

# Mathematics

## FOURTH QUARTER MODULE 1



Department of Education • Republic of the Philippines

**Mathematics- Grade 6**  
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Schools Division Superintendent: Joel T. Torrecampo.CESO VI

**Development Team of the Module**

**Management Team**

Chairperson: Joel T. Torrecampo, Ph.D., CESO VI  
*Schools Division Superintendent*

Co-Chairpersons: Juan C. Obierna  
*Assistant Schools Division Superintendent*

Reviewer/s Gina I. Aguitez

**AUTHORS:**

**MODULE 1**

Lesson 1 Richie L. Macalanda  
Golden Acres ES

Lesson 4 Imelda G. Bobiles  
Almanza Elementary School

Lesson 2 Rowena B. Kis-ing  
Talon Elementary School

Lesson 5 Maryann D. Manansala  
Dona Manuela Elementary School

Lesson 3 Marisa M. Ortigas  
CAA Elementary School Main

Lesson 6 Resly F. Dumasapal  
Pulanlupa Elementary School

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Telefax:  
E-mail Address: [www.depedlaspinas.ph](http://www.depedlaspinas.ph)

# Mathematics

## Quarter 4 - Module 1

This instructional material was collaboratively developed and reviewed by educators from public. We encourage teachers and other education stakeholders to email their feedback, comments, and recommendations to the Department of Education at [action@ deped.gov.ph](mailto:action@deped.gov.ph).

We value your feedback and recommendations.

# **MATHEMATICS 6**

## **QUARTER 4**

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## Preface

**Dear Pupils,**

This module, Mathematics 6 Quarter 4 - Module 4 is written to further enhance your critical thinking and develop the love of mathematics. This acquired skill would soon be applied in your everyday lives.

This module covers the concepts of Pie Graph. These topics are presented in such a way that they are easy to understand and visualize.

The following are the special and unique features of this module:

- **WHAT I NEED TO KNOW.** This part presents the competency or the objective that each learner should know and master.
- **WHAT'S NEW.** This part of the module presents the content input of the topic that will be discussed.
- **WHAT IS IT.** This contains the discussions of the topic which include illustrative examples of the lesson.
- **WHAT'S MORE.** In this part, the first activity will be given to each learner.
- **WHAT I HAVE LEARNED.** Another activity will be answered by the pupils.
- **ASSESSMENT.** This is the last part of each topic in which another activity will be given and answered by the learners to assess if each of them learned and mastered the skill.

Learning Mathematics is fun. It is not as difficult as you think. We hope this module can help you explore the world of mathematical concept in relation to your everyday life.

## Lesson 1

Determine the relationship of the volume between a rectangular prism and a pyramid; a cylinder and a cone; and a cylinder and sphere



### What I need to Know

This Instructional Module in Mathematics 6 is made as self-taught supplementary material in Fourth Quarter. Using step-by-step process with easy to follow examples set in locality of La Pinas City. It helps you to determine the relationship of the volume between a rectangular prism and a pyramid; a cylinder and a cone; and a cylinder and sphere

After going through with this module, you are expected to:

1. Determine the relationship of the volume between a rectangular prism and a pyramid; a cylinder and a cone; and a cylinder and sphere. (M6ME-IVa – 95)



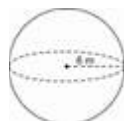
### What I Know

Match the formula to the name and pictures of the solid figure.

**Figure**

**Name**

**Formula**



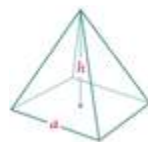
Sphere

$$V = \pi r^2 h$$



Cylinder

$$V = \frac{1}{3} \pi r^2 h$$



Pyramid

$$V = lwh$$



Cone

$$V = \frac{1}{3} lwh$$





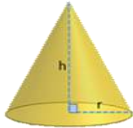
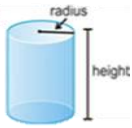
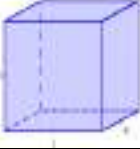
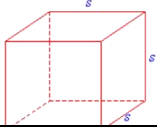
### What's New

Luis would like to put blocks in a box. He would like to find out how many blocks can the box contain. This situation calls for finding the volume of a solid figure. The volume of a space figure is the amount of space it occupies. It is expressed in cubic units ( $\text{cm}^3, \text{m}^3, \text{km}^3$ ).



### **WHAT'S IN**

The volume of a space figure is found using the following formula.

Space Figure	Drawing	Formula
Sphere		$V = \frac{4\pi^3}{3}$
Pyramid		$V = \frac{1}{3} lwh$
Cone		$V = \frac{1}{3} \pi^2 h$
Cylinder		$V = \pi r^2 h$
Rectangular Prism		$V = lwh$
Cube		$V = e^3$



**What Is It** The volume of a rectangular prism is given by the formula  $V = lwh$

$l$  = length  
 $w$  = width  
 $h$  = height

- The volume of a pyramid is obtained using the formula  $V = \frac{1}{3} Bh$   
 where  $B$  = area of the base  
 $h$  = height

- The volume of a cone is obtained using the formula  $V = \frac{1}{3} \pi r^2 h$   
where  $r$  = radius of the base  
 $h$  = height
- The volume of a cylinder is obtained by using the formula  $V = \pi r^2 h$   
where  $r$  = radius of the base  
 $h$  = height
- The volume of a sphere is obtained using the formula  $V = \frac{4\pi r^3}{3}$   
where  $r$  = radius



### **What I Have Learned**

The volume of a prism is given by the formula  **$V = Bh$**  where  $B$  is the area of the base and  $h$  is the height.

The volume of a pyramid is given by the formula  **$V = \frac{1}{3} Bh$**  where  $B$  is the area of the base and  $h$  is the height.

The Volume of a Cylinder is given by the formula  **$V = \pi r^2 h$**  while the Volume of a Cone is  **$V = \frac{1}{3} \pi r^2 h$**

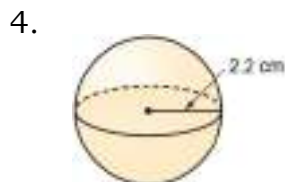
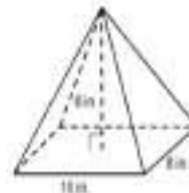
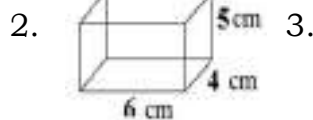


### **WHAT I CAN DO**

Find the volume of each figure.

Use  $\pi = 3.14$

- $r = 2$  cm  
 $h = 9$  cm



### **ASSESSMENT**

Direction: Give the formula for finding the volume of the following solids being described.

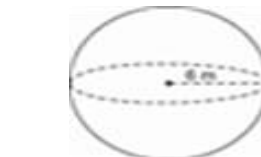
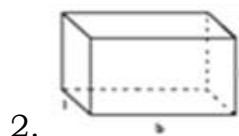


- \_\_\_\_\_ 1. The volume of a rectangular prism is equal to the product of its length, width and height.
- \_\_\_\_\_ 2. The volume of a pyramid is equal to  $\frac{1}{3}$  the product of its base area and height.
- \_\_\_\_\_ 3. The volume of a cube is equal to the cube of an edge.
- \_\_\_\_\_ 4. The volume of a cone is one-third of the product of the area of the circular base and height.
- \_\_\_\_\_ 5. The volume of a cylinder is equal to the area of the circular base and the height.



### **ADDITIONAL ACTIVITY**

Direction: Give the formula for finding the volume of the following objects:



## Lesson 2

## Find the volume of cylinders, pyramids, cones, and spheres



### What I need to Know

This Instructional Module in Mathematics 6 is made as self-taught supplementary material in Fourth Quarter. Using step-by step process with easy to follow examples set in locality of La Pinas City. It helps you in solving the volume of cylinders, pyramids, cones and spheres.

