## TEACHING GUIDE

## Module 11: INTRODUCTION TO PROBABILITY

## A. Learning Outcomes

## Content Standard:

The learner demonstrates understanding of the basic concepts of Probability.

## Performance Standard:

The learner is able to use precisely counting techniques and probability in solving problems related to different fields of endeavour.

| SUBJECT: | LEARNING COMPETENCIES |
| :--- | :--- |
| Grade 8 Mathematics | 1. Define experiment, outcome, sample space, and event. |
| QUARTER | 2. Explain and interpret the probability of an event. |
| Fourth Quarter | 3. Differentiate an experimental probability from a theoretical probability. |
| STRAND: | 4. Count the number of occurrences of an outcome in an experiment and organize |
| Statistics and Probability | them using a table, tree diagram, systematic listing, and the fundamental counting |
| TOPIC: | principle. |
| Probability | 5. Solve simple problems involving probabilities. |
| Lesson: |  |
| 1. Basic Concepts of Probability <br> 2. Probability of an Event: Experimental <br> Probability and Theoretical Probability |  |
| 3. Organizing Outcomes of an Event and <br> the Fundamental Counting Principles |  |
| 4. Problems Involving Probabilities of |  |
| Events |  |


|  | ESSENTIAL UNDERSTANDING: <br> Students will understand that the basic <br> concepts of probability through the <br> number of occurrences of an event can be <br> determined by the counting techniques. | ESSENTIAL QUESTIONS: <br> How is the number of occurrences of an <br> event determined? <br> How does knowledge of finding the <br> likelihood of an event help you in your <br> daily life? |
| :--- | :--- | :--- |
|  | TRANSFER GOAL: <br> Students will, on their own, solve real-life problems using the principles of counting <br> techniques and probability. |  |

## B. Planning for Assessment

## Product/Performance

These are the products and performances which the students are expected to accomplish in this module.
a. A written group report showing the estimated chances of a typhoon hitting the country for each month using the basic concepts of probability
b. A written individual report which shows the number of occurrences of any of the following:
(1) Number of child birth in a hospital for each month last year, or
(2) Number of absentees in a class per month of the previous school year in which the basic concepts of probability are used
c. A group work on a variety of transportation packages/options for the family to choose from in which the students' knowledge on organizing outcomes of an event and the Fundamental Counting Principles are applied
d. Agroup presentation on the chances of losing and winning in carnival games which demonstrates students' understanding of probability of events and Fundamental Counting Principle

## Assessment Map

| TYPE | KNOWLEDGE | PROCESS/SKILLS | UNDERSTANDING | PERFORMANCE |
| :---: | :---: | :---: | :---: | :---: |
| Pre-Assessment | Pre-Test | Pre-Test | Pre-Test | Pre-Test |
| Diagnostic | $(1-3,6-8)$ | $(4-5,10,12,14,17)$ | $(9,11,13,15,18)$ | $(16,19,20)$ |
|  | Situational Analysis |  |  |  |



Assessment Matrix (Summative Test)

| Levels of Assessment | What will I assess? | How will l assess? | How Will I Score? |
| :---: | :---: | :---: | :---: |
| Knowledge 15\% | Defines experiment, outcomes, sample space, and event <br> Explains and interprets the probability of an event <br> Differentiates between an experimental probability and a theoretical probability | Paper and Pencil Test (Summative Test) <br> Part I (1-10) <br> Post -Assessment (1, 2, 4 ) | 1 point for every correct response |
| Process/Skills 25\% | Counts the number of occurrences of an outcome in an experiment and organizes them using a table, tree diagram systematic listing and the fundamental counting principle | ```Paper and Pencil Test Part III (1-5) Post - Assessment (3,5-8)``` | 1 point for every correct response |
| Understanding 30\% | Solves simple problems involving probabilities of events | Paper and Pencil Test <br> (Summative Test) <br> Part II (1-5) <br> Summative Test $(9-15)$ <br> Part IV (1-3) <br> Post - Assessment (9-15) | 1 point for every correct response |


| Product 30\% |  | Transfer Tasks Activity 7: Let's take an activity together Activity 10: An Individual Report Activity 17: Let,s help them enjoy their vacation in Bora! Activity 18: <br> Let's convince the community! <br> Post - Assessment (16-17) | Rubric on Performance Task <br> 1 point for every correct response |
| :---: | :---: | :---: | :---: |

## C. Planning for Teaching-Learning

 IntroductionThis module is a carefully designed tool to guide a teacher to a more exciting, interesting and enjoyable days of teaching probability leading to its richer application in the real world. It encourages students to discover the concepts of probability by themselves through the different activities which can be answered individually and/or by group.

The module has four lessons which are estimated to be covered in twenty (20) hours. However, pacing of the lessons depends on the students' needs and learning competencies.

## Objectives

After the learners have gone through the lessons contained in this module, they are expected to:

1. define experiment, outcome, sample space and event,
2. give the difference between experimental probability and theoretical probability, and
3. find the probability of an event using the tree diagram, table or the formula.
4. explain and interpret the probability of an event.
a. find the number of occurrences of an outcome in an experiment using the tree diagram, table, systematic listing and the Fundamental Counting principle
b. solve simple problems involving probabilities of events
c. perform the tasks collaboratively

## LEARNING GOALS AND TARGETS:

## Content Standard:

The learner demonstrates understanding of the basic concepts of probability.

## Performance Standard:

The learner is able to use precisely counting techniques and probability in solving simple problems related to different fields of endeavor.

Before you start the module, ask the students to answer the Pre-Assessment. Instruct them to read each item carefully, solve if needed, then write the LETTER that corresponds to the correct answer on a separate sheet of paper. This will help assess learner's prior knowledge, skills and understanding of mathematical concepts related to probability.

## Pre-Assessment:

1. Which of the following DOES NOT belong to the group?
a. Chance
b. Interpretation
c. Possibilities
d. Uncertainty

Answer: B All the words refer to Probability except Interpretation.
2. All the possible outcomes that can occur when a coin is tossed twice are listed in the box. What is the probability of having a head?
HH TH
TT HT
a. $\frac{1}{4}$
b. $\frac{1}{2}$
c. $\frac{3}{4}$
d. 1


Answer: C Three out of the 4 outcomes have three heads.
3. The local weather forecaster said there is a $20 \%$ chance of rain tomorrow. What is the probability that it will not rain tomorrow?
a. 0.2
b. 0.8
c. 20
d. 80

Answer: B 100\% - 20\% = 80\% or 0.8
4. A quiz contains three multiple choice-type questions and two true/false-type questions. Suppose you guess the answer randomly on every question. The table below gives the probability of each score.

| Score | 0 | 1 | 2 | 3 | 4 | 5 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Probability | 0.105 | 0.316 | 0.352 | 0.180 | 0.043 | 0.004 |

What is the probability of failing the quiz (getting $0,1,2$, or 3 correct) by guessing?
a. 0.047
b. 0.575
c. 0.773
d. 0.953

Answer: D $0.105+0.316+0.352+0.18=0.953$ or $95.3 \%$
5. A spinner with three equal divisions was spun 1000 times. The following information was recorded. What is the probability of the spinner landing on RED?

| Outcome | Blue | Red | Yellow |
| :---: | :---: | :---: | :---: |
| Spins | 448 | 267 | 285 |


a. $27 \%$
b. $29 \%$
c. $45 \%$
d. $73 \%$

Answer: A $\frac{267}{1000}=0.267$ or $27 \%$
6. Suppose you toss two fair coins once, how many possible outcomes are there?
a. 1
b. 2
c. 4
d. 8

Answer: C The 2 tosses of the coin are independent (the result of one does not affect/depend on the other), thus there are 4 possible outcomes.
7. A number cube is rolled. What is the probability of rolling a number that is not 3 ?
a. $\frac{0}{6}$ or 0
b. $\frac{1}{6}$
c. $\frac{5}{6}$
d. $\frac{6}{6}$ or 1

Answer: C $1-\frac{1}{6}=\frac{5}{6}$
8. In a 500 -ticket draw for an educational prize, Ana's name was written on 41 tickets. What is the probability that she would win?
a. 0.082
b. $\quad 0.122$
c. $\quad 0.41$
d. 0.82
Answer: A $\frac{41}{500}=0.082$ or $8.2 \%$
9. Which of the following is TRUE?
a. Answering a true/false-type question has one possible outcome.
b. Flipping a coin thrice has 3 possible outcomes.
c. The probability of getting a head when a coin is tossed can be expressed as $\frac{1}{2}, 0.5$ or $50 \%$.
d. The probability of rolling 7 in a die is $\frac{1}{7}$.

