# **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	
2. Probability of an Event: Experimental	
Probability and Theoretical Probability	
3. Organizing Outcomes of an Event and	
the Fundamental Counting Principles	
4. Problems Involving Probabilities of	
Events	



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

# **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. A group 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**

ТҮРЕ	KNOWLEDGE	PROCESS/SKILLS	UNDERSTANDING	PERFORMANCE
Pre-Assessment Diagnostic	Pre–Test (1-3, 6-8)	Pre–Test (4-5, 10, 12, 14, 17)	Pre–Test (9, 11, 13, 15, 18)	Pre–Test (16, 19, 20)
		Situationa		

Formative	Quiz What's my Probability?	
Assessment	Oral questioning	
	Compare and Contrast	
	Quiz (Activity 16)	
	Unit Test	
	Post-test	
		Let's take an activity together.
Summative		An Individual Report
Assessment		Let's help them enjoy their vacation in Bora!
		GRASPS Let's convince the community!
		RubricforCulminating Performance or Product
Self- Assessment	Testing for Understanding (Problem Solving)	Reflective Journal



# Assessment Matrix (Summative Test)

Levels of Assessment	What will I assess?	How will I assess?	How Will I Score?
Knowledge 15%	Defines experiment, outcomes, sample space, and event Explains and interprets the probability of an event Differentiates between an experimental	Paper and Pencil Test (Summative Test) Part I (1 – 10) Post –Assessment	1 point for every correct response
Process/Skills 25%	probability and a theoretical probability 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	(1, 2, 4) 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 (Summative Test) Part II (1 -5) Summative Test (9 – 15) Part IV (1 -3) Post – Assessment (9 – 15)	1 point for every correct response

- (598)

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

# C. Planning for Teaching-Learning Introduction

This 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?



# Answer: C Three out of the 4 outcomes have three heads.

- 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%

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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 7.3%	

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 -  $\frac{1}{6} = \frac{5}{6}$ 

- 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. 0.122 c. 0.41 d. 0.82
   Answer: A 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%.

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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 PR which is  $\frac{2}{7}$  what is the correct table for probability?

2	Outcome	R	PR	С	
a.	Probability	$\frac{1}{7}$	$\frac{4}{7}$	<u>2</u> 7	0.
b.	Outcome	R	PR	С	d.
	Probability	$\frac{1}{7}$	$\frac{2}{7}$	$\frac{4}{7}$	

Outcome	R	PR	С
Probability	$\frac{4}{7}$	<u>2</u> 7	$\frac{1}{7}$
Outcome	R	PR	С
Probability	$\frac{4}{7}$	$\frac{1}{7}$	$\frac{2}{7}$

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

R = 
$$2\frac{2}{7}$$
  
2(PR) =  $2\frac{2}{7}$   
R =  $\frac{4}{7}$ ;  $\frac{4}{7} + \frac{2}{7} + \frac{1}{7} = \frac{7}{7}$  or 1

- 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 x 2 x 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	1	h	1	C	9	Ь	1
а.	36	υ.	6	0.	36	u.	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 $\frac{1}{c}$ .

- 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
- Crust: thin or deep dish Topping: cheese, bacon, sausage, pepperoni or hotdog
   Answer: B 2(crust) x 3 (toppings) = 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?

а	Team	А	В	С	D
и.	Probability	25%	30%	15%	30%
	of winning				
h	Team	А	В	С	D
D.	Probability of winning	25%	20%	20%	35%
~	Team	А	В	С	D
C.	Probability	25%	15%	15%	45%
	of winning				
1					
Ч	Team	A	В	С	D
u.	Probability	25%	15%	10%	50%

of winning

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.

#### **Answer Key**

#### Activity 1

- 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.

# Teacher's Note and Reminders



#### **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.

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- 1. Are those words familiar to you?
- What particular topic comes to your mind when you see the words 2. in the illustration?
- What qualitative terms can be used to express probable 3. occurrences of events in a man's life?
- 4 How else can the possible occurrence or likelihood of an event be expressed?
- Based on the illustration, how do you define probability? 5.

You just tried defining **probability** which is the possibility of occurrences of events in a man's life, which can be expressed as a fraction, a decimal or a percent. As you move on to the next activity, your prior knowledge on the basic concepts of probability and the fundamental counting principles will be elicited.

## ACILITY 2 BUDGET...... MATTERSI

Use the illustration below to answer the following questions correctly.



- How many shirts are there? 1.
- How many pairs of short pants are there?\_ 2.
- How many pairs of long pants are there? 3.
- If you will attend a party, how many choices are possible? 4.
- If you are going to attend the mass with your family, how many possible outfits 5 could you choose from? How did you arrive at your answer?