After going through with this module, you are expected to:

1. Find the volume of cylinders, pyramids, cones and spheres.
2. Solve and analyze problems involving volume of cylinders, pyramids, cones and spheres.



### What I Know

Identify the solid figure described.

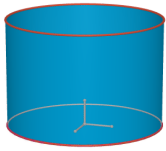
- \_\_\_\_\_ 1. A solid figure with a circular base connected to a vertex.
- \_\_\_\_\_ 2. A solid figure with two congruent or equal circular bases that are parallel.
- \_\_\_\_\_ 3. It is a solid figure with a curved surface in which all points on the surface are equal distance from the center.
- \_\_\_\_\_ 4. It has a polygonal base and flat triangular faces, which join at a common point called the apex.
- \_\_\_\_\_ 5. A kind of pyramid with rectangular base.



### What's New

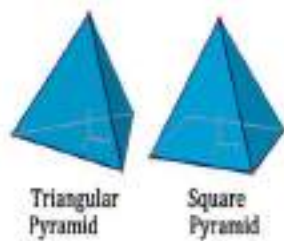
In this lesson pupils will learn about finding the volume of cylinders, pyramids, cones and spheres.

How do we find the volume of cylinders, pyramids, cones and spheres?  
A **cylinder** is like a prism with a circular base.



To find the volume of a cylinder, find the area of its circular base and multiply by its height.

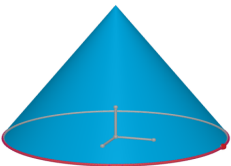
A **pyramid** is similar to a cone, except it has a base that is a polygon instead of a circle. Like prisms, pyramids are named by their base shape.



To find the volume of a pyramid, find the product of the area of the base and the height then divide by three.

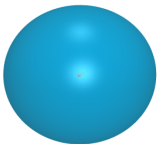
$$\text{Pyramid: } V = \frac{B \cdot h}{3}$$

A **cone** also has a circular base, but its lateral surface meets at a point called the vertex.



To find the volume of a cone, find the area of its circular base and multiply by its height divide by three.

A **sphere** is the set of all points in space equidistant from a center point. The distance from the center point to the sphere is called the radius.



The volume of a sphere relies on its radius.

$$\text{Sphere: } V = \frac{4}{3}\pi r^3$$



**What Is It**

Using the formulas you have learned, let us study how you will find the volume of the solids.

### Example 1

A cone has a radius of 2 cm and a height of 3cm. What is its volume?

$$\begin{aligned}
 V &= \frac{\pi r^2 h}{3} \\
 &= \frac{3.14 (2 \text{ cm}^2)(3 \text{ cm})}{3} \\
 &= \frac{3.14 (4 \text{ cm}^2)(3 \text{ cm})}{3} \\
 &= \frac{3.14 (12 \text{ cm}^3)3}{3} \\
 &= \frac{37.68 \text{ cm}^3 3}{3} \\
 &= 6.28 \text{ cm}^3 \\
 \text{Volume is } &\mathbf{6.28 \text{ cm}^3}
 \end{aligned}$$

Find the volume of a sphere whose radius is 5 cm.

$$\begin{aligned}
 V &= \frac{4}{3} \pi r^3 \\
 &= \frac{4}{3} \times 3.14 \times 5 \text{ cm}^3 \\
 &= \frac{4}{3} \times 3.14 \times 5 \text{ cm} \times 5 \text{ cm} \times 5 \text{ cm} \\
 &= 523.3 \text{ cm}^3
 \end{aligned}$$

Volume is **523.3 cm<sup>3</sup>**

#### Example 4

A cylindrical can of milk has a diameter of 12 cm and has a height of 20 cm. What is its capacity?

$$\begin{aligned}
 V &= \pi r^2 h \\
 &= 3.14 (6 \text{ cm})^2 (20 \text{ cm}) \\
 &= 3.14 (36 \text{ cm}^2)(20 \text{ cm}) \\
 &= 3.14 (720 \text{ cm}^3) \\
 &= 2260.80 \text{ cm}^3 \\
 \text{Volume is } &\mathbf{2260.80 \text{ cm}^3}
 \end{aligned}$$

#### Example 2

What is the volume of a square pyramid if its base measures 10 m and its height measures 24 m

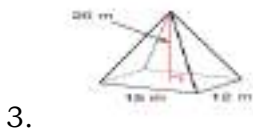
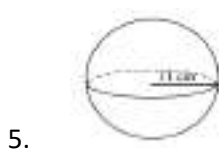
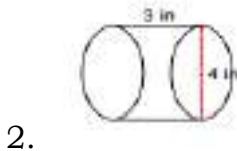
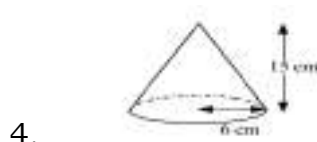
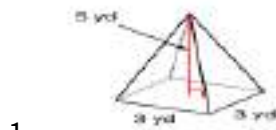
$$\begin{aligned}
 V &= \frac{B \cdot h}{3} \\
 &\text{where } \mathbf{B} \text{ refers to the area of the base} \\
 &\text{Since, the base is a square, we will use the formula} \\
 V &= \frac{s \times s \times h}{3} \\
 &= \frac{10 \text{ m} \times 10 \text{ m} \times 24 \text{ m}}{3} \\
 &= \frac{2400 \text{ m}^3}{3} \\
 &= 800 \text{ m}^3 \\
 \text{Volume is } &\mathbf{800 \text{ m}^3}
 \end{aligned}$$



What's More

#### Example 3

Find the volume of the given solid figure



### What I Have Learned

Volume is the amount of space enclosed by a solid. It must be always expressed in cubic units. The following are the formulas to find the volume of some solids.

Volume of a cylinder =  $V = \pi r^2 h$

where  $\pi = 3.14$   $r$ =radius  $h$ = height

Volume of a pyramid=  $V = \frac{B \cdot h}{3}$

where  $B$  = base  $h$ = height

Volume of a cone =  $V = \frac{\pi r^2 h}{3}$

where  $\pi = 3.14$   $r$ =radius  $h$ = height

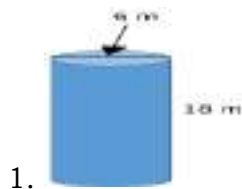
Volume of a sphere=  $V = \frac{4\pi r^3}{3}$

where  $\pi = 3.14$   $r$ =radius



### What I Can Do

Find the volume of each figure. Choose the letter of the correct answer.



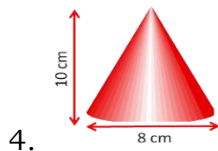
- |   |
|---|
| <p>A. 508.68 m<sup>3</sup></p> <p>B. 509.68 m<sup>3</sup></p> <p>C. 518.68 m<sup>3</sup></p> <p>D. 519.68 m<sup>3</sup></p> |
|---|



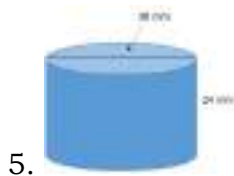
- A.  $245 \text{ in}^3$   
 B.  $265 \text{ in}^3$   
 C.  $285 \text{ in}^3$   
 D.  $305 \text{ in}^3$



- A.  $13\,130 \text{ cm}^3$   
 B.  $14\,130 \text{ cm}^3$   
 C.  $15\,135 \text{ cm}^3$   
 D.  $16\,139 \text{ cm}^3$



- A.  $165.17 \text{ cm}^3$   
 B.  $166.37 \text{ cm}^3$   
 C.  $167.47 \text{ cm}^3$   
 D.  $168.57 \text{ cm}^3$



- A.  $18\,956 \text{ mm}^3$   
 B.  $18\,946 \text{ mm}^3$   
 C.  $17\,956 \text{ mm}^3$   
 D.  $16\,956 \text{ mm}^3$

## ASSESSMENT

Direction: Solve the following problems.

