mutually Exclusive Events

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Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

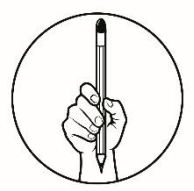
Thank you.

What I Need to Know

This module was designed and written with you in mind. It is here to help you find the probability of mutually exclusive and not mutually exclusive events. The scope of this module permits it to be used in many different learning situations. The lessons are arranged to follow the standard sequence of the course but the pacing in which you read and comprehend the contents and answer the exercises in this module will depend on your ability.

After going through this module, you are expected to be able to demonstrate understanding of key concepts of combinatorics and probability. Specifically, you should be able to:

1) illustrate the probability of a union of two events,
2) illustrate mutually exclusive and not mutually exclusive events,
3) find the probability of $A \cup B$.
4) solve problems involving the probability of mutually exclusive and not mutually exclusive events.



What I Know

Are you ready? You are tasked to answer the following questions before we proceed with our lesson. Do not worry, we only want to know how knowledgeable you are with the topics that we will be discussing in this module.

DIRECTION: Read and answer each item carefully. Write the letter of the correct answer on the blank provided for.

_____1. Events that do not have something in common are called _____.

A. Mutually exclusive events
B. Not mutually exclusive events
C. Dependent events
D. Independent events

_____2. Which of the following are mutually exclusive events when a card is drawn at random from a standard deck of 52 cards?

A. A 4 or a heart
B. A 4 or a jack
C. A 4 or a club
D. A jack or a face card

_____3. Which of the following are not mutually exclusive events when a fair die is rolled once?

A. A 3 or a 6
B. A 5 or an even number
C. A 2 or a factor of 6
D. A 6 or an odd number

_____4. All the following events are not mutually exclusive events EXCEPT:

A. Drawing an ace or a king in a standard deck of cards
B. Drawing a queen or a club in a standard deck of cards
C. Getting a 6 or an even number in rolling a six-sided die
D. Getting a prime number or an even number in rolling a six-sided die

_____5. If P(A) = 0.30, and P(B) = 0.40, and P(A or B) = 0.70 then,

A. P(A and B) = 0.10.
B. P(A and B) cannot be determined.
C. Events A and B are mutually exclusive.
D. events A and B are not mutually exclusive.

____6. Perla plans to visit her grandmother next week. If she chooses a day of the week at random, what is the probability that she will choose Monday or Thursday?

A. $\frac{1}{7}$ B. $\frac{2}{7}$ C. $\frac{1}{5}$ D. $\frac{2}{5}$

_____7. If a coin is tossed once, what is the probability that the coin shows either head or tail?

A. -1 B. 0 C. $\frac{1}{2}$ D. 1

_____8. If a die is rolled once, what is the probability of obtaining an even number or a number greater than 4?

A. $\frac{2}{5}$ B. $\frac{1}{2}$ C. $\frac{2}{3}$ D. $\frac{5}{6}$

_____9. A card is drawn from a standard deck of 52 cards. What is the probability of drawing a 5 or a club?

A. $\frac{1}{13}$ B. $\frac{2}{13}$ C. $\frac{3}{13}$ D. $\frac{4}{13}$

_____10. A bag contains 5 white marbles, 4 red marbles and 6 blue marbles. Stella draws one marble at random from the bag. What is the probability that the drawn marble is either red or blue?

A. $\frac{2}{3}$ B. $\frac{1}{3}$ C. $\frac{2}{15}$ D. $\frac{10}{15}$

_____11. Each of the numbers 1 to 10 is written on a card and placed in a bag. If one card is drawn at random, what is the probability that the number is a multiple of 2 or a multiple of 3?

A. $\frac{3}{5}$ B. $\frac{7}{10}$ C. $\frac{4}{5}$ D. $\frac{8}{10}$

_____12. A spinner is divided into 6 congruent parts. If it is spun once, find the probability of spinning a 5 or a number less than 4.