#### **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							
Acti	Activity 3							
	Sides of 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:								

- 2. 1, 2, 3, 4, 5, 6
- 5. By counting the outcomes listed in the table
- 3. 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.



- How else can you find the number of possible outcomes? 1.
- 2. Suppose you want to wear all those shirts and pairs of pants during vacation, how many combinations are possible?
- Did you find difficulty in choosing which to wear? Why? 3.
- Aside from comfort, what do you consider when you choose an 4. outfit?

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

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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 a Die	1	2	3	4	5	6
1						
2			3, 2			6, 2
3						
4						
5						
6					5, 6	



If you roll a die once, how many outcomes are possible? 1.

What are those outcomes? 2.

- How do we call those outcomes? 3.
- 4. Rolling two dice simultaneously, how many outcomes are possible?
- 5 How did you find the answer?

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 Life has a lot of uncertainties. Oftentimes, our decisions in life are done under does knowledge of finding the likelihood of an event help you in your daily life? 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 Before they perform the next activities, let the students read and understand which will involve you as a game analyst invited by the barangay officials to inform or some notes on the concepts of probability. Should they need your help, educate the community folks to be mindful of their chances of losing and winning in the please explain and let them perform experiments on flipping a coin, rolling a local carnivals so that they will not end up wasting too much of their time and money. die, rolling a coin and a die simultaneously and drawing a card from a deck of 52 cards. You will start by doing the next activities. **Teacher's Note and Reminders** Whet to Process 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) DOMT Rolling a die 1/2/3/4/5/6 FORGETT Sample space is the set of all the possible outcomes or sample points. Sample point is just one of the possible outcomes. 610

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	
I	Flipping two coins	HH, HT, TH, TT	HH	
I	Rolling a die	1, 2, 3, 4, 5, 6	5	
	Rolling a coin and a die simultaneously	H1, H2, H3, H4, H5, H6 T1, T2, T3, T4, T5, T6	Т3	
	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)
- Getting an "odd number" (1, 3, or 5) when rolling a die C.

# ACTIVITY 4 YOU AND I AND MEANS TO BE

#### (Group Activity)

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

- 1.
- 5
- 2. Tail 3. 50%
- 4.
- Right, Wrong KING of Spades 5.
- 6. Rolling an odd number (1, 3 or 5)
- Flipping a 10-peso coin five times 7.
- Getting a head in a single toss of coin 8.
- 9. The chance that something will happen
- The result of a single trial of an experiment 10.
- 11. Tossing a coin and rolling a die simultaneously
- Set of all possible outcomes of an experiment 12
- 13. Guessing the number of marbles in a container
- Choosing an ACE from a deck of standard cards 14.
- 15. A chance process which leads to well -defined results

If your group got a score of 12 and above, you and I are meant to move on.



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	
N		

# **Teacher's Note and Reminders**

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#### 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	Н	Н	Т	Т	Н	Н	Т	Т	Т
Coin 2	Т	Т	Т	Н	Т	Н	Т	Н	Т
Coin 3	Т	Н	Т	Н	Т	Н	Н	Т	Т
Outcome	HTT	HTH							
Is it {HHH}? YES or NO	NO	NO							

In order to find all the \_\_\_\_\_ least 30 times.

In order to find all the \_\_\_\_\_, they have to continue flipping the coins for at

Were you able to complete the paragraph with the correct words?
 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?
- 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?

Experimental Probability is computed after performing an experiment on the actual situation. The actual result of the experiment is used to determine the probability of an event.