Answer: C The probability of getting a head when a coin is tossed can be expressed as $\frac{1}{2}, 0.5$ or $50 \%$.
10. The weather forecaster has announced that Region 1 has rainy ( $R$ ), partly cloudy ( PR ) and cloudy ( C ) weather. If the chance of having $R$ is twice as the probability of $P R$ which is $\frac{2}{7}$ what is the correct table for probability?
a.

| Outcome | R | PR | C |
| :---: | :---: | :---: | :---: |
| Probability | $\frac{1}{7}$ | $\frac{4}{7}$ | $\frac{2}{7}$ |


| Outcome | R | PR | C |
| :---: | :---: | :---: | :---: |
| Probability | $\frac{1}{7}$ | $\frac{2}{7}$ | $\frac{4}{7}$ |


| Outcome | R | PR | C |
| :---: | :---: | :---: | :---: |
| Probability | $\frac{4}{7}$ | $\frac{2}{7}$ | $\frac{1}{7}$ |
| Outcome | R | PR | C |
| Probability | $\frac{4}{7}$ | $\frac{1}{7}$ | $\frac{2}{7}$ |

## Answer: C PR=2/7 2PR = R

$$
\begin{aligned}
\mathrm{R} & =2 \frac{2}{7} \\
2(\mathrm{PR}) & =2 \frac{2}{7} \\
\mathrm{R} & =\frac{4}{7} ; \frac{4}{7}+\frac{2}{7}+\frac{1}{7}=\frac{7}{7} \text { or } 1
\end{aligned}
$$

11. A glass jar contains 40 red, green, blue and yellow marbles. The probability of drawing a single green marble at random is $\frac{1}{5}$. What does this mean?
a. There are 5 green marbles in the glass jar.
b. There are 8 green marbles in the glass jar.
c. There are more green marbles than the others.
d. There is only one green marble in the glass jar.

Answer: B
12. In a restaurant, you have a dinner choice of one main dish, one vegetable, and one drink. The choices for main dish are pork and chicken meat. The vegetable choices are broccoli and cabbage. The drink choices are juice and water. How many choices are possible?
a. 8
b. 10
c. 12
d. 14
Answer: A
13. Arlene Joy got coins from her pocket which accidentally rolled on the floor. If there were 8 probable outcomes, how many coins fell on the floor?
a. 3
b. 4
c. 8
d. 16

Answer: A A coin has 2 possible outcomes (H, T) $2 \times 2 \times 2=8$
14. In a family of 3 children, what is the probability that the middle child is a boy?
a. $\frac{1}{8}$
b. $\frac{1}{4}$
C. $\frac{1}{3}$
d. $\frac{1}{2}$

Answer: D Sample Space = BBB, BBG, BGB, BGG, GBB, GBG, GGB, GGG P = 4/8 or 1/2
15. Jun rolls two dice. The first die shows a 5 . The second die rolls under his desk and he cannot see it. NOW, what is the probability that both dice show 5 ?
a. $\frac{1}{36}$
b. $\frac{1}{6}$
c. $\frac{9}{36}$
d. $\frac{1}{3}$

Answer: B Since we already know that one of the dice shows a 5 , the probability of getting a 5 in the other die is $\frac{1}{6}$.
16. Mrs. Castro asked her students to do an activity. Afterwards, her students noticed that the experimental probability of tossing tails is $48 \%$, while the mathematical/theoretical probability is $50 \%$. Being an attentive student, how would you explain this to your classmates?
a. The experimental probability is wrong.
b. We should always rely on mathematical/theoretical probability.
c. It is normal for experimental probabilities to vary from the theoretical probabilities but for a large number of trials, the two will be very close.
d. It is abnormal for the experimental probabilities to differ from the mathematical/theoretical probabilities because the results must be the same.
Answer: C
17. You decided to order a pizza but you have to choose the type of crust and the toppings. If there are only 6 possible combinations of ordering a pizza, from which of the following should you choose from?
a. Crust: thin or deep dish

Topping: cheese or pepperoni
b. Crust: thin or deep dish

Topping: cheese, bacon or pepperoni
c. Crust: thin or deep dish

Topping: cheese, bacon, sausage or pepperoni
d. Crust: thin or deep dish

Topping: cheese, bacon, sausage, pepperoni or hotdog

## Answer: B 2(crust) x 3 (toppings) $\mathbf{= 6}$ possible combinations

18. There are four teams in a basketball tournament. Team $A$ has $25 \%$ chance of winning. Team $B$ has the same chance as Team D which has $5 \%$ more than team $A$. Team $C$ has half the chance of winning as team $B$. Which of the following has the correct table of probabilities for winning the tournament?
a.

| Team | A | B | C | D |
| :---: | :---: | :---: | :---: | :--- |
| Probability <br> of winning | $25 \%$ | $30 \%$ | $15 \%$ | $30 \%$ |

b.

| Team | A | B | C | D |
| :---: | :---: | :---: | :---: | :--- |
| Probability <br> of winning | $25 \%$ | $20 \%$ | $20 \%$ | $35 \%$ |

c.

| Team | A | B | C | D |
| :---: | :---: | :---: | :---: | :--- |
| Probability <br> of winning | $25 \%$ | $15 \%$ | $15 \%$ | $45 \%$ |

d.

| Team | A | B | C | D |
| :---: | :---: | :---: | :---: | :--- |
| Probability <br> of winning | $25 \%$ | $15 \%$ | $10 \%$ | $50 \%$ |

Answer: A Team A = 25\%, Team B = Team D $+25 \%+5 \%$, Team C $=100-(25+30+30)=15$ Therefore, $25 \%+30 \%+15 \%+30 \%=100 \%$
19. You tossed a five-peso coin five times and you got heads each time. You tossed again and still a head turned up. Do you think the coin is BIASED? Why?
a. I think the coin is biased because it favored the heads.
b. I think the coin is biased because it is expected to turn up tail for the next experiments.
c. I think the coin is not biased because both faces of the coin have equal chances of turning up.
d. I think the coin is not biased because the probability of turning heads up is $\frac{3}{4}$ while that of tails is only $\frac{1}{4}$.

Answer: C
20. Your best friend asked you to accompany him to a carnival to play games of chances. According to him, his horoscope states that he is so lucky that day and he wants to try his luck at the carnival. How will you convince him not to go to the carnival?
a. I will ask him to review very well his notes on probability so that he can apply them to a real life situation like this.
b. I will tell him that what is written in the horoscope is sometimes true and sometimes false so he would rather not go to the carnival.
c. I will give him instances wherein he could see the real picture of having a very little chance of winning so that he will not be wasting his money and time.
d. I will convince him not to go to the carnival this time because we have to finish first our project in Probability. Anyway, there will be other time to go and enjoy all the games there.

## Answer: C

As an introduction to this module, ask the students these essential questions: 1. How is the number of occurrences of an event determined?
2. How does knowledge of finding the likelihood of an event help you in your daily life?