1. A cylindrical tin of Macafe Coffee is 10 cm high and has a base diameter of 8 cm. What is the volume of coffee in the tin when it is full?
2. A rectangular pyramid has a base of 20 cm by 13 cm and height of 15 cm. What is its volume?
3. The wafer of an ice-cream cone has a diameter of 9 cm. The cone is 10 cm high. Calculate the volume of the cone.
4. What is the volume of a square pyramid if its base measures 8 m and its height measures 24 m?
5. A rubber ball has a radius of 7cm. What is the volume of the ball



## ADDITIONAL ACTIVITY

Find the volume of the following solids given their dimensions.

1. Cylinder                  radius = 10 m      height = 7.8 m
2. Cone                      diameter = 20 m      height = 21m
3. Sphere                   Radius = 9 mm
4. Rectangular pyramid length = 12 cm   width = 8 cm      height = 15 cm
5. Square pyramid      side = 15 dm   height = 20 d

### **Lesson 3**

### **Solves routine and non-routine problems involving volume of solid**



#### **What I need to Know**

This Instructional Module in Mathematics 6 is made as self-taught supplementary material in Fourth Quarter. Using step-by step process with easy to follow examples set in locality of La Pinas City. It helps you in solving routine and non-routine problem involving volume of solid figures.

After going through with this module, you are expected to:

Solid



#### **What I Know**

1. Analyze first the formula of the solid figures fit to the problems
- Solve routine and non- routine problems using the formula of the



volume of a

Read, analyze, and understand before answer the question.

1. A room is 4m long , 3m wide and 2.8 m high. How much air can the room hold?

- A. What is the length?\_\_\_\_\_
- B. What is the width ? \_\_\_\_\_
- C. What is the height ? \_\_\_\_\_
- D. What is the formula of the rectangular prism?\_\_\_\_\_
- E. Show your solution to find the rectangular prism



#### **What's New**

In this lesson pupils will learn about analyzing and solving routine and non- routine problems involving volume of solid figures.

Read carefully and analyze the problem so that we can decide what kind of solid figures indicate in the problem. There are different formula of solids figure.

1. Volume of rectangular prism is equal to length times width times height or  $V = l \times w \times h$
2. Volume of cube is equal edge times edge times edge or  $V = e \times e \times e$
3. Volume of pyramids is equal to  $1/3$  of length x width x height or

$$V = l \times w \times h$$

4. Volume of Cylinders is equal  $\pi \times \text{radius} \times \text{radius} \times \text{height}$

5. Volume of a cone is equal  $1/3$  of  $\pi \times \text{radius} \times \text{radius} \times \text{height}$  or

$$V = 1/3 \pi r^2 h$$

6. Volume of sphere  $4/3$  times  $\pi$  times radius cube or  $V = 4/3 \pi r^3$



### What's In

Complete the table.

	l	w	h	volume
1	6 m	4 m	5 m	
2	12cm	10 cm	15 cm	
3	14 cm	17 cm	12.86 cm	
4	27 cm	20.2 cm		13144.14 cubic m
5	8dm		15.6 dm	1248 cubic dm



### What Is It

#### Illustrative Example 1: Analyze and Solve

1. The volume of a prism is the amount of space inside the prism. Volume is measured in cubic units.

How much air can a room contain if it measures 9m long, 7 m wide and 7 m high?

$$\begin{aligned} V &= l \times w \times h \\ &= 9 \text{ m} \times 7 \text{ m} \times 7 \text{ m} \\ &= 441 \text{ cubic meter} \end{aligned}$$

2. The large cube has 8 edges . What is its volume ?

$$\begin{aligned} V &= e \times e \times e \\ &= 8 \times 8 \times 8 \\ &= 512 \text{ cubic units} \end{aligned}$$

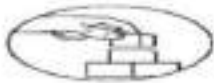
3. A cone-shaped paper cup has a radius of 4 cm and height of 10 cm. How many cubic cm of water contain ?

$$\begin{aligned} V &= 1/3 \pi r^2 h \\ &= 1/3 ( 3.14 \times 4 \times 4 \times 10 ) \\ &= 1/3 ( 3.14 \times 160 ) \\ &= 1/3 ( 502.4 ) \\ &= 167 \text{ cubic cm} \end{aligned}$$



4. A can has a 12 cm in diameter and height 14 cm . Find its volume?

$$\begin{aligned} V &= \pi r^2 h \quad \boxed{2} \\ &= 3.14 \times 6 \times 6 \times 14 \\ &= 3.14 \times 36 \times 14 \\ &= 3.14 \times 504 \\ &= 1582.56 \text{ cubic cm} \end{aligned}$$



**What's More**

### ***Enrichment Activities***

Read, analyze and solve the problem below.

1. Find the volume of a rectangular prism which is 5 m long , 7 m wide and 6 m high?
2. Find the volume of a cube with the 7.5 edges cm.
3. A can has a 16 cm diameter and height of 10 cm. Find its volume?
4. Find the volume of sphere radius of 4 ft?
5. The base of a pyramidal tent is a square . If the tent is 3 meters long and 4 meters high, How many cubic metres of space can it hold inside?



**What I Have Learned**

**How do you solve routine and non-routine problems involving volume of solids.**

To solve routine and non-routine problems involving volume of solids .routine questions , do not require students to used HOTS and Use clear procedures while Non-routine questions Require HOTS or higher ordered thinking skills ,increasing the reasoning ability, Use answers and procedures that are not clear , Encourage more than one solution and strategy, Expect more than one answer , challenge thinking skills, require solutions that more than simply making decisions



### **What I Can Do**

Answer the following.

Solve the following problem:

1. A tin can has a radius of 5cm and the height of 12cm . How much milk it contain ?
2. A rectangular box has a volume of 3600cubic cm. If the length is 12cm, the width is 15 , how high is the box?
3. The volume of a cube is 1728 cubic cm. What is the length of the edge?
4. A toy hat is 72 square cm and its height is 15 cm. What is the volume?
- 5.A spherical tank for natural gas has a radius of 5 meters. About how many cubic meters of natural gas can it hold.



### **Assessment**

Read , analyze the problem :

1. A desk drawer is 28 centimeters long , 55 centimeters wide, and 42.5 centimeters deep. Find its volume ?
2. Find the volume of volleyball that a radius of 5.5 decimeters.
3. A cylindrical tank can hold 628 cubic meters of water. If the radius is 5 meters, how high is the tank?
4. The volume of a cube if the edge is 25 centimeters?
- 5.A metal cone has a radius of 4.2meters and the height of 6 meters. How many cubic decimeter can it hold? How many liters of liquid can it hold?

## **Lesson 4**

## **READ AND INTERPRETS ELECTRIC AND WATER METER READING**



### **What I need to Know**

This Instructional Module in Mathematics 6 is made as self-taught supplementary material in Fourth Quarter. Using step-by

step process with easy to follow examples set in locality of La Pinas City. It helps you in solving routine and non-routine problems using data presented in Pie Graph.

After going through with this module, you are expected to:

3. Record the reading shown by the dials of electric and water meter
4. Read and interpret electric and water meter reading.

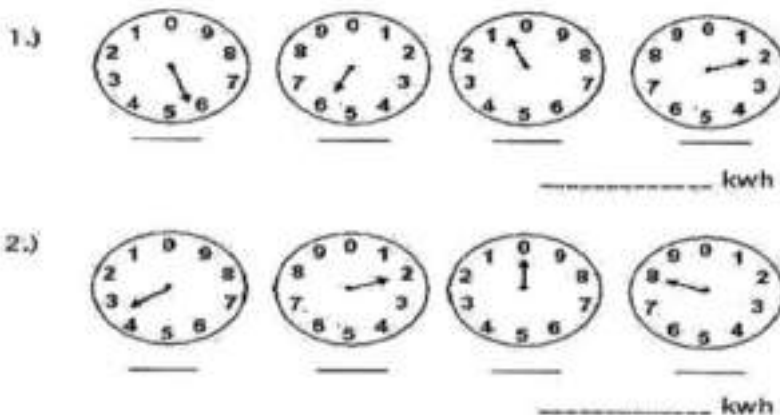


### What I Know

**A. Answer the following questions: Choose from the box the correct answer in the blanks.**

1. An \_\_\_\_\_ is a tool in used in measuring electric consumption?
2. An \_\_\_\_\_ is a tool in used in measuring water consumption?
3. In water consumption what is the unit used in measuring the amount of water consumption?
4. What is the unit used in measuring electric consumption?