Let the students recall odd numbers, even numbers and the divisibility rules before asking them to answer Activity 6.				
Answer Key Activity 6 1. a 4. e	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. You 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}			
2. f 5. b 3. e 6. b	Column A Column 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	The probability of having:       a. $\frac{1}{12}$ d. $\frac{4}{12}$ or $\frac{1}{3}$ 1. a 10      2. a 13       b. $\frac{2}{12}$ or $\frac{1}{6}$ e. $\frac{6}{12}$ or $\frac{1}{12}$ 3. odd numbers       b. $\frac{2}{12}$ or $\frac{1}{6}$ e. $\frac{6}{12}$ or $\frac{1}{12}$			
Teacher's Note and Reminders	4.even numbersc. $\frac{3}{12}$ or $\frac{1}{4}$ f. $\frac{0}{12}$ or 05.an odd number divisible by 312126.an even number divisible by 3			
	<ol> <li>How many possible outcomes are there?</li> <li>To have even numbers, how many favorable outcomes are there?</li> <li>Considering your answers, how do you compute for the probability of an event?</li> <li>What formula can be used?</li> <li>This activity uses Theoretical Probability. How do you define Theoretical Probability?</li> </ol>			
TTUDI TIEIII IIIIII	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			
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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?	(Group Activity)					
<ol> <li>What are those typhoons?</li> <li>Of the typhoons that hit the country, how many hit the country in a month?</li> </ol>	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.					
<ol> <li>Solve for the probability of typhoene bitting the country menthly</li> </ol>	The report should contain the following: 1. Representation of collected data.					
4. Solve for the probability of typhoons mitting the country monthly.	3. Explanation on what type of probabilities is generated in the task.					
5. Explain what type of probabilities is used in the task.	Rubric for the Written Group Report					
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 gradee	Representation         Is complete,         Is complete and         Is complete but         Is incomplete           of Data and         organized         organized         disorganized         and           Explanation         and clear         disorganized         disorganized					
	Has correct & Has correct Has illustration Has no					
Answer Key	Process/         appropriate         inustration of         of         inustration           Computation         illustration or         solution with         solution but has         or solution           solution         minor errorr         errors         errors         errors					
Activity 8 1. $\frac{2}{7}$ 6. $\frac{5}{25}$ or $\frac{1}{5}$						
2. $\frac{7}{12}$ 7. $\frac{20}{45}$ or $\frac{4}{9}$	Solve the following carefully, then write the correct answer on the space provided before each number.					
3. $\frac{-4}{12}$ or $\frac{-1}{3}$ 8. $\frac{-1}{4}$	1. Ear Darenz is asked to choose a day from a week. What is the probability					
4. $\frac{9}{11}$ 9. $\frac{4}{16}$ or $\frac{1}{4}$	<ul> <li> choosing a day which starts with S?</li> <li> 2. Choosing a month from a year, what is the probability of selecting a month with 31 days?</li> </ul>					
5. $\frac{4}{6}$ or $\frac{2}{3}$ 10. $\frac{4}{52}$ or $\frac{1}{13}$	<ul> <li>3. If a letter is chosen at random from the word PERSEVERANCE, what is the probability that the letter chosen is E?</li> <li>4. If one letter is chosen at random from the word TRUSTWORTHY, what is</li> </ul>					
	<ul> <li>the probability that the letter chosen is a consonant?</li> <li>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?</li> </ul>					
	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 <b>orange</b> ball?					
	516					

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.



I have 12 different choices of food and drink.



7. Of the 45 students in a class, 25 are boys. If a student is selected at

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

# Teacher's Note and Reminders



- a. 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).

# ACTIVITY 10 AN INDIVIDUAL REPORT

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

T°NOL TreDeOJ

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	4	3	2		
Representation of Data and Explanation	Is complete, organized and clear	ls complete and organized	Is complete but disorganized	Is incomplete and disorganized	
Process/ Computation	Has correct and appropriate illustration or solution	Has correct illustration or solution with minor errors	Has illustration or solution with major errors	Has no illustration or solution	
Great job! I'm certain you are ready to move on					



To add excitement to Activity 12, let the students play "Snake and Ladder" for five minutes before they answer the activity.	ACTIVITY 12			
Answer Key	Play "Snake and Ladder" with a friend then answer the questions below.			
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 pext meeting.	<ul> <li>Roll the die once.</li> <li>a. How many possible outcomes are there?</li> <li>b. What are those outcomes?</li> <li>c. If you want to move ahead 4 spaces on the board, then what is the probability of rolling a 4?</li> <li>d. If your friend wants to move ahead 8 spaces on the board, then what is the probability of rolling an 8?</li> <li>Why?</li> <li>2. Roll the die twice.</li> <li>a. How many possible outcomes are there?</li> <li>b. What is the probability of having "doubles"?</li> <li>c. What is the probability of getting a set of outcomes whose sum is greater than 10?</li> </ul>			
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, $P = \frac{20}{20} = 1$ .	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.			
•	520			

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	Analyze carefully the problem then answer what is asked for.
Activity 14 1. 4 2. 5 3. 3 4. Tree diagram 5. 60 6. Expression: bcm 7. Solution: 4 x 5 x 3 = 60 I could choose from 60 available cell phones.	One of your dreams is to have a new cell phone. You went to a cell phone deal and he gave you the following options. How many available cell phones could you choo from? Brand: L O V E
Teacher's Note and Reminders	Colors: white (W), red (R), yellow (Y), gray (G), blue (B) Models: X, K, P 1. How many brands are there? 2. How many colors are available? 3. How many models are given? 4. Show the tree diagram which can be used to find the total number of choices.
DON"T FDEIETR	<ul> <li>5. Based on the illustration, how many available cell phones could you choose from?</li> <li>6. By doing simple calculation, how will you get the total number of choices?</li> <li>Write the correct expression, then solve for the total choices.</li> <li>Expression Solution</li> </ul>
6	<u></u> 321

