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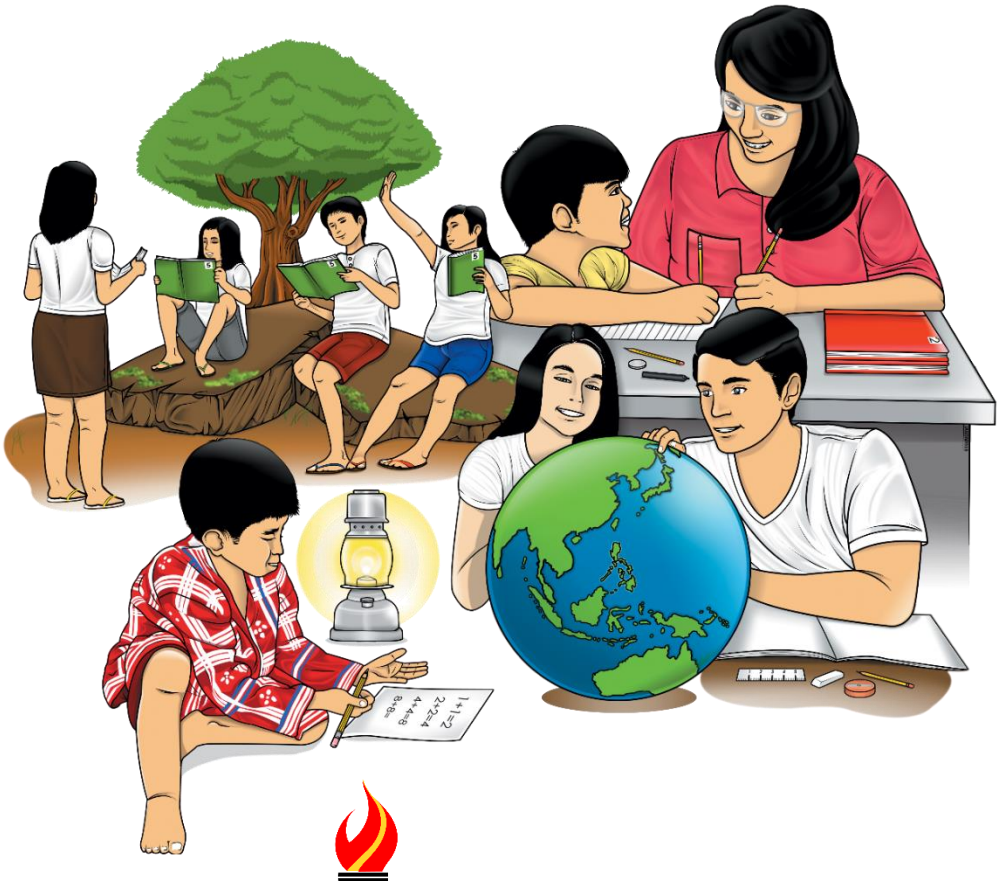
DEPARTMENT OF EDUCATION

Mathematics

Quarter 4 – Module 9
Solaing Routine and Non-Routine Problems Involving Experimental and Theoretical Probability



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Mathematics

Quarter 4 – Module 9:
Solving Routine and Non-Routine Problems Involving Experimental and Theoretical Probability

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Introductory Message

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

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

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

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

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

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

Thank you.

What I Need to Know

This module was designed and written with you in mind. It is here to help you master the skills in solving routine and non-routine problems involving experimental and theoretical probability. The scope of this module allows you to use it in many different learning situations. The language used recognizes your diverse vocabulary level. The lessons are arranged to follow the standard sequence of your course. But the order in which you read them can be changed to match with the textbook you are now using.

After going through this module, you are expected to solve routine and non-routine problems involving experimental and theoretical probability.

What I Know

DIRECTIONS: Read and solve each problem. Write your answer in your answer sheet.

1. A spinner has 5 sectors namely: red, blue, orange, yellow, and black. If you spin once, what is the probability that the spinner lands on white?

2. A coffee shop has sold 20 cups of coffee including 12 brewed coffees. What is the experimental probability that brewed coffee is sold next?

3. Aimee together with her friends was on weekend fishing trip. She caught 8 carp, 5 tilapia, and 12 catfish. What is the probability that the next fish which Aimee catches is a tilapia?

4. In a jar, there are 7 blue marbles, 3 white marbles, 10 red marbles and 12 marbles. What is the theoretical probability of picking red marbles at random?

5. What is the probability of drawing a consonant from the letter of the word SCHOOL?

6. There are 500 tickets left in the drop box. What is the probability that a ticket holder will win a prize if she has 20 tickets in all?

Lesson 1

Solving Routine and Non-Routine Problems Involving Experimental and Theoretical Probability

In the previous lessons, you have learned how to make simple predictions of events based on the results of experiments and theoretical probability. This time, we will focus on how to solve routine and non-routine problems involving experimental and theoretical probability.

What's In

Directions: Read and answer the following problems. Write your answer in your answer sheet.