This module starts with Activity 1 which introduces the concept of probability. Provide a friendly classroom atmosphere which would encourage the students to answer the given activity.

```
Activity }
1. impossible
2. chance
3. certain
4. 4-in-5 chance
5. even
Note: These are the possible answers. Please consider other correct answers which can be elicited from the students. For open-ended questions (OEQ), answers may vary. Ask them how they arrived at their answers or why their answer is different.
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## Teacher's Note and Reminders



## Basic Concepts of Probability

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## 0

Begin this module by assessing what you have learned on the basic mathematical concepts and your skills in performing the different mathematical operations which may help you understand the lessons on Probability. As you go through this module, think of the following essential questions: How is the number of occurrences of an event determined? How does knowledge of finding the likelihood of an event help you in your daily life? To find the answer, perform each activity to the best of what you can.

AGHTity 5

- GNSMERAMETODENTH -

Relate each illustration below with your day to day activities. Fill in the blanks with the correct words that would make the following sentences meaningful.


Unlikely
Even Chance
Likely


Certai


4 in 5 Chance
$\qquad$ to change for the better
2. Now is your $\qquad$ that you can do better than what is expected of you.
3. I'm $\qquad$
4. Given the chanc $\qquad$ chance to succeed in life.

## Answer Key

## Questions:

## Possible answers:

1. Maybe YES/NO
2. Probability
3. Impossible, unlikely, uncertain, chance, odds, likely, certain
4. Can be expressed as a fraction, a decimal or a percent
5. Probability is the possibility of occurrences, chance or likelihood of events in a man's life which can be expressed as a fraction, a decimal or a percent.

Ask the students to answer Activity 2 to explore the basic concepts of probability and the fundamental counting principle. Discuss the tree diagram.

Answer Key

## Activity 2

1. 2
2. 2
3. 2
4. 8 (OEQ)
5. 4 (OEQ), by counting the branches of the tree diagram

## Teacher's Note and Reminders



## Answer Key

## Possible answers:

1. By listing the possible combinations
2. 8
3. YES/NO (OEQ), there are only few pairs of shirts and pants to combine. 4. Price, occasion (OEQ)

Let the students answer Activity 3. Prior to this activity, explain the features of a die, Let them roll the dice which they were asked to bring then explain how to fill in the table using the three given examples: $(3,2),(5,6)$ and $(6,2)$.

## Answer Key

Activity 3

| Sides of <br> a Die | 1 | 2 | 3 | 4 | 5 | 6 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 1,1 | 2,1 | 3,1 | 4,1 | 5,1 | 6,1 |
| 2 | 1,2 | 2,2 |  | 4,2 | 5,2 |  |
| 3 | 1,3 | 2,3 | 3,3 | 4,3 | 5,3 | 6,3 |
| 4 | 1,4 | 2,4 | 3,4 | 4,4 | 5,4 | 6,4 |
| 5 | 1,5 | 2,5 | 3,5 | 4,5 | 5,5 | 6,5 |
| 6 | 1,6 | 2,6 | 3,6 | 4,6 |  | 6,6 |

## Questions:

## Possible answers:

1. 6
2. 36
3. $1,2,3,4,5,6$
4. By counting the outcomes listed in the table
5. Results, (sample space)

As early as now, inform the students that towards the end of this module, they will do a final project which will involve them as game analysts invited by the barangay officials to inform or educate the community folks, especially the youth and the students, to be mindful of their chances of losing and winning in the local carnivals so that they will not end up wasting too much of their time. Tell them that what they will learn in the next section will help them realize said project.


Do the next activity to explore further on the basic concepts of probability and the fundamental counting principles.
 $\because$

Analyze the problem carefully. Fill in the table correctly and answer the questions that follow.

You are holding a die. Your seatmate is holding another die. If both of you roll the dice at the same time, how many outcomes are possible?

| Sides of <br> a Die | 1 | 2 | 3 | 4 | 5 | 6 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 |  |  |  |  |  |  |
| 2 |  |  | 3,2 |  |  | 6,2 |
| 3 |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |
| 6 |  |  |  |  | 5,6 |  |



Remind the students that as they move on, they must be guided by the following questions: How is the number of occurrences of an event determined? How does knowledge of finding the likelihood of an event help you in your daily life?

Before they perform the next activities, let the students read and understand some notes on the concepts of probability. Should they need your help, please explain and let them perform experiments on flipping a coin, rolling a die, rolling a coin and a die simultaneously and drawing a card from a deck of 52 cards.

Life has a lot of uncertainties. Oftentimes, our decisions in life are done under conditions of uncertainty. These are the probabilities of life.

What you will learn in the next section will also enable you to do the final project which will involve you as a game analyst invited by the barangay officials to inform or educate the community folks to be mindful of their chances of losing and winning in the local carnivals so that they will not end up wasting too much of their time and money.

You will start by doing the next activities.

## Whavolmoass

Your goal in this section is to learn and understand the key concepts of probability and the fundamental counting principle by conducting several experiments which would lead you to differentiate experimental probability from theoretical probability. As you move on, please be guided by the following questions: How is the number of occurrences of an event determined? How does knowledge of finding the likelihood of an event help you in your daily life?

Probability is the chance that something will happen. Events cannot be predicted with total certainty. We can say, "How likely they are to happen."

Probability Experiment is a chance process that leads to a well-defined result called an outcome

Examples: Flipping a coin Rolling a die

Outcome is the result of a single trial of an experiment.

| Experiment | Outcome |
| :---: | :---: |
| Flipping a coin | Head (H)/ Tail (T) |
| Rolling a die | $1 / 2 / 3 / 4 / 5 / 6$ |

Sample space is the set of all the possible outcomes or sample points
Sample point is just one of the possible outcomes.

Activity 4 may be given as a group activity to let them enjoy learning the concepts of probability. Provide them illustration boards and pieces of chalk. Please give further instructions on how to perform a group activity.

## Answer Key

## Activity 4

1. Probability
2. Sample point
3. Probability
4. Sample space
5. Sample point
6. Sample point
7. Experiment
8. Event
9. Probability
10. Outcome
11. Experiment
12. Sample space
13. Experiment
14. Event
15. Experiment

| Experiment | Sample Space | Sample Point |
| :---: | :---: | :---: |
| Flipping two coins | HH, HT, TH, TT | HH |
| Rolling a die | 1, 2, 3, 4, 5, 6 | 5 |
| Rolling a coin and a die simultaneously | $\mathrm{H} 1, \mathrm{H} 2, \mathrm{H} 3, \mathrm{H} 4, \mathrm{H} 5, \mathrm{H} 6$ T1, T2, T3, T4, T5, T6 | T3 |
| Drawing a card from a deck of 52 cards | 13 Diamonds, 13 Hearts, 13 Spades, 13 Clubs (Ace, 2, 3, 4, 5, 6, 7, 8, 9, 10, Jack, Queen, King) | Queen of Hearts |

"Queen" is not a sample point because there are four Queens which are four different sample points in a deck of cards.

Event is any set of one or more outcomes satisfying some given conditions.
Examples:
a. Getting a TTT when flipping a coin thrice
b. Choosing a "Queen" from a deck of cards (any of the 4 Queens)
c. Getting an "odd number" $(1,3$, or 5$)$ when rolling a die
 $\qquad$

## (Group Activity)

Use the basic concepts of probability to identify the following. Write each answer on the illustration board.

1. $\frac{5}{6}$
2. Tail
3. $50 \%$
4. Right, Wrong
5. KING of Spades
6. Rolling an odd number (1, 3 or 5 )
7. Flipping a 10 -peso coin five times
8. Getting a head in a single toss of coin
9. The chance that something will happen
10. The result of a single trial of an experiment
11. Tossing a coin and rolling a die simultaneously

12 Set of all possible outcomes of an experiment
13. Guessing the number of marbles in a container
14. Choosing an ACE from a deck of standard cards
15. A chance process which leads to well-defined results

Before asking the students to answer Activity 5, group them (3-5 groups) then instruct them to perform the experiment of tossing three coins simultaneously (at least 30 trials), and record the outcomes in their module notebook.

## Answer Key

## Activity 5

experiment
event
sample space
TTT - NO
THH - NO
HTT - NO
HHH - YES
TTH - NO
THT - NO
TTT - NO
outcomes

## Teacher's Note and Reminders



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## (Group Activity)

Join Jayar and his friends perform the same experiment. Record each outcome of your experiment. Then fill in the blanks using the basic concepts of probability to complete the paragraph

Jayar and his friends decided to find the number of times three heads "HHH" would come up when flipping three five-peso coins simultaneously. Every time Jayar and his friends flip the fair coins is an $\qquad$ . The $\qquad$ that they are looking for is to come up with three heads: $\{\mathrm{HHH}\}$. The $\qquad$ is the set of all possible outcomes: \{HHH\}, \{HTH\} ... \{TTT\}.
These are the results of their experiment. Complete the table.

|  | Trial 1 | Trial 2 | Trial 3 | Trial 4 | Trial 5 | Trial 6 | Trial 7 | Trial 8 | Trial 9 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Coin 1 | H | H | T | T | H | H | T | T | T |
| Coin 2 | T | T | T | H | T | H | T | H | T |
| Coin 3 | T | H | T | H | T | H | H | T | T |
| Outcome | HTT | HTH |  |  |  |  |  |  |  |
| Is it <br> HHH $\}$ <br> YES or <br> NO | NO | NO |  |  |  |  |  |  |  |

In order to find all the $\qquad$ they have to continue flipping the coins for at least 30 times.


1. Were you able to complete the paragraph with the correct words?
2. Do the words come easy to you? Why?
3. After 9 trials, Jayar and his friends had 1 "HHH" event. Is the result of the experiment close to what you have expected? What would have they done to make it closer to what is expected?
4. In your group experiment, how many " HHH " events did you have? Is the result of your experiment close to what is expected? Why?
5. What Jayar, his friends and your group had performed uses an Experimental Probability. In your own understanding, how do you define Experimental Probability?

Let the students recall odd numbers, even numbers and the divisibility rules before asking them to answer Activity 6.

## Answer Key