A. $\frac{1}{6}$ B. $\frac{1}{2}$ C. $\frac{2}{3}$ D. $\frac{5}{6}$

_____13. If there is 40% chance that Jericho will buy a tablet, 70% chance that he will buy a cellphone, and 28% chance that he will buy a tablet and a cellphone, what is the probability that he will buy a tablet or a cellphone?

A. 30% B. 42% C. 68% D. 82%

For items 14 – 15. The probabilities of three students Roy, Ann and Leo winning the poster making contest are $\frac{2}{7}$, $\frac{1}{8}$ and $\frac{1}{5}$, respectively. Assume that only one contestant can win the contest.

_____ 14. What is the probability that either Ann or Leo wins?

A. $\frac{1}{40}$ B. $\frac{13}{40}$ C. $\frac{23}{56}$ D. $\frac{17}{35}$

_____ 15. What is the probability that neither Roy nor Ann wins?

A. $\frac{23}{56}$ B. $\frac{18}{35}$ C. $\frac{33}{56}$ D. $\frac{27}{40}$

Lesson 1

Probability of Mutually Exclusive and Not Mutually Exclusive Events

What's In

Let us recall from our previous lesson the following concepts on probability.

1. The probability of an event (**E**) is given by the formula:

$$P(E) = \frac{number\ of\ favorable\ outcomes}{number\ of\ all\ possible\ outcomes} = \frac{n(E)}{n(S)}$$

2. The probability of an event must be a number from 0 to 1. That is, $0 \leq P(E) \leq 1$.

3. The **union** of events *A* and *B,* denoted by $A \cup B$, is the set of all outcomes for either *A* **or** *B*.

4. The **intersection** of events *A* and *B,* denoted by $A \cap B$, is the set of all outcomes shared by *A* **and** *B*.

Now, answer the following activity.

Activity 1

Solve the following problems.

1) A one-peso coin and a 5-peso coin are tossed once. Find the probability of getting two heads.
   Answer: _____

2) A spinner is divided into 5 congruent parts and numbered 1 to 5. If it is spun twice, find the probability of each of the following events:
   a. Both spins stop on even numbers.
      Answer: _____
   b. Both spins stop on prime numbers.
      Answer: _____

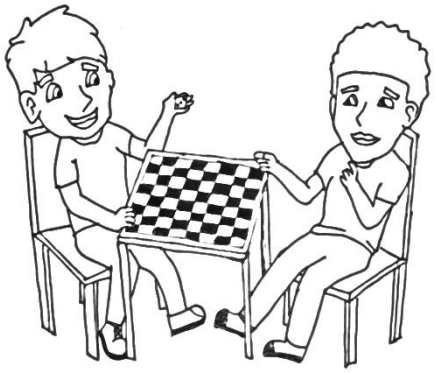
3) Two fair dice are rolled once. Find the probability of each of the following events:
   a. A sum less than 5.
      Answer: _____
   b. One number is 3 and the other is even.
      Answer: _____

What's New

You already know how to find the probability of simple events. However, in real life, some events are connected. Consider the situation below.

Fair Play

Daryll and Ricky decided to play Polynomial Damath to ease their boredom brought about by the COVID-19 pandemic. They agreed that they will roll a die to determine who will make the first move. Both will roll the die and whoever gets the higher number makes the first move. Ricky rolls the die and gets a 4. What is the probability that Daryll gets to play first?



What number may turn up on the die if Daryll will roll it so that he will be the one to play first?

If you say 5 or 6, you are correct!

Rolling a die and getting a 5, and rolling a die and getting a 6 are two simple events that cannot occur or happen at the same time. Answer Activity 2 to see other events that cannot occur at the same time.

Activity 2

Put a tick (/) if the events can happen at the same time and (X) if they can't happen at the same time on the box.

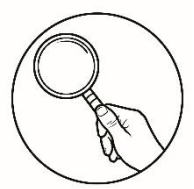
1) A = tossing a coin and getting a head ☐
   B = tossing a coin and getting a tail

2) A = rolling a die and getting a factor of 6 ☐
   B = rolling a die and getting a prime number

3) A = a heart is drawn from a standard deck of cards ☐
   B = a face card is drawn from a standard deck of cards

4) A = an '8' is drawn from a standard deck of cards ☐
   B = a king is drawn from a standard deck of cards

5) A = a multiple of 3 turning up in rolling a die once ☐
   B = a factor of 4 turning up in rolling a die once



What is It

Were you able to identify the events that can occur at the same time and the events that cannot occur at the same time? The pair of events in activity 2 are compound events and they could either be mutually exclusive or not mutually exclusive events.