1. What is the probability of getting tail when a coin is tossed?

2. A fair number cube is rolled. What is the probability of rolling a 4?

3. In a cup are the numbers 1 up to 30. Without looking, what is the probability of picking even numbers?

4. A bag has 4 red marbles, 3 blue marbles, 2 yellow marbles and 1 green marble. What is the probability of pulling a red marble?

5. A fair number cube is rolled five times and these are the results: 2,4,4,5 and 5. Based on the given information, what is the probability that the next roll will be 2?

What's New

Read and understand problem below:

A bag contains 12 red marbles, 8 blue marbles, and 4 yellow marbles. Find the theoretical probability of getting a blue marble.

How will you solve the above problem?

What is It

The Four-Step Plan can be used in solving the problems.

Let's solve the first problem.

Step 1. Understand.

a. What is asked?
The theoretical probability of getting a blue marble

b. What are the given facts?
bag contains 12 red balls, 8 blue marbles, 4 yellow marbles or a total of 24 marbles

Step 2. Plan.

a. What operation to be used to solve the problem?
Addition and division are the operations to be used in solving the problem.

b. What formula and equation to be used to solve the problem?

In finding the theoretical probability, use this formula:

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

The equation to be used to solve the problem is:

TP (blue) = $\frac{8}{24}$

Step 3. Solve.

a. Show the computation.

To find the theoretical probability
Theoretical Probability $_{\text{(Blue Marble)}} = \frac{number\ of\ favorable\ outcomes}{number\ of\ possible\ outcomes}$

$TP_{\text{(Blue Marble)}} = \frac{8}{24}$

Simplifying the fraction, $\frac{8}{24}$, by dividing both the numerator and denominator by 8 will result to $\frac{1}{3}$.

$TP_{\text{(blue marble)}} = \frac{8}{24} \div \frac{8}{8} = \frac{1}{3}$ or 33.33 %
Therefore, the theoretical probability of getting a blue marble is $\frac{1}{3}$ or 33.33 %.

Step 4. Check.

a. Check your answer.

This is one way on how to check if the answer is correct. Go back to your computation. Check if all the given values are properly substituted to the formula. Check also the flow of your computation.

Let's solve another problem.

A coin is tossed 20 times. It lands on tail 14 times. What is the experimental probability of the coin landing on heads?

Step 1. Understand.

a. What is asked?
The experimental probability of the coin landing on heads

b. What are the given facts?
a coin tossed 20 times, coin lands on tail 14 times

Step 2. Plan.

a. What operations to be used to solve the problem?
Subtraction and Division are the operations to be used in solving the problem.

b. What formula and equation to be used to solve the problem?

- Let N = the number of times that a coin lands on head

N = Total number of times the coin was tossed – the number of times the coin landed on tail

20 times – 14 times = N

- In finding the experimental probability, use this formula:

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

EP (Head) = $\frac{N}{20}$

Step 3. Solve.

a. Show the computation.
   - To solve the number of times the coin lands on head (N), do this.

     20 times – 14 times = N

     6 times = N

     Therefore, 6 times the coin lands on head.

   - To solve the experimental probability of the coin landing on heads.

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

EP $_{(Head)}$ = $\frac{6}{20}$

EP $_{(Head)}$ = $\frac{6\div2}{20\div2} = \frac{3}{10}$ or 30%

Therefore, the experimental probability of the coin landing on heads is $\frac{3}{10}$ or 30%.

Step 4. Check.

a. Check your answer.

This is one way on how to check if the answer is correct. Go back to your computation. Check if all the given values are properly substituted to the formula. Check also the flow of your computation.

What's More

Read and solve the problems below. Write your answer in your answer sheet.

1. When a die is rolled, what is the theoretical probability that number five will be rolled?

2. Ruby tossed a die 50 times. The results are recorded in the table below. What is the experimental probability that 5 will appear?

Die Number	Times It Appeared
1	10
2	6
3	14
4	6
5	12
6	2

3. A box contains 5 blue sticks, 4 red sticks, and 3 orange sticks. Find the theoretical and experimental probabilities of getting orange stick.

    a. Theoretical Probability

    b. Experimental Probability

        Note: To get the experimental probability:

        (1) Take a stick from the bag.

        (2) Record the color and return the stick in the bag.

        (3) Repeat the process (at least 10 times).

        (4) Count the number of times an orange stick is picked (suppose it is 2).

Note: If the materials mentioned are not available at home, colored papers (blue, red and orange) cut into smaller equal pieces can be used for the activity.

What I Have Learned

To solve routine and non-routine problems involving experimental and theoretical probability, follow the 4-step plan:

Step 1: Understand.

a. What is asked in the problem?

b. What are the given facts?

Step 2: Plan.

a. What operations to be used to solve the problem?

b. What formula or equation shall we use to solve the problem?

Step 3: Solve.

a. Solve the problem by using the formula and the given facts.

Step 4: Check.

a. Check if the given values are properly substituted to the formula. Check also the flow of the computation.

What I Can Do

Read and solve the following problems. Write the answer in your answer sheet.