```
Activity }
1. a 4. e
2. f 5. b
3. e 6. b
```

To increase their knowledge on Experimental Probability and Theoretical Probability, encourage the students to visit this site:
http://www.onlinemathlearning.com/theoretical-probability.html

## Teacher's Note and Reminders



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Probabilities can be solved theoretically in which each event is assumed to be equally likely. Look carefully at the given set then match column A with column B. Your answers will help you understand the concept on the probability of an event.

Given: Set $R=\{1,2,3,4,5,6,7,8,9,10,11,12\}$

Column A

The probability of having:
$\qquad$ 1. a 10
2. a 13
3. odd numbers
4. even numbers
5. an odd number divisible by 3
$\qquad$ 6. an even number divisible by 3


1. How many possible outcomes are there?
2. To have even numbers, how many favorable outcomes are there? . Considering your answers, how do you compute for the probability of an event?
3. What formula can be used?
4. This activity uses Theoretical Probability. How do you define Theoretical Probability?

To enrich your knowledge about the difference between Experimental Probability and Theoretical Probability, you may visit these sites:
www.algebra-class.com/theoretical-probability.html
http://www.onlinemathlearning.com/theoretical-probability.html

Let the students read some notes on Probability of Events and study carefully the given examples．If they have questions on what they have read，provide a friendly interactive discussion before asking them to answer the next activity．

## Teacher＇s Note and Reminders




## Probability of Events

The probability of an event， $\mathbf{P}$（event），is a number from 0 to 1 which tells how likely the event is to happen．

## Take a closer look at the probability line below

| Never to <br> happen | To happen about <br> half the time |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| 0 | $\frac{1}{4}$ | $\frac{1}{2}$ | $\frac{3}{4}$ | Sure to <br> happen |
| 0 | 0.25 | 0.5 | 0.75 | 1 |
| 0 | $25 \%$ | $50 \%$ | $75 \%$ | $100 \%$ |

## Probability Rules

1．The probability of any event is a number（either a fraction，a decimal or a percent）from 0 to 1
Example：The weather forecast shows a $70 \%$ rain

$$
P(\text { rain })=70 \%
$$

2．If an event will never happen，then its probability is 0 ．
Example：When a single die is rolled，find the probability of getting an 8.
Since the sample space consists of $1,2,3,4,5$ ，and 6 ，it is impossible to get an 8．Hence，$P(9)=\frac{0}{9}=0$ ．
3．If an event is sure to happen，then the probability is 1 Example：When a single die is rolled，what is the probability of getting a number less than 7 ？
Since all the outcomes $\{1,2,3,4,5,6\}$ are less than 7 ，
$P($ number less than 7$)=\frac{6}{6}=1$
4．The sum of the probabilities of all the outcomes in the sample space is 1 Example：
In rolling a fair die，each outcome in the sample space has a probability of $\frac{1}{6}$ Hence，the sum of the probabilities of the outcomes is 1.

If a fair coin is flipped，$P(T)=\frac{1}{2}$ and $P(H)=\frac{2}{2}$
If you flipped the coin ten times and got the following outcomes：H，H．H，T，H，T，T，H， H ，what is the probability that the last outcome will also be a Head $(\mathrm{H})$ ？How did you arrive at your answer？

$P$ (event) $=\frac{\text { Number of favorable outcomes }}{\text { Number of all possible outcomes }}$
$P($ event $)=\frac{\text { Number of expected events }}{\text { Number of all possible outcomes }}$
$P($ event $)=\frac{\text { Number of expected events }}{\text { Number of all possible outcomes }}$
Examples:

1. What is the probability of getting a HEART from a deck of cards? $P$ (heart) $=\frac{13}{52}=\frac{1}{4}$
2. There are 25 marbles in a container: 4 are red, 5 are blue and 11 are yellow. What is the probability that a blue marble will be picked?
$P($ blue marble $)=\frac{5}{20}=\frac{1}{4}$
Sometimes, getting an event affects the outcome of another event. Take a look at these examples:
3. Five red candies are left in a bag of 40 different colored candies.

a. What is the probability that you will get a red candy?

How did you get your answer?
b. What are your chances of getting a red one when you pick again? Do you have the same answer? Why?
How many candies are now in the bag?
How many red candies are there?
Getting the next candy is affected by the result of the first attempt. Every time you get a piece of candy from a bag, the chance of getting a red one will change. These are called dependent events.
2. Flipping a Coin

a. When you flip a coin, what is the probability of heads landing up?
b. If you flip it again, what is the probability of getting tails?

The two events do not affect each other. They are independent events

## Explain patiently Activity 7 to the students. To come up with a good report,

 give them the following guide questions:1. How many typhoons hit the country last year?
2. What are those typhoons?
3. Of the typhoons that hit the country, how many hit the country in a month? Represent them using a table.
4. Solve for the probability of typhoons hitting the country monthly.
5. Explain what type of probabilities is used in the task.

Let the students recall the formula in finding the probability of an event before asking them to answer Activity 8. To assess how well they've learned, tell them to explain their answers on the board. You may record their scores but do not give them grades.

## Answer Key

## Activity 8

1. $\frac{2}{7}$
2. $\frac{7}{12}$
3. $\frac{4}{12}$ or $\frac{1}{3}$
4. $\frac{9}{11}$
5. $\frac{4}{6}$ or $\frac{2}{3}$
6. $\frac{5}{25}$ or $\frac{1}{5}$
7. $\frac{20}{45}$ or $\frac{4}{9}$
8. $\frac{1}{4}$
9. $\frac{4}{16}$ or $\frac{1}{4}$
10. $\frac{4}{52}$ or $\frac{1}{13}$

##  <br> (Group Activity)

Gather data on the number of typhoons that hit the country in the previous year. Using the basic concepts of probability, come up with a report showing the estimated chances of a typhoon hitting the country for each month.

The report should contain the following:

1. Representation of collected data.
2. Process of coming up with the estimated probabilities
3. Explanation on what type of probabilities is generated in the task.

Rubric for the Written Group Repor

|  | 4 | 3 | 2 | 1 |
| :---: | :---: | :---: | :---: | :---: |
| Representation <br> of Data and <br> Explanation | Is complete, <br> organized <br> and clear | Is complete and <br> organized | Is complete but <br> disorganized | Is incomplete <br> and <br> disorganized |
| Process/ <br> Computation |  <br> appropriate <br> illustration or <br> solution | Has correct <br> illustration or <br> solution with <br> minor errorr | Has illustration <br> or <br> solution but has <br> errors | Has no <br> illustration <br> or solution |

AGfTV苞 8 $\qquad$
$\qquad$

## (Quiz)

Solve the following carefully, then write the correct answer on the space provided before each number.
$\qquad$ 1. Ear Darenz is asked to choose a day from a week. What is the probability of choosing a day which starts with S?
2. Choosing a month from a year, what is the probability of selecting a month with 31 days?
$\qquad$ 3. If a letter is chosen at random from the word PERSEVERANCE, what is the probability that the letter chosen is $\mathbf{E}$ ?
4. If one letter is chosen at random from the word TRUSTWORTHY, what is the probability that the letter chosen is a consonant?
$\qquad$ 5. The sides of a cube are numbered 11 to 16. If Jan Renz rolled the cube once, what is the probability of rolling a composite number?
6. A box contains 7 red balls, 5 orange balls, 4 yellow balls, 6 green balls and 3 blue balls. What is the probability of drawing out an orange ball?

Let the students solve the problems in Activity 9. To understand the Fundamental Counting Principle, elicit the students' answers to the process questions patiently. You may give follow-up questions if needed.

c. 6
d. The number of branches is equal to the number of choices, therefore I can dress in 6 different ways