Definition

- A **compound event** consists of two or more simple events that are connected by the word ***and*** or ***or.***
- Two events are **mutually exclusive** if both events cannot occur at the same time. These events have no common elements. They are also called **disjoint events**.
- Two events are **not mutually exclusive** if both events can occur at the same time. These events have common elements. They are also called **inclusive events.**

Example 1. In tossing a coin once, the events of getting a head and getting a tail are mutually exclusive events because they cannot appear at the same time. If **A** is the event of getting a head and **B** is the event of getting a tail, then, $\boldsymbol{A \cap B = \{\,\}}$ or $\boldsymbol{n(A \cap B) = 0}$. That is, there is no common element in events **A** and **B**.

Example 2. In rolling a six-sided die once, the events 'a 2 turning up' and 'an even number turning up' are not mutually exclusive events. If **A** is the event of 'a 2 turning up' and **B** is the event of 'an even number turning up', then, $\mathbf{A} = \{2\}$ and $\mathbf{B} = \{2, 4, 6\}$. Observe that the number 2 is common to both events **A** and **B**, therefore, $\boldsymbol{A \cap B = \{2\}\ or\ n(A \cap B) = 1}$.
Answer the next activity to familiarize yourself with mutually exclusive and not mutually exclusive events.

Activity 3

Determine if each pair of events are mutually exclusive **(ME)** or not mutually exclusive **(I)**. Write your answer on the blank before each number.

_____ 1) drawing 'a jack' and 'a club' from a standard deck of cards
_____ 2) drawing 'a 7' and 'a 4' from a standard deck of cards
_____ 3) picking 'a blue ball' and 'a red ball' in a basket
_____ 4) electing 'the president' and 'the secretary' of the class
_____ 5) getting 'an even number' and 'a factor of 4' in rolling a fair die once
_____ 6) getting 'a prime number' and 'a multiple of 2' in rolling a fair die once
_____ 7) getting 'a 1' and 'a prime number' in rolling a fair die once
_____ 8) getting 'a grade of 90 in Math' and getting 'a grade of 90 in English'
_____ 9) 'working in Davao' and 'you are an Ilokano'
_____10) 'attending a class in the school' and 'sleeping on bed at home'

The probability that one event ***or*** another event will occur usually involves ***union*** and ***addition.***

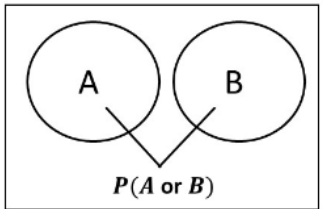
Probability of Mutually Exclusive Events

If two events, A and B, are mutually exclusive, then the probability that either A or B occurs is the sum of their probabilities.

In symbols,

$$\boldsymbol{P(A \text{ or } B) = P(A \cup B) = P(A) + P(B)}$$

Using the Venn diagram, we have,



From the situation presented in the What's New, the die must show a 5 or a 6 so that Daryll will play first. Let us find $\boldsymbol{P(E)}$ where $\boldsymbol{E}$ is the event that "the die shows either 5 or 6".

Since the die has 6 faces numbered 1 – 6, then, $n(S) = 6$.

If we let A be the event that the die shows a 5, then, $P(A) = \frac{1}{6}$, and if we let B be the event that the die shows a 6, then, $P(B) = \frac{1}{6}$.

$$P(E) = P(shows\ a\ 5\ or\ a\ 6) = \boldsymbol{P(A \cup B)} = P(A) + P(B) = \frac{1}{6} + \frac{1}{6} = \frac{2}{6} = \frac{1}{3}$$

Therefore, the probability that Daryll will play first is $\frac{1}{3}$.