1. In a popular television game show, a contestant must choose one from the five envelopes. One envelope contains the grand prize, a car. Find the theoretical probability of choosing the envelope that contains the car prize.

2. James made 15 out of 35 free throws. What is his experimental probability as a fraction?

3. The table below shows the results of spinning the spinner 100 times. What is the experimental probability of landing on 2?

Number Spun	Times Spun
1	11
2	22
3	15
4	33
5	19

4. There are four queens in a standard deck of 52 playing cards. If Ryle picks a card at random, what is the probability that he picks a queen card?

5. Kea has seen 12 blue, 15 white and 23 red cars driving by her house in 2 hours. What is the probability that the next car driving by her house is not a white car?

Assessment

DIRECTIONS: Read and answer the following problems. Write your answer in your answer sheet.

1. You ask a friend to think of a number from 4 to 10. Find the theoretical probability of choosing number 7.

2. Each letter in the word LOVE are on separate cards, face down on table. You pick a card. What is the theoretical probability that letter V will be picked?

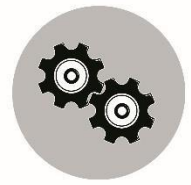
3. Alex has a box of crayons. The box contains 25 yellow crayons, 15 green crayons, 10 red crayons, 8 orange crayons and 5 red crayons. If he selects randomly a crayon, which color of the crayon she would most likely to select?

4. A restaurant conducts menu preference survey to its customers. The results of the survey are the following: 8 hamburgers. 15 pizza, 12 pastas, 6 steaks and 9 adobo. What is the experimental probability of hamburgers or steaks?

5. A drawer contains 6 black neckties, 2 white neckties, 4 red neckties, 2 maroon neckties and 2 blue neckties. Find the theoretical and experimental probabilities of getting black necktie.

    a. Theoretical Probabilities

    b. Experimental Probability
    (Supposed a black necktie is picked 4 times after the experiment is conducted with 32 trials.)



Additional Activities

Read and solve the following problems. Write your answer in your answer sheet.

1. There are 5 red balls and 6 blue balls in a jar. What are the theoretical and experimental probabilities of picking a red ball?

    a. Theoretical probability

    b. Experimental probability

    Note: To get the experimental probability:
    (1) Take a ball from the jar.
    (2) Record the color and return the ball in the jar.
    (3) Repeat the process (at least 8 times).
    (4) Count and record the number of times a red ball IS picked.

2. There are 5 white balls, 8 red balls, and 4 green balls in a jar. Find the theoretical and experimental probabilities of choosing A red ball.

    a. Theoretical probability

    b. Experimental probability

    Note: To get the experimental probability:

    (1) Take a ball from the jar.

    (2) Record the color and return the ball in the jar.

    (3) Repeat the process (at least 10 times).

    (4) Count and record the number of times a red ball IS picked.

3. Perform an experiment for each event, and them list all the possible outcomes.
    a. Tossing 3 coins
    b. Tossing a coin and rolling one regular die
    c. Scheduling an appointment for a weekday during the morning or afternoon.

Note: If the materials mentioned are not available at home, colored papers cut into smaller equal pieces can be used for the activity. Ordinary box can be used also instead of a jar.

Answer Key

What I Know

1. 0
2. $\frac{3}{5}$ *or* 60%
3. $\frac{1}{5}$ *or* 20%
4. $\frac{5}{16}$ *or* 31.25%
5. $\frac{2}{3}$ *or about* 66.67%
6. $\frac{1}{25}$ *or* 4%

What I Can Do

1. $\frac{1}{5}$ *or* 20%
2. $\frac{3}{7}$
3. $\frac{11}{50}$ *or* 22%
4. $\frac{1}{13}$ *or about* 7.69%
5. $\frac{7}{10}$ *or* 70%

What's In

1. $\frac{1}{2}$ *or* 50%
2. $\frac{1}{6}$ *or about* 16.67%
3. $\frac{1}{2}$ *or* 50%
4. $\frac{2}{5}$ *or* 40%
5. $\frac{1}{5}$ *or* 20%

What's More

1. $\frac{1}{6}$ *or about* 16.67%
2. $\frac{6}{25}$ *or* 24%
3. a. $\frac{1}{4}$ *or* 25%
   b. $\frac{1}{6}$ *or about* 16.67%

Assessment

1. $\frac{1}{7}$ *or about* 14.29%
2. $\frac{1}{4}$ *or* 25%
3. yellow
4. $\frac{7}{25}$ *or* 28%
5. a. $\frac{3}{8}$ *or* 37.5%
   b. $\frac{1}{8}$ *or* 12.5%

Additional Activities

1. a. $\frac{5}{11}$ *or about* 45.45%
   b. Answers may vary
2. a. $\frac{8}{17}$ *or about* 47.06%
   b. Answers may vary

References

Most Essential Learning Competencies (MELCs) in Mathematics 6

Perez, M. et.al, 21st Century MATHletes Learner's Material, (Quezon City: Vibal Group, Inc. . 2016).

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