Republic of the Philippines
Department of Education
NATIONAL CAPITAL REGION
Misamis Street, Bago-Bantay, Quezon City

UNIFIED SUPPLEMENTARY LEARNING MATERIALS
(USLeM)

MATHEMATICS 6

Quarter 4 Week 9

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LESSON 1: SOLVING ROUTINE AND NON-ROUTINE PROBLEMS INVOLVING EXPERIMENTAL AND THEORETICAL PROBABILITY.

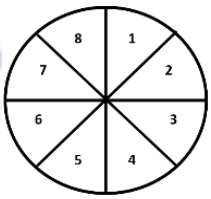
EXPECTATIONS

Specifically, this module will help you to solve routine and non-routine problems involving experimental and theoretical probability. (M6SP-IVj-24)

PRE-TEST

DIRECTIONS: Read the following problems carefully. Choose the letter of your answer.

1. Mr. Abad has a bag of tennis balls. There are 3 green balls, 2 white balls, and 1 yellow ball. He is going to pick a tennis ball at random. What is the probability of picking a green tennis ball?
   A. $\frac{1}{2}$ B. $\frac{1}{3}$ C. $\frac{1}{4}$ D. $\frac{1}{5}$
2. Alex tossed a coin 30 times. If he was able to record 25 tails, what is the probability of landing on heads?
   A. $\frac{1}{2}$ B. $\frac{1}{3}$ C. $\frac{1}{4}$ D. $\frac{1}{6}$
3. A medical study tests a new medicine on 5 000 participants. It is effective for 4 500 participants. Find the experimental probability that the medicine is effective.
   A. 75% B. 80% C. 85% D. 90%
4. Consider the spinner. What is the probability of getting a number less than 5?
   A. $\frac{1}{2}$ B. $\frac{1}{3}$ C. $\frac{1}{4}$ D. $\frac{1}{5}$



5. In a raffle, there are 20 guests who has an equal chance to win the prize. Marian wins only if her card is drawn. What is her chance of winning the prize?
   A. $\frac{1}{10}$ B. $\frac{1}{15}$ C. $\frac{1}{20}$ D. $\frac{1}{25}$

LOOKING BACK

DIRECTIONS: Determine the probability of the following situations. Put a check mark on the column that corresponds to your answer.

	0	50%	100%
1. You are more than 10 years old.			
2. I will get tail if I toss a coin.			
3. You will obtain 8 when rolling a die.			
4. Tossing an even number or tossing an odd number using a cube numbered 1-6.			
5. Whales are mammals.			

BRIEF INTRODUCTION

- A sample space is a list of all the possible outcomes of an activity or experiments.
- When we use a formula to find the probability of an event, we are finding the theoretical probability.
- Theoretical Probability of an event is the number of ways that an event can occur divided by the total number of outcomes.

  Theoretical Probability (event) = $\frac{number\ of\ favorable\ outcomes}{number\ of\ possible\ outcomes}$

- Experimental Probability of an event is the ratio of the number of times an event occurs to the total number of trials or times the activity is performed.
- When we find the probability of an event by doing an experiment, we are finding the experimental probability.

  Experimental Probability (event) = $\frac{number\ of\ times\ favorable\ outcomes}{number\ of\ trials\ in\ the\ experiments}$

- Experimental probability is used in most real-life situations when the probabilities cannot be determined theoretically.

Consider the following situations:

Example 1

A bag contains 12 orange marbles, 8 green marbles, 4 blue marbles.
Find the theoretical and experimental probabilities of getting a green marble.

UNDERSTAND.

a. What is asked?
   The theoretical and experimental probabilities of getting a green marble.
b. What are the given facts?
   12 orange marbles, 8 green marbles, 4 blue marbles

PLAN. What strategy can you use to solve the problem?
In solving the problem, we will use theoretical probability method and experimental probability method.

SOLVE.

Method 1: Theoretical Probability

There are 8 green marbles. Therefore, the number of favorable outcomes is 8.
There are a total of 24 marbles. Therefore, the number of possible outcomes is 24.
Using the formula, we have

Theoretical Probability (event) = $\frac{\textbf{number of favorable outcomes}}{\textbf{number of possible outcomes}} = \frac{\mathbf{8}}{\mathbf{24}}$

P (green marble) = $\frac{\mathbf{8}}{\mathbf{24}}$

P (green marble) = $\frac{\mathbf{1}}{\mathbf{3}}$

Therefore, the theoretical probability of getting a green marble is $\frac{\mathbf{1}}{\mathbf{3}}$.

Method 2: Experimental Probability

Solution:

1. Take a marble from the bag.
2. Record the color and return the marble in the bag.
3. Repeat the process (at least 10 times).
4. Count the number of times a green marble was picked (suppose it is 4)

Using the formula, we have

Experimental Probability (event) = $\frac{\textbf{number of times favorable outcomes}}{\textbf{number of trials in the experiments}}$

P (green marble) = $\frac{\mathbf{4}}{\mathbf{10}}$

P (green marble) = $\frac{\mathbf{2}}{\mathbf{5}}$

Theoretical probability is what we expect to happen, where experimental probability is what actually happens when we try it out. As more trials conducted, the experimental probability generally gets closer to the theoretical probability.