Example 3. A bag contains 4 blue marbles, 8 green marbles and 6 red marbles. Carlo draws one ball at random. What is the probability that the marble is either red or green?

Solution: A ball cannot be both red and green, so these are mutually exclusive events.

$$P(\text{red or green}) = P(\text{red}) + P(\text{green})$$

$$P(\text{red or green}) = \frac{6}{18} + \frac{8}{18}$$

$$P(\text{red or green}) = \frac{14}{18} \text{ or } \frac{7}{9}$$

∴The probability that the drawn marble is either red or green is $\frac{7}{9}$.

Example 4. A card is drawn at random from a standard deck of 52 cards. What is the probability of drawing an ace, a 10 or a king?

Note: A standard deck of 52 cards has 4 suits, the heart, the diamond, the club or spade, and clover. It is also of two colors, red and black. The hearts and the diamonds are red while the clubs or spades and the clovers are black. There are 13 cards in each suit. Each suit has 3 face cards – the king, queen and jack, 9 number cards and 1 letter card which is the Ace.

Solution: The three events are mutually exclusive since you cannot draw a card that is an ace, a 10 and a king at the same time. Thus,

$$P(\text{ace or 10 or king}) = P(\text{ace}) + P(10) + P(\text{king})$$

$$P(\text{ace or 10 or king}) = \frac{4}{52} + \frac{4}{52} + \frac{4}{52}$$

$$P(\text{ace or 10 or king}) = \frac{12}{52} \text{ or } \frac{3}{13}$$

∴The probability of drawing an ace, a 10 or a king is $\frac{3}{13}$.

Example 5. In this 'new normal situation', nobody can go out without wearing a face mask. Mark has 15 disposable face masks: 4 are red, 6 are blue and 5 are green. What is the probability that he will wear a red or a blue face mask today?

Solution: A face mask cannot be both red and blue at the same time, so these are mutually exclusive events.

$$P(\text{red or blue}) = P(\text{red}) + P(\text{blue})$$

$$P(\text{red or blue}) = \frac{4}{15} + \frac{6}{15}$$

$$P(\text{red or blue}) = \frac{10}{15} \text{ or } \frac{2}{3}$$

∴The probability of wearing a red or a blue face mask is $\frac{2}{3}$.

Now that you are already familiar with mutually exclusive events, then let us proceed with not mutually exclusive events.

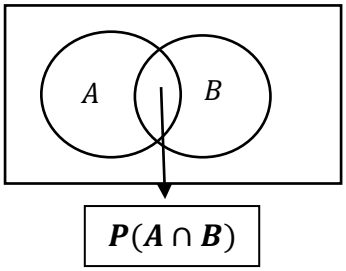
Probability of Not Mutually Exclusive Events or Inclusive Events

For any two events A and B of the same experiment which are not mutually exclusive events, the probability of the union of A and B is

$$\boldsymbol{P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)}$$

$$\boldsymbol{P(A \cup B) = P(A) + P(B) - P(A \cap B)}$$

Let us illustrate the concept above using the Venn diagram.



Observe that the events intersect each other. This only shows that there are elements in A and in B that occur at the same time. The intersection of A and B should be subtracted to eliminate elements being duplicated.

Study the next examples.

Example 6. A die is rolled once. What is the probability of an even number or a factor of 6 turning up?

Solution: A die has six faces numbered $1 - 6$, so, $n(S) = 6$.

Let: A = { even number} and B = {factor of 6}

$A = \{2, 4, 6\}$ $B = \{1, 2, 3, 6\}$

$n(A) = 3$ $n(B) = 4$

$A \cap B = \{2, 6\}$ $n(A \cap B) = 2$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$P(A \cup B) = \frac{3}{6} + \frac{4}{6} - \frac{2}{6}$$

$$P(A \cup B) = \frac{5}{6}$$

∴The probability of getting an even number or a factor of 6 is $\frac{5}{6}$.

Example 7. If there is 30% chance of rain on Saturday, 70% chance of rain on Sunday, and 21% chance of rain on Saturday and Sunday, what is the probability that it will rain on either Saturday or Sunday?