### B. Write the reading shown in electric meter



### What's New

In this lesson pupils will learn about reading and interpreting electric and water meter reading.

Water and electricity are a must in most home. What happens when there is no water supply or electricity? Our daily activities and work will be affected, it

is important therefore to conserve water and electricity. How do we measure our monthly electric and water consumption?

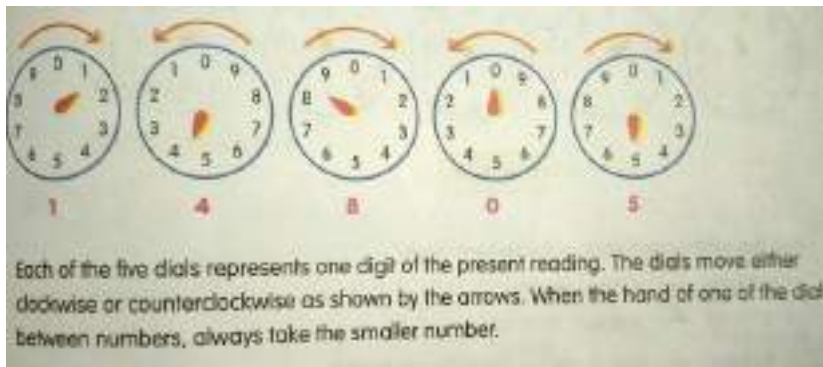
Our electric consumption is expressed in kilowatt-hour (KWh)

Water consumption is measured in cubic meters



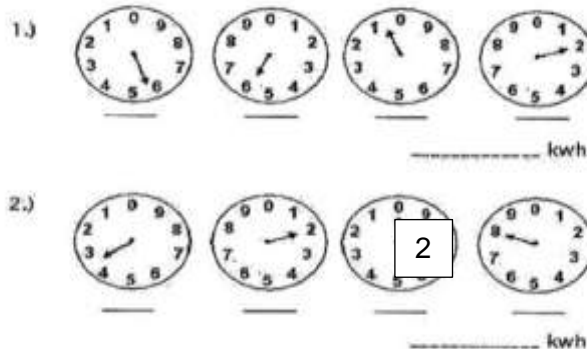
## ***What's In***

Here is how to read electric meter



The dial above read as 14, 805 kilowatt-hour or kWh

The reading below show the present and previous reading



**To find the difference between the present and previous reading**

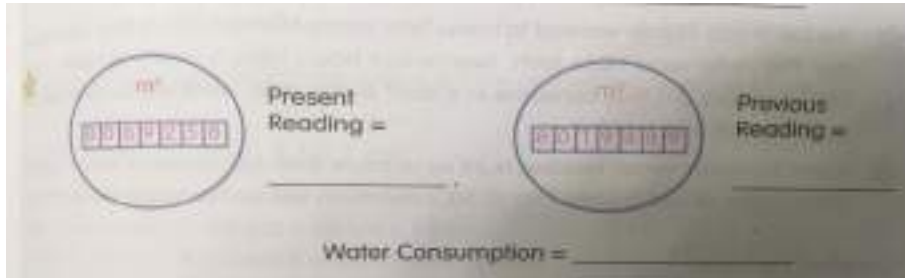
	<b>5802</b>	<b>present reading</b>
<b>-</b>	<b>3208</b>	<b>previous reading</b>
	<b>2594 KWh</b>	<b>electric consumption for the month</b>



### What Is It

#### **Illustrative Example 1:** Analyz

**A water meter measures water consumption It is in the form of digital clock called an adometer The first 3 digit from the right are the decimal part. The next 4 digit to the left represent the whole number you may disregard the decimal part.**



Read as 8089 cubic meter Present reading

**Read as 8019 cubic meter Previous reading**

**0070 cubic meter monthly consumption**

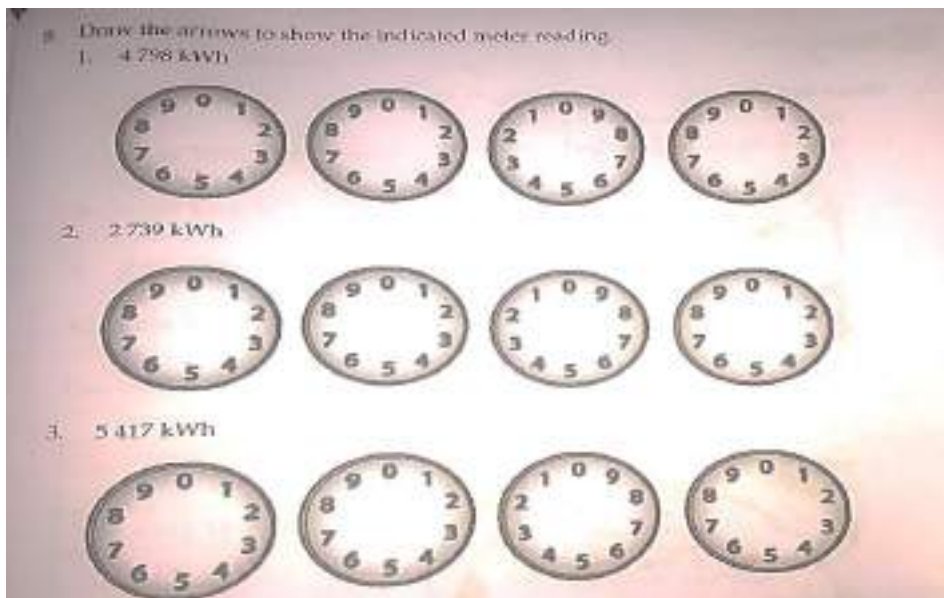


### What's More

A. Write the correct reading of the following electric meter



B. Draw an arrow to show the indicated meter reading



### What I Have Learned

#### How do you read and interpret electric and water meter reading ?

To read an electric meter with dials Each of the dials represents one digit of the present reading The dials move either clockwise or counterclockwise dial 1,3 and 5 move clockwise 2 and 4 move counterclockwise . When the hands of the dials is between numbers always take the smaller number.

To read digital water meter the first 3 digit from the right are the decimal number. The next 4 digit to the left represent the whole



### What I Can Do

A. How do we conserve electricity and water?

Give at least 3 ways how to conserve electric consumption and 3 ways how to conserve water consumption.

B. Find the electric consumption given in the following information.

Present reading	Previous reading	Electric consumption
2092	1923	
5085	4985	
3952		148 kwh

C. Find the water consumption for the following information

Present reading	Previous reading	Water consumption
4216	4185	
7108	7067	
8462		105 cubic meter

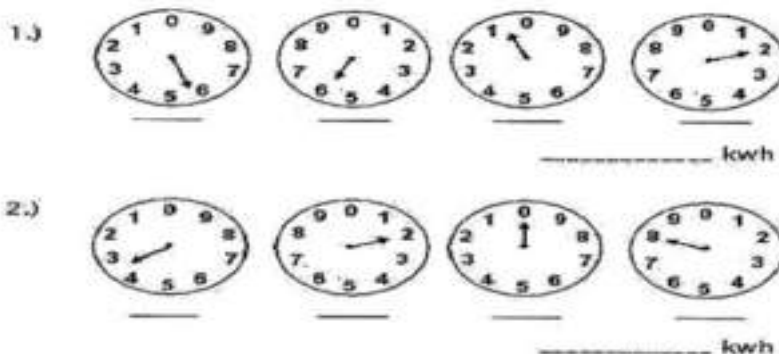


## Assessment

**A. Answer the following questions: Choose from the box the correct answer in the blanks.**

1. An \_\_\_\_\_ is a tool in used in measuring electric consumption?
2. An \_\_\_\_\_ is a tool in used in measuring water consumption?
3. In water consumption what is the unit used in measuring the amount of water consumption?
4. What is the unit used in measuring electric consumption?