Explain carefully how the students will answer Activity 15. The said activity may be given as a quiz.	
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   Teacher's Note and Reminders	Activity is       Image: Match the following with each letter on the probability line. Number 1 is done for you         a       b       c       d       e         0       0.25       0.5       0.75       1         (impossible)       (poor chance)       (fair chance)       (good chance)       (certain)         e       1.       There are 7 days in a week.
۲۵۵۵ ۲۹۵۵ ۲۹۵۵	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.
	622))

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

#### Whatto Transfer score. 0 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 **Teacher's Note and Reminders** 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?" 0 ACIVELY 16 LEFS HELP THEM ENDOY THER VACATION IN BORA 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 2 4 3 1 Neat. readable. correctly Neat, readable, labelled correctly diagram and Readable labelled Visual Appeal has a very and correctly Messy diagram and creative labelled has a creative design that design enhances the diagram Dong Detailed but Detailed but Computation of Correct and FORGETS with minor with major Not detailed Charge detailed errors errors Based Based on on sound Based on correct mathematical Based on Proposal mathematical equation and reasoning Guessing computation computation without computation 623

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	Situation: The <i>barangay</i> 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 <i>barangay</i> 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 <i>barangay</i> 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.
	<b>Goal</b> : 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 <i>barangay</i> officials.
	Audience: The target audience are the <i>barangay</i> 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.
T"""UU FUIIER T	Product/Performance: You need to create a presentation for the monthly <i>barangay</i> /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.
6	24

You may make your own rubric for Acitivity 17.	PERFORMANCE TASK RUBRIC				
	CRITERIA	OUTSTANDING 4	SATISFACTORY 3	DEVELOPING 2	BEGINNING 1
Teacher's Note and Reminders	USE OF MATHEMATICAL CONCEPTS	It shows in-depth understanding of the required mathematical knowledge in probability. The solution completely addresses all mathematical components presented in the task.	It shows understanding of required mathematical knowledge. The solution addresses most of the mathematical components presented in the task.	It shows some understanding of the required mathematical knowledge. The solution addresses some of the mathematical components presented in the task.	It shows no understanding of the problem, perhaps only re-copying the given data. The solution addresses none of the mathematical components required to solve the task.
	ACCURACY	100% of the steps and solutions have no mathematical errors.	Almost all (85 - 89%) of the steps and solutions have no mathematical errors.	Most (75-84%) of the steps and solutions have no mathematical errors.	More than 75% of the steps and solutions have mathematical errors.
	ORGANIZATION	It uses an appropriate and complete strategy for solving the problem. Uses clear and effective diagrams and/or tables.	It uses a complete strategy for solving the problem. Uses creative diagrams and/or tables.	It uses an inappropriate strategy or application of strategy is unclear. There is limited use or misuse of diagrams and/or tables.	It has no particular strategy for solving the problem. It does not show use of diagrams nor tables.
	DELIVERY	There is a clear and effective explanation of the solution. All steps are included so the audience does not have to infer how the task was completed. Mathematical representation is actively used as a means of communicating ideas, and precise and appropriate mathematical terminology.	There is a clear explanation and appropriate use of accurate mathematical representation. There is effective use of mathematical terminology.	There is an incomplete explanation; it is not clearly represented. There is some use of appropriate mathematical representation and terminology to the task.	There is no explanation of the solution. The explanation cannot be understood, or is unrelated to the task. There is no use or inappropriate use of mathematical representation and terminology to the task.

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.	
Teacher's Note and Reminders	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.
	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 took was to apply what you have learned in this medule is real.
	life 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.
CO <sup>C</sup> CER	
T.	
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# **Summative Test**

I. Matching Type

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

	Column A	Colur	nn B
1.	Yes, No	a.	0
2.	Tossing a fair coin thrice	b.	1
3.	Events that do not affect each other	C.	0.25
4.	Chance that something will happen	d.	50%
5.	Set of all outcomes of an experiment	e.	dependent events
6.	The result of a single trial of an experiment	f.	event
7.	Probability of an event that is sure to happen	g.	experiment
8.	Guessing the number of marbles in a container	ĥ.	independent events
9.	Choosing the KING of hearts from a deck of cards	i.	outcome
10.	Probability of an event which will never happen	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. <u>Probability</u> is only our guide. It does not tell us exactly what will occur.
- 2. When Ana flips a coin, the possible outcomes are <u>1, 2, 3, 4, 5, 6</u>.
- 3. The choices made in answering a True-or-False type of quiz are <u>dependent</u>.
- 4. Danielle rolls a die. One of the possible outcomes in the sample space is <u>7</u>.
- 5. A <u>tree diagram</u> can be used to find all the possible outcomes of an event.