Solution: Let: A = { chance of rain on Saturday}

B = {chance of rain on Sunday}

$P(A \cap B)$ = {Saturday and Sunday}

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$P(A \cup B) = 0.30 + 0.70 - 0.21$$

$$P(A \cup B) = 0.79 = 79\%$$

∴There is 79% chance that it will rain on either Saturday or Sunday.

Example 8. Each of the numbers 1 – 30 is written on a slip of paper, rolled and put in a box and mixed thoroughly. One number is picked up at random. Find the probability that the picked number is even or a multiple of 5?

Solution: Let: $n(S) = 30$

A = {even number} = $\{2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30\}$; $n(A) = 15$

B = {multiple of 5} = $\{5, 10, 15, 20, 25, 30\}$; $n(B) = 6$

$A \cap B = \{10, 20, 30\}$; $n(A \cap B) = 3$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$P(A \cup B) = \frac{15}{30} + \frac{6}{30} - \frac{3}{30}$$

$$P(A \cup B) = \frac{18}{30} \text{ or } \frac{3}{5}$$

∴The probability that the number picked is even or multiple of 5 is $\frac{3}{5}$.

Example 9. The probabilities of three students X, Y and Z winning the math quiz bee is $\frac{1}{5}$, $\frac{1}{6}$ and $\frac{1}{3}$, respectively. If only one contestant can win the quiz bee, find the probability that:

a) either X or Y wins
b) neither X nor Z wins

Solution: Since only one candidate can win, the events are mutually exclusive.

a) P(X or Y wins) = P(X wins) + P(Y wins)

$$= \frac{1}{5} + \frac{1}{6} = \frac{11}{30}$$

b) To get the probability that neither X nor Z wins, we get first its complement which is either X or Z wins, then, subtract it from 1.

$$P(\text{X or Z wins}) = P(\text{X wins}) + P(\text{Z wins})$$

$$= \frac{1}{5} + \frac{1}{3} = \frac{8}{15}$$

$$P(\text{neither X nor Z wins}) = 1 - P(\text{X or Z wins})$$

$$= 1 - \frac{8}{15}$$

$$P(\text{neither X nor Z wins}) = \frac{7}{15}$$

∴ The probability that neither X nor Z wins is $\frac{7}{15}$.

Example 10. Triple A Store has 30 employees, 18 men and 12 women. Two-thirds of the men and half of the women are married. Find the probability that one employee chosen at random is a man or is married.

Solution: Let us identify the given in the problem:

$$n(\text{men}) = 18$$
$$n(\text{women}) = 12$$
$$n(\text{married men}) = \frac{2}{3}(18) = 12$$
$$n(\text{married women}) = \frac{1}{2}(12) = 6$$

Let us put the results in a tabular form to make the analysis easier.

	Married	Unmarried	Total
Men	12	6	18
Women	6	6	12
Total	18	12	30

From the table,
if we let:

A = { the person chosen is a man}
B = {the person chosen is married}
$(A \cap B)$ = {married men}

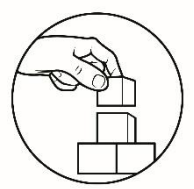
then, $n(A) = 18$
$n(B) = 18$
$n(A \cap B) = 12$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$P(A \cup B) = \frac{18}{30} + \frac{18}{30} - \frac{12}{30}$$

$$P(A \cup B) = \frac{24}{30} \text{ or } \frac{4}{5}$$

∴The probability that the person chosen is a man or is married is $\frac{4}{5}$.



What's More

Now that you are already familiar with mutually exclusive and not mutually exclusive events, you are now ready to answer the next activities.

Activity 4

John Donne famously wrote this poem comparing people to countries and arguing for the interconnectedness of all people with God.

____	____	____	____	____	____	____	____	____	____
7	2	4	3	7	8	6	3	7	

____	____	____	____	____	____	.
8	6	1	3	7	5	

Direction. To decode the message, solve the following problems on a separate sheet of paper.

1) A fair die is rolled once, what is the probability of getting a factor of 4 or a multiple of 3.