**B. Write the reading shown in electric meter**



**C. Compute the electric consumption for given reading**

\_\_\_\_\_

## Lesson 5

## Solving Routine and non-routine Problems involving Electric and Water Consumption



### What I need to Know

This Instructional Module in Mathematics 6 is made as self-taught supplementary material in Fourth Quarter. Using step-by step process with

easy to follow examples set in locality of La Pinas City. It helps you in solving routine and non-routine problems involving electric and water consumption.

After going through with this module, you are expected to:

1. Analyze routine and non-routine problems involving electric and water consumption.
2. Solve routine and non- routine problems involving electric and water consumption.



### What I Know

Read and solve the problems.

1. The electric meter reading last month was 7621 kWh. The present reading is 8 347 kWh. How much electricity was consumed in one month?
2. The previous water reading at Mary's residence was 3 124 m<sup>3</sup>, the following month, the reading was 3 202 m<sup>3</sup>. How much water was consumed in one month?



### What's New

In this lesson pupils will learn about analyzing and solving routine and non- routine problems involving electric and water consumption.

Electricity and water are essentials in every household. Individuals have become accustomed to electricity which gives comfort and makes our life easier. On the other hand, water is something that we can't live without. The conservation of the said resources is highly encouraged. We should be cautious of our daily electric and water consumption.

At home, we receive our monthly bill for the total amount of electricity used. A **watt** is a unit of power in electricity. Since watt is a very small unit, **kilowatt** is used. A kilowatt is equal to 1 000 watts. A **kilowatt- hour (kWh)** is equivalent to a kilowatt consumed in one (1) hour.

The electric bill provided by electric companies shows information like the previous and present readings, the amount of electricity consumed, and all other charges whose total is commonly called *total electricity bill or total amount due*. To find the total amount due for the month, multiply the electric consumption by the respective rates, per kilowatt-hour (kWh) of all the charges/.



The amount of water that we use at home is measured using water meter. It measures the amount of water consumed in **cubic meters (m<sup>3</sup>)**. The reading shown in water meters determine the amount to be paid every month. It is important to check and verify the amount in water bill, to monitor water use, and to check suspected leaks,



### What's In

A. Read and interpret the dials of the electric meter below.

1.



2.



3.



2

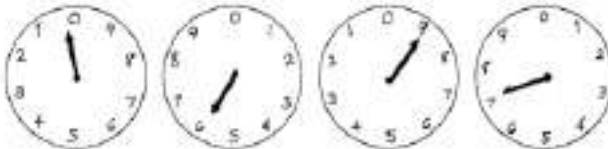
B. Read and interpret the dials on the meter below.

1.



\_\_\_\_\_

2.



\_\_\_\_\_



### What Is It

- The electric bill of Aguila family shows that the present reading is 00983 kWh. The previous reading is 00787 kWh. How much electricity is consumed?

**Solution:** Find the difference between the present and the previous reading.

$$\begin{array}{r}
 00983 \text{ kWh present reading} \\
 - 00787 \text{ kWh previous reading} \\
 \hline
 196 \text{ kWh}
 \end{array}$$

The amount of electricity consumed is **196** kwh

The electric company charges Php **8.50** per kilowatt hour and all other charges that total to Php 345.00. How much is the total amount due of Aguila family?

**Solution:** Total amount due = generation charge + other charges

Generation charge:  $196 \times \text{Php } 8.50 = \text{Php } 1\,666.00$

Other charges: Php 345.00

Total: Php 2 011.00

The total amount due of Aguila family is **Php 2 011.00**.

2. In April, the reading of the water meter in Manansala's household is  $1\,435 \text{ m}^3$ . In March, it was  $1\,285 \text{ m}^3$ . Find the amount of water used by the Manansala family for one month.

**Solution:** Find the difference between the present and the previous reading.

$$\begin{array}{r} 1\,435 \text{ present reading ( April )} \\ - 1\,285 \text{ previous reading (March )} \\ \hline 150 \end{array}$$

Therefore, the Manansala family consumed  **$150 \text{ m}^3$**  for one month.

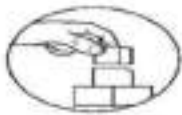
MDM Water District	
First $10 \text{ m}^3$ ( minimum charge )	Php 200
11- $20 \text{ m}^3$	Php 20 /

The water rate above shows the minimum charge is Php 200. 00 for the consumption of  $10 \text{ m}^3$  and below. This means that if the family consumes only  $1 \text{ m}^3$  or  $5 \text{ m}^3$  or any amount of water less than  $10 \text{ m}^3$ , the rate will be fixed at Php 200.00. However, for every succeeding cubic meter from  $11 \text{ m}^3$  to  $20 \text{ m}^3$ , the rate will be Php 20.00 per cubic meter

The Manansala family's water consumption for the month of April is 150 m<sup>3</sup>. If they live where MDM Water District supplies the water, how much is their water consumption for the month of April?

<b>Solution:</b> First 10 m <sup>3</sup> ( minimum)		= Php 200.00
11 m <sup>3</sup> – 20 m <sup>3</sup>	10 x 20	= Php 200.00
21 m <sup>3</sup> – 30 m <sup>3</sup>	10 x 25	= Php 250.00
31 m <sup>3</sup> – 40 m <sup>3</sup>	10 x 30	= Php 300.00
41 m <sup>3</sup> and up	110 x 35	= Php 3 850.00
		<hr/> Php 4 800.00

Therefore, the amount of water consumption of Manansala family is  
**Php 4 800.00**



#### What's More

Analyze and solve the given problems carefully.

1. Mr. Baltazar made s record of their 3- month consumption. The initial reading is 862 kWh.

April: 1110      May: 1242      June: 1 412

Assume that the charged for kilowatt-hour is Php 8.50 with additional charges of Php 348.00. Complete the table below to show the total amount due of Mr. Baltazar for each month.

<b>Month</b>	<b>Present reading</b>	<b>Previous reading</b>	<b>Kilowatt-hour consumed</b>	<b>Total amount due.</b>
April				
May				
June				

2. The Malvar family recorded their water consumption for the past three months. Initial reading; 0112  
 January: 0143    February: 0195    March: 0245
- On what month did they use most water?
  - How many cubic meters did they use for three months?
  - Given the rate (see the table below). How much is their water bill for the month of March?

Water Consumption Rate	
First 10 m <sup>3</sup> ( minimum charge )	Php 200
11- 20 m <sup>3</sup>	Php 20 / m <sup>3</sup>
21 – 30 m <sup>3</sup>	Php 25 / m <sup>3</sup>
31 – 40 m <sup>3</sup>	Php 30 / m <sup>3</sup>
40 m <sup>3</sup> and up	Php 35 / m <sup>3</sup>



### What I Have Learned

**How do you solve routine and non-routine problems involving electric and water consumption?**

To solve routine and non-routine problems electric and water consumption, subtract the previous from the present reading. Electric and water consumption are expressed in kilowatt –hour (kWh) and cubic meter ( m<sup>3</sup> ) respectively.



### What I Can Do

Analyze and solve each problem carefully.

- The electric meter reading last month was 7621 kWh. The present reading is 8 247 kWh.
  - How much electricity was consumed in one month?
  - If the price per kilowatt hour is Php 7.35 how much is the total bill?
- The previous water reading in a restaurant was 2 915 m<sup>3</sup>, the following month, the reading was 3 102 m<sup>3</sup>.
  - How much water was consumed in one month?
  - If water costs Php 15.00 per cubic meter, how much will the restaurant be charged?