e. Multiply the 2 tasks.

Therefore, I can dress in 6 different ways.
2.

| Food/Drinks | Coffee (C) | Juice (J) | Hot chocolate <br> $(\mathrm{H})$ | Tea (T) |
| :---: | :---: | :---: | :---: | :---: |
| Pancake (P) |  | PJ | PH |  |
| Waffles (W) | WC |  | WH | WT |
| Fries (F) | FC | FJ |  | FT |

a. 3
b. 4
c. 12
d. fd

I have 12 different choices of food and drink.

Of the 45 students in a class, 25 are boys. If a student is selected a random for a field trip, what is the probability of selecting a girl?
$\qquad$ 8. Two fair coins are tossed simultaneously, what is the probability of showing tail $(T)$ first and head $(H)$ next?
9. A spinner is divided equally and numbered as follows: $1,1,2,3,3,4,1$, $1,2,4,1,2,3,4,1,2$. What is the probability that the pointer will stop at an even prime?
$\qquad$ 10. What is the probability of getting an 8 from a deck of 52 cards?

In the next activity, you will discover how useful the Fundamental Counting Principle is. This principle is all about choices you can make given many possibilities.

## 

$\qquad$
Read the following situations carefully then answer all the questions that may lead you to understand the fundamental counting principle.

1. On a Saturday morning, you washed most of your clothes and they are still wet. Your friend invites you to attend his birthday party and you are left with only 2 pants and 3 shirts. In how many different ways can you dress? Make a tree diagram to show all the choices you can make.
a. How many choices do you have for pants? $\qquad$
b. How many choices for shirts are there?
$\qquad$
c. How many branches are there in the tree diagram? $\qquad$ -
d. How are the branches of the tree diagram related to the number of choices that you can make? Therefore, in how many different ways can you dress?
. You have 2 choices for pants and 3 choices for shirts. What should you do with the two tasks to get the answer easily and quickly?
2. You go to a restaurant to buy some breakfast. The menu says, for food: pancakes, waffles, or home fries; and for drinks: coffee, juice, hot chocolate, and tea. How many different choices of food and drink do you have? Illustrate the choices by using the table below.

| Food/Drinks | Coffee (C) | Juice (J) | Hot chocolate <br> $(\mathrm{H})$ | Tea (T) |
| :---: | :---: | :---: | :---: | :---: |
| Pancake (P) | PC |  |  | PT |
| Waffles (W) |  | WJ |  |  |
| Fries (F) |  |  | FH |  |

To have more examples and practice on finding the total possible outcomes using the fundamental counting principle, visit these sites: http://www.algebra-class.com/fundamental-counting-principle.html http://www.aaknow.com/sta-basic-cntg.htm

Let the students read the notes on Fundamental Counting principle.

Let the students do Activity 10. This time, do not give guide questions. Let them do it independently



How many choices for food are there?
b. How many choices for drinks are there?
c. By counting, how many different choices of food and drink do you have?
d. If the number of choices for food is $f$ and $d$ for drinks, what expression helps you find the answer quickly and correctly?

Should you want to have more examples on using the Fundamental Counting Principle to determine the sample space, watch the video in this site:
http://www.algebra-class.com/fundamental-counting-principle.html
To have more practice on finding the total possible outcomes, visit this site: http://www.aaaknow.com/sta-basic-cntg.htm

You can get the total number of possible outcomes by using a tree diagram or a table; however, it is time consuming. You use the Fundamental Counting Principle to find easily the total outcomes by multiplying the outcomes for each individual event. Thus, if you have $f$ ways to do the first event and $s$ ways to do the second event, then you can find the total number of outcomes by multiplying $f$ and $s$, that is $(f)(s)$.

Choose any of the given tasks.
a. Know the number of child births in a hospital for each month last year
b. Know the number of absentees in a class per month of the previous school year

Use the basic concepts of probability to come up with a report showing the the number of occurrences.

The report should contain the following:
a. . Representation of collected data
b. Process of coming up with the estimated probabilities
c. Explanation on what type of probabilities is used in the task

Rubric for the Written Individual Report

|  | 4 | 3 | 2 |  |
| :---: | :---: | :---: | :---: | :---: |
| Representation <br> of Data and <br> Explanation | Is complete, <br> organized <br> and clear | Is complete and <br> organized | Is complete but <br> disorganized | Is incomplete <br> and <br> disorganized |
| Process/ <br> Computation | Has correct and <br> appropriate <br> illustration or <br> solution | Has correct <br> illustration or <br> solution with <br> minor errors | Has illustration <br> or <br> solution with <br> major errors | Has no <br> illustration <br> or solution |

Great job! I'm certain you are ready to move on...


Let the students use the tree diagram, table or the fundamental counting principle to answer Activity 11 correctly.

## Answers Key

## Activity 11

. a. 4
b. $\mathrm{HH}, \mathrm{HT}, \mathrm{TH}, \mathrm{TT}$
c. $\frac{1}{4}$
2. a. 8
b. HHH, HHT, HTH, HTT, THH, THT, TTH, TTT
c. $\frac{4}{8}$ or $\frac{1}{2}$

In this section, the discussion was about the basic concepts of probability, experimental probability and theoretical probability, and the fundamental counting principles.

Go back to the previous section and compare your initial ideas with the discussion. How much of your initial ideas are found in the discussion? Which ideas are different and need revision?

Now that you know the important ideas about this topic, go deeper by moving on to the next section.

## Wheromiderand

O Your goal in this section is to take a closer look at some aspects of the topic I'm certain that you are now ready to answer the different exercises to have a deeper understanding of what you have learned. As you continue answering the next activities, please search for the answer to the following questions:
"How is the number of occurrences of an event determined? How does knowledge of finding the likelihood of an event help you in making decisions?"

Read the problem carefully then answer the questions that follow.
Jann has a 5-peso coin in his pocket.

1. He tosses the coin twice.
a. How many possible outcomes are there? $\qquad$
$\qquad$
b. What are those possible outcomes? $\qquad$
$\qquad$
c. What is the probability of both tails turning up? $\qquad$
2. He tosses the coin thrice.
a. How many possible outcomes are there? $\qquad$ -
b. What are those possible outcomes? $\qquad$ wo heads? $\qquad$
c. What is the probability of getting at least two heads?

## To add excitement to Activity 12, let the students play "Snake and Ladder" for

 five minutes before they answer the activity.
## Answer Key

## Activity 12

a. 6
b. $1,2,3,4,5,6$
c. $\frac{1}{6}$
d. $\frac{0}{6}=0$

The probability of rolling an 8 is 0 because a die has only 6 faces. Hence, it does not have an 8.
e. 36
f. $\frac{6}{36}=\frac{1}{6}$
g. $\frac{3}{36}=\frac{1}{12}$

Explain an icosahedron to the students. You may ask them to make their own icosahedron a week before answering Activity 13. Let them answer the activity at home. Answers must be explained next meeting.

## Answer Key

## Activity 13

1. 20
2. $1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20$
3. $\frac{0}{20}=0$

The icosahedron has only 20 faces, numbered 1 - 20. It has no 25 , therefore, the probability is 0 .
4. $\frac{10}{20}=\frac{1}{2}$
5. $\frac{5}{20}=\frac{1}{4}$
6. $\frac{20}{20}=1$

An icosahedron has 20 faces, numbered $1-20$, which are all positive numbers. Hence, $P=\frac{20}{20}=1$.

## ACHUTD

Play "Snake and Ladder" with a friend then answer the questions below.


1. Roll the die once
a. How many possible outcomes are there? $\qquad$ -
b. What are those outcomes? $\qquad$ -