2) A number is drawn at random from the set $\{1, 2, 3, \ldots, 20\}$. Find the probability that the number chosen is a multiple of 3 or a multiple of 10.

3) Suppose out of 100 grade10 students, 35 play basketball, 25 play volleyball and 10 play basketball and volleyball. What is the probability that a student play basketball or volleyball?

4) Each of the letters S, A, F, E, T and Y is written on a face of a letter cube. Find the probability that a letter of the word FACE or a letter of the word MASK will appear when you roll the letter cube once.

5) A card is drawn at random from a standard deck of 52 cards. Find the probability of drawing a 7 or a red card?

6) A spinner is divided into 7 congruent parts. If it is spun once, find the probability of getting a 1 or a composite number.

7) Each of the letters A, B, C, D, E and F is written on a face of a cube. If the cube is rolled once, what is the probability of that 'a consonant' or 'a letter in the word FADE' turn up?

8) A box of miniature cars contains 6 red cars, 5 blue cars and 7 black cars. One car is drawn at random from the box. What is the probability of drawing either a red or a black car?

A	D	I	L	M	N	O	S
$\frac{1}{2}$	$\frac{7}{13}$	$\frac{13}{18}$	$\frac{5}{6}$	$\frac{2}{3}$	1	$\frac{2}{5}$	$\frac{3}{7}$

Activity 5.

Solve the following problems. Show your solutions below each problem.

1) The probabilities of three students, Rey, Oliver and Gemma, to be elected as SSG president are $\frac{2}{9}$, $\frac{1}{6}$ and $\frac{1}{12}$ respectively. Find the probability that
   a. either Oliver or Gemma will be elected.
   b. either Rey or Oliver will be elected.
   c. neither Rey nor Gemma will be elected.

2) Mrs. Cruz has 55 students, 30 males and 25 females. One-third of the males and 60% of the females have internet connection. What is the probability that a student chosen is
   a. a female or has no internet connection?
   b. a male or has no internet connection?

What I Have Learned

Summing up, let us list down what we have learned in our discussion.

Activity 6

A. Categorize each statement below whether mutually or not mutually exclusive events. Write your answer in the table.

Mutually Exclusive Events	Not Mutually Exclusive Events

- ✓ Inclusive events
- ✓ Events that can occur at the same time
- ✓ $P(A \cup B) = P(A) + P(B)$
- ✓ Disjoint sets
- ✓ Events that cannot happen at the same time

B. Illustrate mutually exclusive and not mutually exclusive events using the Venn diagram.

What I Can Do

In this part of the module, let us integrate probability of not mutually exclusive events with combination. Consider the problem below.

Example 11: There are 11 student leaders composed of 6 females and 5 males. A committee of 5 student leaders is to be selected at random to attend a symposium on bullying. What is the probability that the committee will have at least 3 males?

Solution: The phrase "at least 3 males" implies 3 or more males. This means that in the committee of 5, it is possible that there will have 3, 4, or 5 male members. Therefore, the committee will be composed of:

3 males & 2 females or 4 males & 1 female or 5 males

If we let M for males and F for females, then

$P(\text{at least 3 males}) = P(3\text{M \& } 2\text{F}) + P(4\text{M \& } 1\text{F}) + P(5\text{M \& } 0\text{F})$

In this case we shall be using the formula for the combination of $\boldsymbol{n}$ objects taken $\boldsymbol{r}$ at a time or $\boldsymbol{nCr}$ which we have discussed before.

$$P(\text{at least 3 males}) = \frac{{}_5C_3 \bullet {}_6C_2}{{}_{11}C_5} + \frac{{}_5C_4 \bullet {}_6C_1}{{}_{11}C_5} + \frac{{}_5C_5 \bullet {}_6C_0}{{}_{11}C_5}$$

$$= \frac{15 \bullet 10}{462} + \frac{5 \bullet 6}{462} + \frac{1 \bullet 1}{462}$$

$$= \frac{150}{462} + \frac{30}{462} + \frac{1}{462}$$

$$P(\text{at least 3 males}) = \frac{181}{462}$$

∴The probability that the committee will have at least 3 males is $\frac{181}{462}$.