### Assessment

Solve each problem carefully.

- The Matipid family monitors closely their electric consumption. This month, the reading on their dial is 5 634, last month it was 5 554. How many Kwh was used?
- The Masinop family sees it to that they will not run out of budget. One of the things they do is to closely monitor their water consumption. The

record shows the reading for 4 months:

Month	Meter Reading	m <sup>3</sup> consumed
January	0077.163	
February	0091.256	
March	0102.009	
April	0130.056	

- Find the monthly consumption. (Initial Reading is 0065.0163.)
- In which month did they consume the most? The least?
- In which month will they pay the most? Explain.
- What can you do to help lower your water bill

## Lesson 6

## Constructing a pie graph based on a given set of data and interpret it.



### What I need to Know

This Instructional Module in Mathematics 6 is made as a self-taught supplementary material in Fourth Quarter. Using step-by-step process with easy-to-follow examples set in locality of Las Piñas City. It helps you in constructing a pie graph based on a given set of data and interpret it.

The module is It helps you in constructing a pie graph based on a given set of data and interpret it. (M6SP-IVe-2.6)

After going through this module, you are expected to:

- Construct a pie graph based on a given set of data and
- Interpret data presented on a pie graph.



### What I Know

Read and analyze the graph below.

Type of Movie	Frequency
Action	12
Comedy	8
Drama	5
Romance	15
Sci-fi	10
<b>TOTAL</b>	<b>50</b>



- What kind of graph is shown?
- How many people were in the survey?
- What is the most preferred type of movie?
- Which type of movie has the least percentage?

This lesson provides you more opportunities to study more about fractions. Your knowledge in fractions which you gained in previous grades will help you more in constructing a pie graph based on a given set of data and interpret it. Varied activities are provided for meaningful, enjoyable and fun learning.



### What's In

- **A Pie graphs** are used to show the percentage of a quantity in each of the several categories.  
It can also be to easily visualize the ratio of one category to another.
- To get the percentage of each frequency, divide the frequency with the total number of respondents.



### What's New

A survey was conducted on the subjects that the pupils like most in Pulanlupa Elementary School. A total of 150 pupils participated in the survey. The frequency table shows the result.

Subject	Frequency	Percent
<b>SCIENCE</b>	<b>24</b>	
<b>ENGLISH</b>	<b>30</b>	
<b>ARALING PANLIPUNAN</b>	<b>15</b>	
<b>FILIPINO</b>	<b>36</b>	
<b>MATH</b>	<b>45</b>	
<b>TOTAL</b>	<b>150</b>	

#### **Most Favorite Subject of some pupils in Pulanlupa Elementary**

$$\text{Science} = \frac{24}{150} = .16 \times 100 = 16\%$$

$$\text{English} = \frac{30}{150} = .20 \times 100 = 20\%$$

$$\text{A.P.} = \frac{15}{150} = .10 \times 100 = 10\%$$

$$\text{Filipino} = \frac{36}{150} = .24 \times 100 = 24\%$$

$$\text{Math} = \frac{45}{150} = .30 \times 100 = 30\%$$



### What's It

A. In Pulanlupa Elementary School, there are 350 pupils in Grade 3, 300 pupils in Grade 4, 320 pupils in Grade 5, and 422 pupils in Grade 6. Draw a pie graph to represent the numbers of pupils in the school.

$$\text{Grade 3} = 350/1400 \times 100 = 25\%$$

$$\text{Grade 4} = 310/1400 \times 100 = 22\%$$

$$\text{Grade 5} = 320/1400 \times 100 = 23\%$$

$$\text{Grade 6} = 420/1400 \times 100 = 30\%$$

Steps:

1. Find the angle measure for each section.

Grade 3:  $25\%$  of  $360^\circ = .25 \times 360^\circ = 90^\circ$

Grade 4:  $22\%$  of  $360^\circ = .22 \times 360^\circ = 79.2^\circ$

Grade 5:  $23\%$  of  $360^\circ = .23 \times 360^\circ = 82.8^\circ$

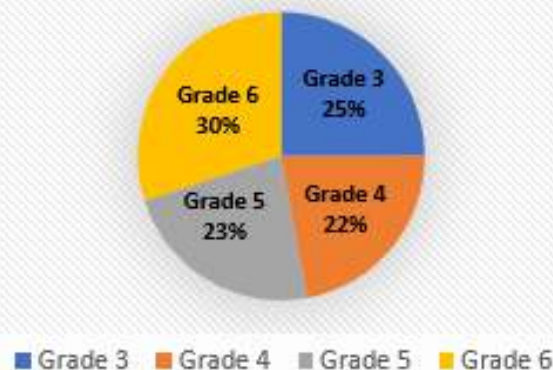
Grade 6:  $30\%$  of  $360^\circ = .30 \times 360^\circ = 108^\circ$

2. Draw a circle using a compass.

3. Use a protractor to draw the angle measure of each section then label it.

4. Write a title for the graph.

**Number of Pupils in Pulanlupa Elementary School**



### ***What's More***

**Activity:** Construct a pie graph using paper plate based on data given to them. Follow the steps in constructing graph.

The table below shows how workers in Las Piñas get to work.

Mode of Transportation	Frequency	Percent	Degrees
Bus	11	22%	
Jeep	9	18%	
Tricycle	7	14%	
Motorcycle	13	26%	
Taxi	10	20%	



### ***What I Have Learned***

To get the angle measurement, multiply the percentage to  $360^\circ$

Laborers	Numbers	Percent	Degrees
Carpenter	21	21%	
Electrician	19	19%	
Mason	23	23%	
Plumber	20	20%	
Engineer	17	17%	
Total	100		



### ***What I Can Do***

Make a pie graph showing the budget of Reyes Family.

Category	Percent	Degrees
Food	40%	
Education	25%	
Utility Expenses	20%	
Savings	10%	
Recreation	5%	



### ***Assessment***

**Directions:** The table shows the percentages of blood types for a group of 300 people:

Type A= 30%

Type B= 15%

Type AB= 10%

Type O=45%

Make a pie graph showing the given data. (Use compass and protractor)



### ***Additional Activities***

Make a pie graph showing how the grade in Math of each pupil is computed by the teacher if:

Written work= 30%

Performance task= 50%

Quarterly Assessment= 2





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# **Mathematics**

## **FOURTH QUARTER**

### **MODULE 2**



Department of Education • Republic of the Philippines

**Mathematics- Grade 6**  
**Alternative Delivery Mode**  
**Quarter 4 – Module 2 Number and Number Sense**  
**First Edition, 2020**

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Schools Division Superintendent: Joel T. Torrecampo.CESO VI

**Development Team of the Module**

Management Team

Chairperson: Joel T. Torrecampo, Ph.D., CESO VI  
*Schools Division Superintendent*

Co-Chairpersons: Juan C. Obierna  
*Assistant Schools Division Superintendent*

Reviewer/s Gina I. Aguitez

AUTHORS:

**MODULE 2**

**Lesson 7 Liezel Bautista**  
Daniel Fajardo Elementary School

**Lesson 10 Myrrh Estela G. Ramirez**  
Vergonville Elementary School

**Lesson 8 Reyland O. Dumlao**  
Moonwalk Elementary School

**Lesson 11 Renniel T. Premian**  
Golden Acres Elementary School

**Lesson 9 Mary Jane D. Ayapana**  
Zapote Elementary School

**Lesson 12 Erwin Escalante**  
Pamplona ES Central

**AMADOR R. AYAPANA**  
Las Pinas Elementary School Central

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# 6

# Mathematics

## Quarter 4 - Module 2

This instructional material was collaboratively developed and reviewed by educators from public. We encourage teachers and other education stakeholders to email their feedback, comments, and recommendations to the Department of Education at [action@ deped.gov.ph](mailto:action@deped.gov.ph).