c. If you want to move ahead 4 spaces on the board, then what is the probability of rolling a 4 ? $\qquad$ nead
d. If your friend wants to move ahead 8 spaces on the board, then what is the probability of rolling an 8 ? $\qquad$ Why? $\qquad$ -
2. Roll the die twice.
a. How many possible outcomes are there? $\qquad$
b. What is the probability of having "doubles"? $\qquad$ -
c. What is the probability of getting a set of outcomes whose sum is greater than 10 ? $\qquad$

Parents love working with their children. At home, invite your father or mother to toss an icosahedron which has congruent faces numbered 1 to 20 , then read and answer together all the questions that follow.


Your father rolled the icosahedron once.

1. How many possible outcomes are there? $\qquad$ _
2. What are those possible outcomes?
3. What is the probability that the face which lands up is 25 ? $\qquad$ How will you interpret your answer? $\qquad$
$\qquad$
4. What is the probability that the face which lands up is an odd number?
5. What is the probability that the face which lands up is an even number divisible by 4 ? $\qquad$ -
6. What is the probability that the face which lands up is a positive number? How did you arrive at your answer? Explain. $\qquad$

The total number of choices can be found using the tree diagram but this is time consuming. Let the students realize this by answering Activity 14.

## Answer Key

## Activity 14

1. 4
2. 5
3. 3
4. Tree diagram
5. 60
6. Expression: bcm
7. Solution: $\mathbf{4 \times 5 \times 3 = 6 0}$

I could choose from 60 available cell phones.

## Teacher's Note and Reminders



Actlotio 54


Analyze carefully the problem then answer what is asked for.
One of your dreams is to have a new cell phone. You went to a cell phone dealer and he gave you the following options. How many available cell phones could you choose from?

Brand:


Colors: $\quad$ white ( $\mathbf{W}$ ), red ( $\mathbf{R}$ ), yellow ( $\mathbf{Y}$ ), gray ( $\mathbf{(})$, blue ( $\mathbf{B}$ )
Models: $\mathrm{X}, \mathrm{K}, \mathrm{P}$


## Explain carefully how the students will answer Activity 15. The said activity

 may be given as a quiz.
## Answer Key

Activity 15

1. e
2. d
3. a
4. C
5. e
6. a
7. e
8. b
9. e
10. c
11. c


## ACHOTHy

Match the following with each letter on the probability line. Number 1 is done for you.

|  | b | c | d | c |
| :---: | :---: | :---: | :---: | :---: | :---: |
| (impossible) | (poor chance) | (fair chance) | (good chance) | (certain) |

e 1. There are 7 days in a week.
2. Out of 20 items, Jann got 15
_3. In the Philippines, it will snow in March.
4. If you flip a coin, it will come down heads
5. All months of the year have 28 days.
-6. It will be daylight in Manila at midnight.
_ 7. The day before Monday is Sunday.
8. Of the 40 seedlings, only 10 survived.
9. Next year, the month after November has 30 days
$\qquad$ 10. The third person to knock on the door will be a female.
11. The chance that the last outcome in rolling a number cube is an even number

In this section, the discussion was about problems involving probabilities of events and fundamental counting principles.

What new realizations do you have about the topic? What new connections have you made for yourself?

Now that you have a deeper understanding of the topic, you are ready to do the tasks in the next section.

Encourage the students to work collaboratively to come up with an excellent work.
Explain clearly how they will perform Activity 16 and how they will earn their score.


##  <br> 

Your goal in this section is to apply your learning to real life situations. You will be given practical tasks which will demonstrate your understanding. After answering a lot of exercises, I'm sure you're now ready to give your insights on the following questions:
"How is the number of occurrences of an event determined? How does knowledge of finding the likelihood of an event help you in making decisions?"

## [actidivi

Read the following carefully then perform the task diligently.
The family plans for a three-day summer vacation in Boracay. The challenge is to present variety of transportation packages within the allotted budget of the family. Create a variety of transportation options for the family to choose from. Explain how you arrived with those options.

Rubric on the Group Work for Transportation Packages

|  | 4 | 3 | 2 | 1 |
| :---: | :---: | :---: | :---: | :---: |
| Visual Appeal | Neat, readable, correctly labelled diagram and has a very creative design that enhances the diagram | Neat, readable, correctly labelled diagram and has a creative design | Readable and correctly labelled | Messy |
| Computation of Charge | Correct and detailed | Detailed but with minor errors | Detailed but with major errors | Not detailed |
| Proposal | Based on correct equation and computation | Based on mathematical computation | Based on sound mathematical reasoning without computation | Based on Guessing |

Encourage them to plan and work collaboratively with their groupmates in order to come up with a very good presentation.

## Teacher's Note and Reminders




##  <br> 凹Ex <br> $\qquad$

Situation:
The barangay officials want the community folks especially the students and youth to be informed/educated about engaging in games of chance (those found in the local carnivals). They invited a game analyst to convince the people in the community that they should be mindful of their chances of losing and winning in these types of games so that they will not end up wasting their time and money. The game analyst needs to present and disseminate this during the barangay monthly meeting. The presentation should meet the following standards: use of mathematical concepts, accuracy, organization and delivery.

Activity:
Consider yourself as the game analyst invited by the barangay officials to make an educational presentation on how to convince the community folks of their chances in losing and winning in those games in the local carnival. The presentation should meet the set standards.

Goal:
The problem or challenge is to inform/educate the people, especially the students and youth in a community about engaging in games of chance (those found in the local carnivals and the like).

Role
You are a game analyst invited by the barangay officials.
Audience:
The target audience are the barangay officials and the people in the community.
Situation:
You need to convince the people in the community that they should be mindful of their chances of losing and winning in these types of games so that they would not end up wasting too much of their time and money.

## Product/Performance:

You need to create a presentation for the monthly barangay/community forum/ meeting in order to disseminate the information.

Standards:
The presentation should meet the following standards: use of mathematical concepts, accuracy, organization and delivery.


Let the students answer Activity 18 which further reflects how they will apply the knowledge and skills learned in this module in their day-to-day activities.


## AGATHity <br> 

In this module, you learned concepts which helped you accomplished the different tasks successfully. This time, kindly answer this activity which would show how important this module is in your day- to- day activities.

## In this module, I learned about

I can use these concepts

These are very important because

I understand that

I can use the basic concepts of probability and the fundamental counting principles in my day to day activities by

In this section, your task was to apply what you have learned in this module in reallife situation.

How did you find the performance task? How did the task help you see the real world use of the topic?

You have completed this lesson in probability. Before you go for a summer vacation, you have to answer the following post - assessment

## Summative Test

I. Matching Type

Match column A with column B. Write the LETTER of the correct answer.

## Column A

1. Yes, No
2. Tossing a fair coin thrice