- III. Answer the following correctly
  - 1. Five coins are tossed. How many outcomes are possible?
  - 2. If a die is rolled once, then what is the probability of getting a number less than 7?
  - 3. A card is drawn from an ordinary deck. What is the probability of getting an ACE?
  - 4. What is the probability of getting the 7 of diamonds from an ordinary deck of cards?
  - 5. 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. H, T	2. <u>6</u> 6
	3. h	8. g	3. independent	$3.\frac{4}{52} \text{ or } \frac{1}{13}$
	4. I	9. f	4. 1/2/3/4/5/6	4. <u>1</u> 52
	5 ј	10. a	5. True	5. <u>3</u>
	- ,			8

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## IV.1.10-peso coin

	1	2	3	4	5	6	7	8
н	H1	H2	H3	H4	H5	H6	H7	H8
Т	T1	T2	Т3	T4	T5	Т6	T7	Т8

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 M -- CM (c) B -- CB W -- CW buko pie (p) M -- PM B -- PB W -- PW

- 4. Malunggay Ice Cream M -- IM (I) B -- IB W -- IW
  - 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?

а	<u> </u>	b _	<u>1</u> C	3	D	
	8		2	8	2.	

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. 0.56 d. 0.72 Answer: b. <u>14</u> 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

45% 71% d.

```
a. 27% b. 29%
Answer: B <u>143</u> = 0.286 or 29%
```

Suppose you toss a fair coin four times, how many possible outcomes are there? 6.

b. 8 16 d. 32 a. 4 C. 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.

1

A die is rolled. What is the probability of rolling a number that is greater than 6? 7.

a. 
$$\frac{0}{6}$$
 or 0 b.  $\frac{1}{6}$  c.  $\frac{5}{6}$  d.  $\frac{6}{6}$  or

Answer: A, A die has 6 faces only, therefore, it has no side which is greater than 6.

In a 2000-ticket draw for an educational prize, your name was written on 58 tickets. What is the probability that you will get 8. the prize?

a. 2.9% \* b. 5.8% of Answer: A <u>58</u> = 0.029 or 2.9% 29% C. d. 58%

9. Which of the following is FALSE?

The probability of rolling 3 in a die is  $\frac{1}{6}$ . a.

- Flipping a coin thrice has 3 possible outcomes. b.
- C. Answering a true/false type question has two possible outcomes.
- The probability of getting a head when a coin is tossed once can be expressed as  $\frac{1}{2}$ , 0.5 or 50%. d. 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?

b. 8 12 d. 30 a. 7 C. 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. 18 d. 24 Answer: C 2 x 3 x 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 x 2 x 2 x 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.

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

# **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.

# REFERENCES AND WEBSITE LINKS USED IN THIS LESSON:

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# WEBSITE LINKS

Copyright 2011MathsIsFun.com www.mathsisfun.com/definitions/probability.html These sites provide the picture of the probability line and definitions of the basic concepts.

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.

www.algebra-class.com/theoretical-probability.html

This site provides notes, pictures and examples of Experimental Probability and Theoretical Probability. http://www.onlinemathlearning.com/theoretical-probability.html This site provides a video lesson on experimental and theoretical probability.

www. Learningwave.com/chapters/probability/dependent\_independent.html This site provides examples of dependent and independent events

http://www.mathworksheets4kids.com

This site provides exercises/ worksheets for the students to answer.

http://www.algebra-class.com/fundamental-counting-principle.html This site provides the formula and examples of Fundamental Counting Principle.

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www.virtualnerd.com/algebra-2/probability-statistics/fundamental-counting-principle-definition.php This site provides a video lesson on Fundamental Counting Principle.

http://www.aaaknow.com/sta-basic-cntg.htm

This site provides notes on basic counting principles and practice exercises on finding the total possible outcomes.

http:// mathgoodies.com/lessons/vol16/intro-probability.html This site provides examples and items for the Pre/Post Assessment.

http:// www.mathwire.com/games/datagames.html This site provides enrichment games on Probability. This site provides the formula and examples of Fundamental Counting Principle.

www.virtualnerd.com/algebra-2/probability-statistics/fundamental-counting-principle-definition.php This site provides a video lesson on Fundamental Counting Principle.