We value your feedback and recommendations.

# MATHEMATICS 6

## QUARTER 4

### Module 2

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# Preface

**Dear Pupils,**

This module, Mathematics 6 Quarter 4 - Module 4 is written to further enhance your critical thinking and develop the love of mathematics. This acquired skill would soon be applied in your everyday lives.

This module covers the concepts of Pie Graph. These topics are presented in such a way that they are easy to understand and visualize.

The following are the special and unique features of this module:

- **WHAT I NEED TO KNOW.** This part presents the competency or the objective that each learner should know and master.
- **WHAT'S NEW.** T. it his part of the module presents the content input of the topic that will be discussed.
- **WHAT IS IT.** This contains the discussions of the topic which include illustrative examples of the lesson.
- **WHAT'S MORE.** In this part, the first activity will be given to each learner.
- **WHAT I HAVE LEARNED.** Another activity will be answered by the pupils.
- **ASSESSMENT.** This is the last part of each topic in which another activity will be given and answered by the learners to assess if each of them learned and mastered the skill.

Learning Mathematics is fun. It is not as difficult as you think. We hope this module can help you explore the world of mathematical concept in relation to your everyday life.

The Author

## Lesson 7

## Solving Routine and Non-Routine Problems using data presented in a Pie Graph



### What I need to Know

This Instructional Module in Mathematics 6 is made as self-taught supplementary material in Fourth Quarter. Using step-by step process with easy to follow examples set in locality of La Pinas City. It helps you in solving routine and non-routine problems using data presented in Pie Graph.

After going through with this module, you are expected to:

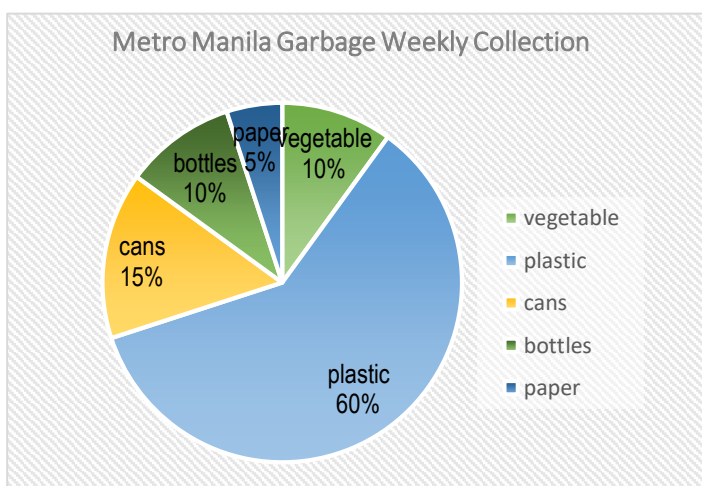
1. Analyze routine and non-routine problems using data presented in a pie graph.
2. Solve routine and non- routine problems using data presented in a pie graph.



### What I Know

**Read and interpret the pie graph.**

1. What is the title of the pie graph?
2. What kind of garbage are enumerated in the graph?
3. How many percent does each represent?
4. What is the total percent?
5. What is the greatest amount of garbage that is thrown?



### What's New

In this lesson pupils will learn about analyzing and solving routine and non- routine problems using data presented in a pie graph.

When we look for information to help us make important decisions, we often find the information in the form of graphs. A lot of newspaper regularly use graphs to help readers to compare amounts or see trends. One of these graphs is the pie graph.

**Pie Graphs** are used to show the percentage of a quantity in each of the several categories. It can also be used to easily visualize the ratio of one category to another.

The Pie represents the entire quantity, the whole unit or 100%. A fractional part of the whole number is represented by an equivalent fractional part of the circle and is usually named as percent.

The word problems below involve multi – steps in solving problems using data presented in a pie graph.



## What's In

Fill out the puzzle.

a.			b.	
		c.		
	d.			
e.				
		f.		

### ACROSS

- a.  $\frac{1}{2}$  of 70
- b. 25% of 360
- c.  $(2 \times 15) + 7$
- d. One complete revolution
- e. 7 multiplied by itself
- f.  $10^2$

### DOWN

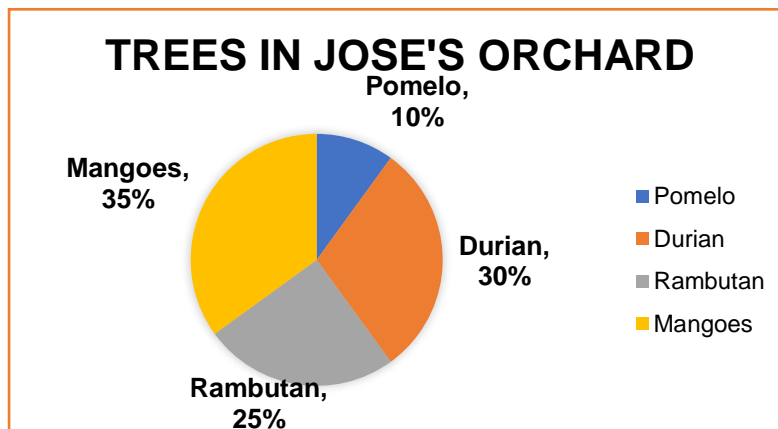
- a.  $\frac{1}{12}$  of 360
- b.  $97 \times 10$
- c. 10% of 360
- d. One number of 13 and 3
- e. A single number for  $2^4 \times 3$



## What Is It

### Illustrative Example 1: Analyze and Solve

Used the graph to answer the following questions.  
The number of trees in the orchard is 120.



1. How many mango trees are there?

Step: Find the percent of mango and multiplied it to 120 trees  
(total number of trees in Jose' orchard)

Answer:

$$35\% \text{ of mango} \times 120 \text{ trees} = 0.35 \times 120$$

$$= \mathbf{42 \text{ mangoes}}$$



2. How many more durian trees are there than the pomelo trees?

Step 1: Find the percent of durian trees and pomelo trees.

Answer:

$$\begin{aligned} 30\% \text{ of durian trees} \times 120 &= 0.30 \times 120 \\ &= \mathbf{36 \text{ durian trees}} \end{aligned}$$

$$\begin{aligned} 10\% \text{ of pomelo trees} \times 120 &= 0.10 \times 120 \\ &= \mathbf{12 \text{ pomelo trees}} \end{aligned}$$

Step 2. Subtract the number of pomelo trees from the number of durian trees.

**Answer:**

$$36 \text{ durian trees} - 12 \text{ pomelo trees} = \mathbf{24 \text{ more durian trees than pomelo}}$$

3. What fraction of the number of trees are rambutan?

Step: Get the fractional parts of rambutan trees from the pie graph and reduce it to lowest term if possible.

**Answer:**

$$\mathbf{25/120 \text{ or } 5/24}$$

4. What fraction of the number of trees are pomelo?

Step: Find the fractional parts of pomelo trees from the pie graph and reduce it to lowest term if possible.

**Answer:**

$$\mathbf{10/120 \text{ or } 1/12}$$

5. How many mango and rambutan trees are there in all?

Step 1: Find the percent of mango and rambutan trees.

**Answer:**

$$35\% \text{ of mango trees} \times 120 = 42 \text{ mango trees}$$

$$25\% \text{ of rambutan trees} \times 120 = 30 \text{ rambutan trees}$$

Step 2: Add the number of mango and rambutan trees

**Answer:**

$$42 + 30 = \mathbf{72 \text{ trees are in all}}$$



**What's More**

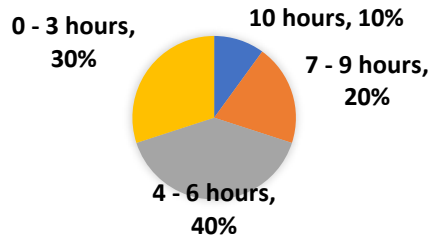
### **Enrichment Activities**

Read, analyze and solve the problem below.