3. Events that do not affect each other
4. Chance that something will happen
5. Set of all outcomes of an experiment
6. The result of a single trial of an experiment
7. Probability of an event that is sure to happen
8. Guessing the number of marbles in a container
9. Choosing the KING of hearts from a deck of cards
10. Probability of an event which will never happen

Column B
a. 0
b. 1
c. $\quad 0.25$
d. $50 \%$
e. dependent events
f. event
g. experiment
h. independent events
i. outcome
j. sample space
k. tree diagram
I. probability
II. Modified True or False

Write TRUE if the statement is correct and if is wrong, change the underlined word/s or number/s to make the statement correct.

1. Probability is only our guide. It does not tell us exactly what will occur.
2. When Ana flips a coin, the possible outcomes are 1, 2, 3, 4, 5, 6.
3. The choices made in answering a True-or-False type of quiz are dependent.
4. Danielle rolls a die. One of the possible outcomes in the sample space is $\underline{7}$.
5. A tree diagram can be used to find all the possible outcomes of an event.
III. Answer the following correctly
6. Five coins are tossed. How many outcomes are possible?
7. If a die is rolled once, then what is the probability of getting a number less than 7 ?
8. A card is drawn from an ordinary deck. What is the probability of getting an ACE?
9. What is the probability of getting the 7 of diamonds from an ordinary deck of cards?
10. A family has three children. What is the probability of having two of the children are girls and one is a boy?
IV. Read the following carefully then answer correctly as indicated.

Use the following to show the solution.
For no. 1, use a table.
For no. 2, use a formula.
For no. 3, use a tree diagram.

1. Heindrich and Xander are playing a ten-peso coin and an octahedron, a special die with eight congruent faces marked 1 to 8 . If they toss the coin and roll the octahedron simultaneously, what are the possible outcomes?
2. A summative test is given to a Mathematics class of sixty students. Four got perfect scores. What is the probability that a student who is picked at random got a perfect score?
3. A Snack Bar serves three desserts: native cake, buko pie and Malunggay ice cream. It also serves three beverages: milk, buko juice and mineral water. If you choose one dessert and one beverage, how many possible outcomes would you choose from? Which of the possible outcomes do you prefer? Why?

## Answer Key

I. 1. j
6. i
II. 1. true
III. 1.32
2. $g$
7. b
2. $\mathrm{H}, \mathrm{T}$
3. $h$
8. g
3. independent
4. I
9. f
4. $1 / 2 / 3 / 4 / 5 / 6$
2. $\frac{6}{6}$
5 j 10. a
5. True
3. $\frac{4}{52}$ or $\frac{1}{13}$
4. $\frac{1}{52}$

IV. 1. 10-peso coin

|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| H | H1 | H2 | H3 | H4 | H5 | H6 | H7 | H8 |
| T | T1 | T2 | T3 | T4 | T5 | T6 | T7 | T8 |

2. $\frac{4}{60}$ or $\frac{1}{15}$
$\frac{1}{15}$ is the probability that a student who is picked at random got a perfect score.
3. native cake $\quad \mathrm{M}-\mathrm{CM}$
(c)

buko pie M -- PM
(p)

B -- PB
W -- PW
4. Malunggay Ice Cream M -- IM
(I) $\underbrace{}_{\text {B -- IB }}$

- I would choose from 9 possible outcomes.
- Answers to the other 2 questions (OEQ) may vary.


## Post-Test

It's now time to evaluate your learning. Write the letter of the answer that you think best answers the question. Your score will reflect what you have learned in this module.

1. Which of the following is an experiment in which results are observed?
a. Head, Tail
b. $1,2,3,4,5,6$
c. Rolling an odd number
d. Guessing the number of marbles in a jar.

Answer: D. Guessing the number of marbles in a jar is the only experiment in the choices.
2. A coin is tossed thrice. What is the probability of having two heads and a tail?
a. $\frac{1}{8}$
b. $\frac{1}{2}$
C. $\frac{3}{8}$
D. 1

## Answer: C. Three out of the 8 outcomes have two heads and a tail.

3. Coco has been observing the types of vehicle passing through an intersection. Of the last 50 vehicles, 28 were tricycles, 8 were trucks and 14 were buses. Estimate the probability that the next vehicle through the intersection will be a BUS.
a. 0.16
b. 0.28
c. $\quad 0.56$
d.
0.72
Answer: b. $\frac{14}{50}$ or 0.28
4. Which of the following illustrates a theoretical probability?
a. Bel rolled a die several times and recorded her observations.
b. Bel tossed a coin and listed down the number of occurrences for heads and tails.
c. Bel has three 10-peso coins, four 5-peso coins and five 1-peso coins. She repeatedly picked a coin from her pocket and listed down the outcomes.
d. Bel asked her 40 classmates if they are left - handed. Based on the survey, 8 students said they are left - handed, so he/she estimated that there are only 8 left - handed students from the class.
Answer: D illustrates theoretical probability, the others illustrate experimental probability.
5. After 500 spins of the spinner, the following information was recorded. What is the probability of the spinner landing on VIOLET?

| Outcome | Green | Orange | Violet |
| :---: | :---: | :---: | :---: |
| Spins | 225 | 132 | 143 |
| a. $27 \%$ <br> Answer: B $\frac{143}{500}$ | b. $29 \%$ <br> c. $45 \%$ <br> d. $71 \%$ $=0.286 \text { or } 29 \%$ |  |  |

6. Suppose you toss a fair coin four times, how many possible outcomes are there?
a. 4
b. 8
c. 16
d. 32

Answer: C The 2 tosses of the coin are independent (the result of one does not affect/depend on the other), thus there are 16 possible outcomes.
7. A die is rolled. What is the probability of rolling a number that is greater than 6 ?
a. $\frac{0}{6}$ or 0
b. $\frac{1}{6}$
c. $\frac{5}{6}$
d. $\frac{6}{6}$ or 1

Answer: A, A die has 6 faces only, therefore, it has no side which is greater than 6.
8. In a 2000-ticket draw for an educational prize, your name was written on 58 tickets. What is the probability that you will get the prize?
a. $2.9 \%$ *
b. $5.8 \%$
c. $29 \%$
d. $58 \%$
Answer: A $\frac{58}{2000}=\mathbf{0 . 0 2 9}$ or 2.9\%
9. Which of the following is FALSE?
a. The probability of rolling 3 in a die is $\frac{1}{6}$.
b. Flipping a coin thrice has 3 possible outcomes.
c. Answering a true/false type question has two possible outcomes.
d. The probability of getting a head when a coin is tossed once can be expressed as $\frac{\mathbf{1}}{\mathbf{2}}, 0.5$ or $50 \%$.

Answer: C Flipping a coin thrice has 8 possible outcomes.
10. A bottle contains white, blue, brown and red coated candies. The $P($ white $)=\frac{1}{10}, P($ blue $)=\frac{4}{15}, P($ brown $)=\frac{7}{30}$, and $P($ yellow $)=\frac{2}{5}$. How many yellow candies are in the bottle?
a. 7
b. 8
c. 12
d. 30

Answer: C $\frac{2}{5} \times \frac{6}{6}=\frac{12}{30}$
11. A glass jar contains 80 red, orange, yellow, and green plastic chips. If the probability of drawing at random a single ORANGE chip is $1 / 8$, what does this mean?
a. There are 8 orange chips in the glass jar.
b. There are 10 orange chips in the glass jar. *
c. There are more orange chips than the others.
d. There is only one orange plastic chip in the jar.

Answer: B $\frac{10}{80}=\frac{1}{8}$
12. In a restaurant, you have a choice of one main dish, one vegetable, and one drink. The main dish choices are pork and chicken meat. The vegetable choices are broccoli, cabbage and "pinakbet". The drink choices are " buko" juice, soft drinks or water. How many dinners are possible?
a. 8
b. 12
c. $\quad 18$
d. 24

Answer: C $2 \times 3 \times 3=18$
13. Xander got coins from his pocket which accidentally rolled on the floor. If there were 16 probable outcomes, how many coins fell on the floor?
a. 3
b. 4
c. 8
d. 16

Answer: B A coin has 2 possible outcomes (H, T) $2 \times 2 \times 2 \times 2=16$
14. In a family of three children, what is the probability that the middle child is a girl?
a. $\frac{1}{8}$
b. $\frac{1}{4}$
C. $\frac{1}{3}$
d. $\frac{1}{2}$

Answer: D Sample Space $=$ BBB, BBG, BGB, BGG, GBB, GBG, GGB, GGG, P $=\frac{4}{8}$ or $\frac{1}{2}$