CHECK.

To check if our answers are correct, we may use the formula of Theoretical Probability and the formula of Experimental Probability. Thus, our answers are correct.

Example 2

A certain shopping mall offers its employees a variety of uniform styles from which they can choose. The jackets come in both red and blue. The blouses come in red, white and blue.

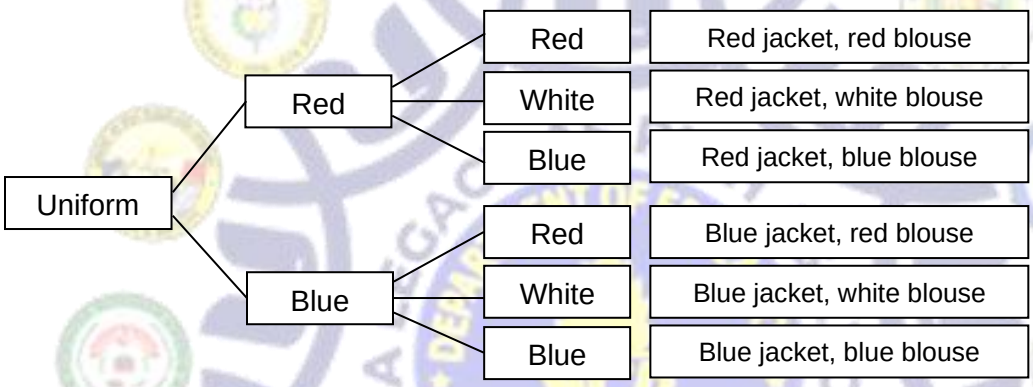
a. How many uniforms are possible?
b. What is the probability of wearing a uniform with a red jacket and blue blouse?
c. What is the probability of wearing a uniform with red blouse?

UNDERSTAND.

a. What are being asked in the problem?
   The possible number of uniforms.
   The probability of wearing a uniform with a red jacket and blue blouse.
   The probability of wearing a uniform with red blouse.

PLAN. What strategy can you use to solve the problem?
In solving the problem, we will use tree diagram.

SOLVE.
Let's make a tree diagram to show all the possible uniforms.



a. How many uniforms are possible?
   There are 6 possible uniforms.

b. What is the probability of wearing a uniform with a red jacket and a blue blouse?
   There are 6 possible uniforms, and 1 uniform with red jacket and blue blouse.

   Probability (red jacket and blue blouse) = $\frac{\textbf{number of favorable outcomes}}{\textbf{number of possible outcomes}} = \frac{\mathbf{1}}{\mathbf{6}}$

c. What is the probability of wearing a uniform with red blouse?
   There are 2 possible ways to wear a uniform with red blouse and any of the two jackets. Thus,

   Probability (uniform with red blouse) = $\frac{\textbf{number of favorable outcomes}}{\textbf{number of possible outcomes}} = \frac{\mathbf{2}}{\mathbf{6}} = \frac{\mathbf{1}}{\mathbf{3}}$

CHECK. This is one way to check your answer.
Go back to the solution. Check if the given are properly placed. Also check the flow of the distribution of jackets and blouses.

Example 3 Experimental Probability

You asked your friends Abby, Benny and Cassey to toss a fair coin 25 times each in a row and the outcome of this experiment is given below:

Coin tossed by:	No. of Heads	No. of Tails
Abby	10	15
Benny	12	13
Cassey	14	11

Calculate the probability of occurrence of heads and tails.

UNDERSTAND.

a. What is asked?
   The probability of occurrence of heads and tails.
b. What are the given facts?
   No. of heads: 10, 12, 14 No. of tails: 15, 13, 11

PLAN. What strategy can you use to solve the problem?
In solving the problem, we will use experimental probability method.

SOLVE.

Experimental Probability of occurrence of heads = $\frac{\textbf{number of times head occurs}}{\textbf{number of times coin is tossed}}$

Experimental Probability of occurrence of tails = $\frac{\textbf{number of times tail occurs}}{\textbf{number of times coin is tossed}}$

Coin Tossed by:	No. of Heads	No. of Tails	Experimental Probability for the occurrence of Head	Experimental Probability for the occurrence of Tail
Abby	10	15	$\frac{10}{25} = \frac{2}{5}$ = 0.4 = 40%	$\frac{15}{25} = \frac{3}{5}$ = 0.6 = 60%
Benny	12	13	$\frac{12}{25}$ = 0.48 = 48%	$\frac{13}{25}$ = 0.52 = 52%
Cassey	14	11	$\frac{14}{25}$ = 0.56 = 56%	$\frac{11}{25}$ = 0.44 = 44%

We observe that the probability of the occurrence of heads or tails ranges from 40%-60%. Try doing the experiment and toss it more than 25 times. What did you observe?

If the number of tosses of the coin increases, then the probability of occurrence of heads or tails also approaches to 0.5 or 50%.