Activity 7

Solve the following problems on a separate sheet of paper.

1) A committee of three is to be chosen at random from a group of 7 employees consisting of 4 females and 3 males. What is the probability that the committee will have at least one female?

2) A school has 12 good runners of which 5 are girls. If four are chosen at random to represent the school in the district meet, what is the probability that the group will have at most three boys?

Assessment

DIRECTION: Let us determine how much you have learned from this module. Read and answer each item carefully. Write the letter of the correct answer on the blank provided for.

_____1. Which of the following are mutually exclusive events when a card is chosen at random from a standard deck of 52 cards?

A. Choosing a 9 or a diamond
B. Choosing an ace or a red card
C. Choosing a king or a queen
D. All of the above

_____2. Which of the following are mutually exclusive events when a fair die is rolled?

A. Getting a number less than 3 or a multiple of 3
B. Getting a factor of 4 or a number divisible by 2
C. Getting an odd number or a factor of 3
D. Getting a 2 or a prime number

_____3. All the following events are not mutually exclusive events EXCEPT:

A. Drawing a jack or a heart from a standard deck of cards
B. Choosing a factor of 6 or a multiple of 4 from the numbers 1-10
C. Spinning a 1 or an odd number in a spinner with 4 congruent sectors
D. Rolling a composite number or an even number in rolling a fair die

_____4. If P(A) = 0.25, and P(B) = 0.60, and P(A ∩ B) = 0.15 then,

A. P(A ∪ B) = 0.80
B. P(A ∪ B) cannot be determined
C. events A and B are mutually exclusive.
D. events A and B are not mutually exclusive.

_____5. Hermie rolled a fair die once. What is the probability that a 4 or a prime number will turn up?

A. $\frac{1}{6}$ B. $\frac{1}{3}$ C. $\frac{1}{2}$ D. $\frac{2}{3}$

_____6. A spinner is divided into 8 congruent sectors ad numbered from 1 to 8. If it will be spun once, find the probability that is stops at a factor of 6 or a multiple of 3.

A. $\frac{1}{2}$ B. $\frac{3}{8}$ C. $\frac{1}{4}$ D. $\frac{1}{8}$

_____7. Each of the numbers 1 – 25 is written on a slip of paper, rolled, and put in a box and mixed thoroughly. If a slip of paper is picked at random, what is the probability that the number in it is even or a multiple of 4?

A. $\frac{18}{25}$ B. $\frac{16}{25}$ C. $\frac{12}{25}$ D. $\frac{9}{25}$

_____8. Let the universal set contain the first 20 natural numbers. If set A contains the set of even numbers while set B contains the set of odd numbers, then what is the intersection of the two sets?

A. all odd numbers from 1 to 19
B. all even numbers from 2 to 20
C. null set
D. cannot be determined

_____9. A card is drawn from a standard deck of 52 cards. What is the probability of drawing a 3 or a face card?

A. $\frac{1}{13}$ B. $\frac{2}{13}$ C. $\frac{3}{13}$ D. $\frac{4}{13}$

_____10. A bag contains 8 black pens, 7 red pens and 5 blue pens. Kyra draws one pen at random. What is the probability that the pen is either red or blue?

A. $\frac{2}{5}$ B. $\frac{3}{5}$ C. $\frac{13}{20}$ D. $\frac{3}{4}$

_____11. Each of the numbers 1 – 40 is written on a card, and placed in a bag. If one card is drawn at random, what is the probability that the number is divisible by 4 or a multiple of 3?

A. $\frac{1}{2}$ B. $\frac{3}{8}$ C. $\frac{1}{4}$ D. $\frac{1}{8}$

_____12. Twenty-six tiles, each with a letter of the English alphabet, are placed in a bag and one tile is drawn at random. What is the probability of selecting a vowel or a letter from the word *humble*?