15. Jun rolls two dice. The first die shows a 2. The second die rolls under his desk and he cannot see it. What is the probability that both dice show 2 ?
a. $\frac{1}{36}$
b. $\frac{1}{6}$
c. $\frac{9}{36}$
d. $\frac{1}{3}$

Answer: B Since we already know that one of the dice shows a 2 , the probability of getting a 2 in the other die is $\frac{1}{6}$
16. Mr. Martin asked his students to do an activity. Afterwards, his students noticed that the experimental probability of tossing heads is $54 \%$ while the mathematical/theoretical probability is $50 \%$. Being an attentive student, how would you explain this to your classmates?
a. The experimental probability is wrong.
b. We should toss the coin as high as possible to get a reliable result.
c. It is normal for experimental probabilities to differ from the theoretical probabilities but for a large number of trials, the two will be very close.
d. It is abnormal for the experimental probabilities to differ from the mathematical/theoretical probabilities because the results must be the same.
Answer: C Usually, the results of an experimental probability and a theoretical probability differ, but for a large number of trials, they will be very close.
17. You decided to order a pizza but you have to choose the type of crust and the toppings. If there are only 8 possible combinations of ordering a pizza, from which of the following should you choose from?
a. Crust: thin or deep dish

Topping: cheese or pepperoni
b. Crust: thin or deep dish Topping: cheese, bacon or pepperoni
c. Crust: thin or deep dish

Topping: cheese, bacon, sausage and pepperoni
d. Crust: thin or deep dish

Topping: cheese, bacon, sausage, pepperoni and hotdog
Answer: C 2(crust) x 4 (toppings) = 8 possible combinations
18. You choose a number at random from three to seven. What do you conclude on the probability of each event?
a. The event of choosing even numbers is always equal to the event of choosing odd numbers.
b. The events even and odd are equally likely to occur because 3 to 7 are composed of odd and even numbers.
c. The events even and odd are not equally likely to occur because there are three odd numbers and only two even numbers from 3 to 7 .
d. The events even and odd are equally likely to occur because the probability of choosing even numbers is always equal to the probability of choosing odd numbers.
Answer: C There are 3 odd numbers $(3,5,7)$ and 2 even numbers $(4,6)$ from 3 to 7 , therefore, the events even and odd are not equally likely to occur.
19. You tossed a coin twenty times and you got tails each time. You tossed again and still a tail turned up. Do you think the coin is FAIR? Why?
a. I think the coin is not fair because it favored the heads.
b. I think the coin is fair because both faces of the coin have equal chances of turning up.
c. I think the coin is not fair because for twenty experiments, it is expected to turn up tails, too but it didn't. *
d. I think the coin is fair because the probability of turning tails up is $\frac{3}{4}$ while that of heads is only $\frac{1}{4}$.

Answer: C The coin is not fair because for twenty experiments, it should have turned up tails, too. For a fair coin, the $P(H)=P(T)$.
20. Which of the following is NEVER true?
a. To find the total number of outcomes, multiply the ways of doing the different events.
b. A tree diagram can be used to figure out all the possible outcomes in a sample space.
c. The Fundamental Counting Principle is the easiest way to count the the number of possible outcomes in a sample space.
d. Experimental probability deals with what should happen after testing while Theoretical probability deals with what happened after testing.
Answer: D Theoretical probability deals with what should happen after testing while Experimental probability deals with what happened after testing.

## SUMMARY/SYNTHESIS/GENERALIZATION

This module was about the basic concepts of probability and the fundamental counting principles. In this module, the students were encouraged to discover by themselves the operational definition of concepts, the difference between experimental probability and theoretical probability a and the importance of the fundamental counting principle. Their knowledge and computational skills gained in this module help them solve real life problems involving probabilities of events which would lead them to make better decisions in life and to perform practical tasks to the best of what they can.

## GLOSSARY OF TERMS USED IN THIS MODULE:

Certain refers to an event which has to happen.
Chance refers to the" likelihood" that something will happen.
Dependent Events are events in which one event affects the outcome of another.
Die is a small cube whose faces are marked with dots of $1,2,3,4,5$ and 6 in each of the 6 faces.
Equally likely events are events that have the same probability of occurring.
Event refers to a result satisfying some given conditions. It is any set of one or more outcomes.
Experiment refers to a chance process that leads to well-defined results called outcomes.
Experimental Probability is the probability of an outcome of an event based on an experiment. The more experiments we do, the closer the probabilities get to the theoretical probability.

Fundamental Counting Principle states that we can figure out the total number of ways different events can occur by multiplying the number of events or each task can happen. If you have $x$ ways of doing event $1, y$ ways of doing event 2 , and $z$ ways of doing event 3 , then you can find the total number of outcomes by multiplying: $(x)(y)(z)$.

Icosahedron is a three-dimensional geometric figure formed of 20 sides or faces.
Impossible refers to an event which will never happen.
Independent Events are two events which do not affect each other.
Octahedron is a three-dimensional geometric figure formed of eight faces.
Outcome is the result of a single trial of a probability experiment.
Possibilities are the conditions or qualities of something to happen.
Probability is a branch of Mathematics that seeks to study uncertainty in a systematic way. It is a measure or estimate of the likelihood of an event happening.

Probability of an Event is a number from 0 to 1 which tells how likely the event is to happen.

$$
\begin{gathered}
P(E)=\frac{\text { Number of favorable outcomes }}{\text { Number of possible equally likely outcomes }} \\
P(E)=\frac{\text { Frequency of occurrences favorable to that event }}{\text { Total frequency }}
\end{gathered}
$$

## Probability Rules:

1. The probability of any event is a number (either a fraction, a decimal or a percent) between and including 0 and 1.
2. If an event is never to happen, then its probability is 0 .
3. If an event is sure to happen, then the probability is 1 .
4. The sum of the probabilities of all the outcomes in the sample space is 1 .

Sample point refers to just one of the possible outcomes.
Sample Space refers to the set of all possible outcomes of an experiment.

Theoretical Probability is the probability that is calculated using math formulas. This is the probability based on math theory.
Tree Diagram is a device consisting of line segments emanating from a starting point and from the outcome point. It is used to determine all possible outcomes of a probability experiment.

Uncertain refers to something which is likely to change, and therefore not reliable or stable.
Unlikely refers to something which is not likely to occur, not likely to be true or be believed.

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http://intmath.com/counting-probability/2-basic-principles-counting.php
This site provides the picture for Activity 2, notes/tips on the basic counting principles.
http://whatis.techtarget.com/definition/probability
This site provides the definition of probability and other concepts.
www.algebra-clss.com/probability-problems.html
This site provides notes, pictures and examples of independent/dependent events.
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