CHECK.

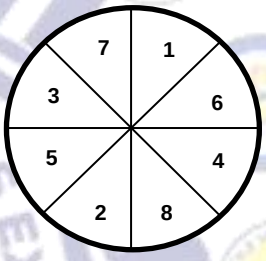
Go back to the solution. Is the answer reasonable? This is one way to check if the answer is correct.

ACTIVITIES

ACTIVITY 1: PRACTICE

DIRECTIONS: Use the given situation below. Read, analyze and solve each given question.

A spinner numbered 1 to 8 is spun.



What is the probability of spinning:

a. an odd number? _____

b. a factor of 9? _____

c. a multiple of 2? _____

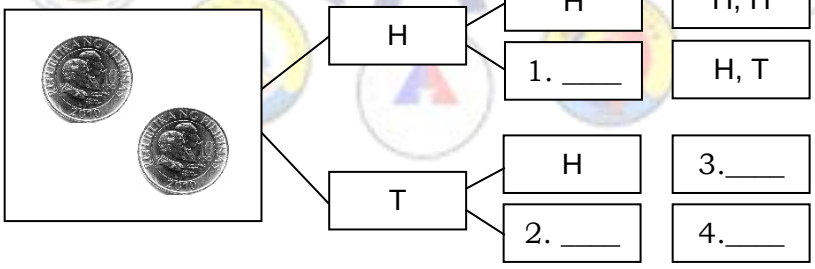
d. a composite number? _____

e. a smallest even number? _____

ACTIVITY 2: KEEP PRACTICING

DIRECTIONS: Complete the tree diagram below.

Two coins are tossed at the same time.



ACTIVITY 3: TEST YOURSELF

DIRECTIONS: Consider the given problem. Then answer the following questions by completing the table.

A set of cards have letters written on it. One card is chosen at random and then returned.

P	R	O	B	A	B	I	L	I	T	Y

What is the probability that it will show each of the following?	
1. The letter B	
2. A vowel	
3. The letter I	
4. A consonant	
5. The letter O	

REMEMBER

- Theoretical Probability of an event is the number of ways that an event can occur divided by the total number of outcomes.

  Theoretical Probability (event) = $\frac{number\ of\ favorable\ outcomes}{number\ of\ possible\ outcomes}$

- Experimental Probability of an event is the ratio of the number of times an event occurs to the total number of trials or times the activity is performed.

  Experimental Probability (event) = $\frac{number\ of\ times\ favorable\ outcomes}{number\ of\ trials\ in\ the\ experiments}$

CHECKING YOUR UNDERSTANDING

1. What is a sample space?

2. What is theoretical probability?

3. When is experimental probability used?

POST-TEST

DIRECTIONS: Read the following problems carefully. Choose the letter that corresponds to the correct answer.

1. A bowl contains 6 blue balls, 8 red balls, 6 white balls, and 10 yellow balls. What is the probability of picking a yellow ball?

   A. $\frac{1}{2}$ C. $\frac{1}{4}$
   B. $\frac{1}{3}$ D. $\frac{1}{5}$

2. Mary tossed a coin 50 times. If he was able to record 25 Tails, what is the probability of landing on heads?

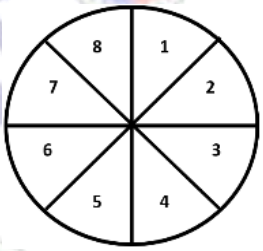
   $A.\frac{1}{2}$ C. $\frac{1}{4}$
   $B.\frac{1}{3}$ D. $\frac{1}{6}$

3. Look at the menu inside the box. How many ways can you order snacks?

HAMBURGERS	**BEVERAGES**
Regular burger	Juice
Cheeseburger	Tea
Pizza burger	

   A. 4 C. 8
   B. 6 D. 10

4. Consider the spinner. What is the probability of getting factor of 18?



   A. $\frac{1}{2}$ C. $\frac{1}{4}$
   B. $\frac{1}{3}$ D. $\frac{1}{5}$

5. There are 6 possible ways for a die to turn up. What is the probability that a prime number will occur?

   A. $\frac{1}{5}$ B. $\frac{1}{4}$ C. $\frac{1}{3}$ D. $\frac{1}{2}$

KEY TO CORRECTION

LESSON 1

PRETEST

1. A
2. D
3. D
4. A
5. C

LOOKING BACK

	0	50%	100%
1.			/
2.		/	
3.	/		
4.		/	
5.			/

ACTIVITIES

ACTIVITY 1

1. $\frac{2}{11}$
2. $\frac{4}{11}$
3. $\frac{2}{11}$
4. $\frac{7}{11}$
5. $\frac{1}{11}$

ACTIVITY 2

1. T
2. T
3. T, H
4. T, T

ACTIVITY 3

1. $\frac{1}{2}$
2. $\frac{1}{4}$
3. $\frac{1}{2}$
4. $\frac{3}{8}$
5. $\frac{1}{8}$

POSTTEST

1. B
2. A
3. B
4. A
5. D

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