A. $\frac{9}{26}$ B. $\frac{5}{26}$ C. $\frac{5}{13}$ D. $\frac{4}{13}$

For items 13 – 14. The probabilities of three employees Lara, Mary and Joseph to be promoted are $\frac{3}{8}$, $\frac{2}{5}$ and $\frac{1}{7}$, respectively. Assume that only one employee will be promoted.

_____13. What is the probability that either Lara or Joseph will be promoted?

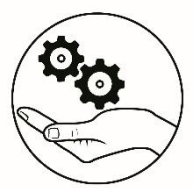
A. $\frac{29}{35}$ B. $\frac{31}{40}$ C. $\frac{19}{35}$ D. $\frac{29}{56}$

_____ 14. What is the probability that neither Lara nor Mary will be promoted?

A. $\frac{31}{40}$ B. $\frac{16}{35}$ C. $\frac{9}{40}$ D. $\frac{5}{40}$

_____ 15. There are 9 class officers composed of 5 males and 4 females. A group of 3 officers is to be selected at random to represent their class in forum. What is the probability that the group will have at least 2 males?

A. $\frac{17}{42}$ B. $\frac{25}{42}$ C. $\frac{10}{21}$ D. $\frac{5}{40}$



Additional Activities

Activity 8.

Answer the following problems.

1) A basket contains red, blue and green balls. One ball is to be chosen at random. The probability that the selected ball is blue is equal to five times the probability that the selected ball is green. The probability that the chosen ball is green is the same as the probability that the chosen ball is red. Find the probability that the chosen ball is blue or red.

2) At a particular Junior High School, the number of students in the four grade levels are broken down by percent, as shown in the table:

Class	Percent
Grade 7	31
Grade 8	26
Grade 9	25
Grade 10	18

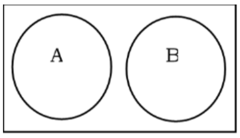
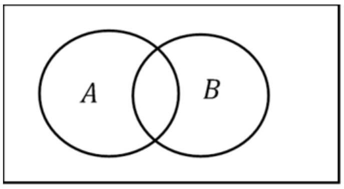
A single student is picked randomly by lottery for a cash assistance to be given due to COVID-19.

a. What is the probability that the student selected for the cash assistance is a grade 7, a grade 8 or a grade 9?

b. Is the process of selecting a recipient for the cash assistance fair? Why or why not?

c. Can you suggest another way of selecting the recipient for the cash assistance?

Answer Key

What I Know	Activity 1	Activity 2	Activity 3
1) A 2) B 3) C 4) B 5) A 6) B 7) D 8) C 9) D 10) A 11) B 12) C 13) D 14) B 15) C	1) $\frac{1}{4}$ 2a) $\frac{4}{25}$ 2b) $\frac{9}{25}$ 3a) $\frac{1}{6}$ 3b) $\frac{1}{6}$	1. X 2. / 3. / 4. X 5. X	1) I 2) ME 3) ME 4) ME 5) I 6) I 7) ME 8) I 9) I 10) ME
Activity 4 NO MAN IS AN ISLAND. 1) $\frac{5}{6}$ 2) $\frac{2}{5}$ 3) $\frac{1}{2}$ 4) $\frac{2}{3}$ 5) $\frac{7}{13}$ 6) $\frac{3}{7}$ 7) 1 8) $\frac{13}{18}$	**Activity 5** 1a) $\frac{1}{4}$ b) $\frac{7}{18}$ c) $\frac{25}{36}$ 2a) $\frac{9}{11}$ b) $\frac{8}{11}$	**Activity 6** Mutually Exclusive Events ✓ Disjoint sets ✓ Events that cannot occur at the same time ✓ $P(A \cup B) = P(A) + P(B)$ 	Not Mutually Exclusive Events ✓ Inclusive Events ✓ Events that occur at the same time 
Activity 7 1. $\frac{34}{35}$ 2. $\frac{92}{99}$	**Activity 8** 1. $\frac{6}{7}$ 2a. $\frac{41}{50}$ *They can have different answers for b and c depending on their opinion.	**Assessment** 1) C 2) A 3) B 4) D 5) D 6) A 7) C 8) C	9) D 10) B 11) A 12) A 13) D 14) C 15) B

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