1. Mr. Palma asked 50 Grade 6 pupils if they use the internet during weekends and how many hours they spend in using it.

The pie graph below shows the result.

### NUMBER OF HOURS SPENT USING INTERNET DURING WEEKENDS



1. How many pupils use the Internet for 0 – 3 hours during weekends?
2. How many pupils use the internet for at least 7 hours?
3. How many pupils use the Internet for no more than 6 hours?



#### What I Have Learned

#### How do you solve routine and non-routine problems using data presented in pie graph?

To solve routine and non-routine problems using data presented in pie graph, you need to remember how to read and interpret data in pie graph to answer the questions in a problem. Pie Graphs are used to show the percentage of a quantity in each of the several categories. It can be used to easily visualize the ratio of one category to another.

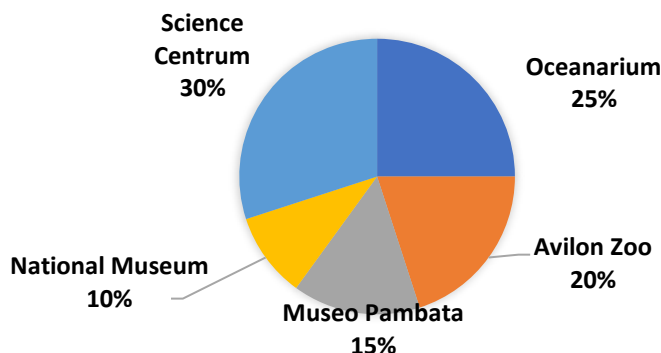


#### What I Can Do

Answer the following.

Mr. Reyes asked his class to vote on where they would most like to go on a field trip. The choices he gave them were: Museo Pambata, National Museum, Oceanarium, Science Centrum and Avilon Zoo. All 40 pupils cast one vote each.

### FIELD TRIP DESTINATIONS

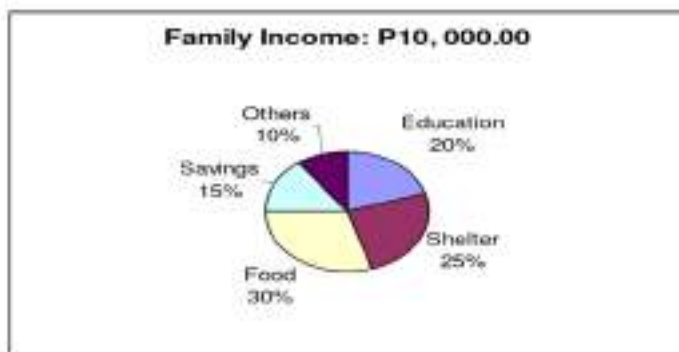


1. Which field trip destination got the highest percentage of votes?
2. Which field trip destination got the lowest percentage of votes?
3. How many pupils voted for Avilon Zoo as destination of their field trip?
4. How many more pupils chose the Science Centrum than the Oceanarium?
5. How many pupils chose out the Museo Pambata or Avilon Zoo?



## Assessment

Analyze the graph below and answer the following questions.



1. Which item has the biggest allocation?
2. How much is the budget on food?
3. Which item has the least allocation?
4. How much is spent for:
  - a. Education \_\_\_\_\_
  - b. Savings \_\_\_\_\_
  - c. Shelter \_\_\_\_\_



## Additional Activity

Make a pie graph to show how Ruby budgeted her P2,000.00 weekly allowance if she spent it for the following: 50% for fare, 35% for others, 15% for savings. How much is spent for each category?

### Lesson 8

**Describes the meaning of probability such as 50% chance of rain and one in a million chance of winning**



#### What I need to Know

This Instructional Module in Mathematics 6 is made as self-taught supplementary material in Fourth Quarter. Using step-by-step process with easy to follow examples set in locality of Las Piñas City. It helps you describes the meaning of probability such as 50% chance of rain and one in a million chance of winning.

After going through with this module, you are expected to:

1. Describes the meaning of probability such as 50% chance of rain and one in a million chance of winning.



## WHAT I NEED TO KNOW

### TEST YOURSELF

**How good are you at predicting the OUTCOMES? Try these.  
What is the probability of the following situations?**

- \_\_\_\_\_ 1. You roll a single die numbered from 1 to 6. What is the probability of rolling an odd number, expressed as a fraction?
- \_\_\_\_\_ 2. A jar contains 12 caramels, 7 mints and 16 dark chocolates. What is the probability of selecting a mint expressed as a fraction?
- \_\_\_\_\_ 3. You roll a single die numbered from 1 to 6. Is it likely you will roll a number greater than 4 the first time and a number less than 2 the 2nd?
- \_\_\_\_\_ 4. It will rain within this month. Is it likely or unlikely to happen?
- \_\_\_\_\_ 5. The letters that form the word MATHEMATICS are placed in a bowl. Are the odds favorable or unfavorable that he will choose a letter that is a vowel followed by a "T"?



### What's New

In this lesson, pupils will learn how to describe the meaning of probability such as 50% chance of rain and one in a million chance of winning.

If you listen to weather forecasts you could hear expressions like these:

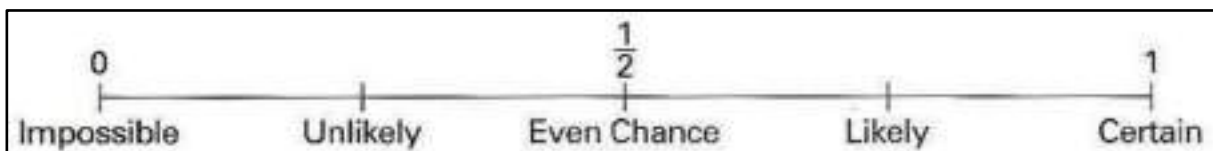
- 'There is a strong likelihood of rain tomorrow'.
- 'In the afternoon there is a possibility of thunder'.
- 'The rain will probably clear towards evening'.

Weather forecasts are made by studying charts and weather data to tell us how.

**Probability** uses numbers to tell us how likely something is to happen. The probability or chance of something happening can be described by using words such as Impossible, Unlikely, Even Chance, Likely and Certain.

An event which is **certain to happen** has a probability of **1**. An event which **cannot happen** has a probability of **0**. All other probabilities will be a number greater than 0 and less than 1. The **more likely** an event is to happen, the **closer the probability is to 1**.

### PROBABILITY SCALE



**Probability** is a measure of the likelihood of an event to occur. Many events cannot be predicted with total certainty. We can predict only the chance of an event to occur.

**For example**, when we toss a coin, either we get Head OR Tail; only two possible outcomes are possible (H, T). But if we toss two coins in the air, there could be three possibilities of events to occur, such as both the coins show heads or both shows tails or one shows heads and one tail, i.e.(H, H), (H, T),(T, T).

The **probability formula** is defined as the possibility of an event to happen is equal to the ratio of the number of favourable outcomes and the total number of outcomes.

### PROBABILITY FORMULA

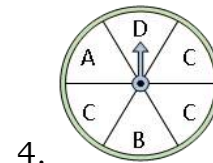
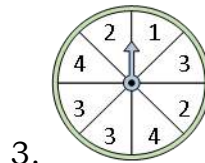
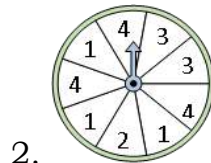
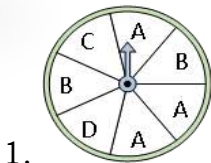
**. Probability of event to happen  $P(E) = \frac{\text{Number of favourable outcomes}}{\text{Total}}$**



How **likely** something is to happen.

### *What's In*

#### Review:



**Answer the following questions. Please refer to the pictures above.**

1. Which two letters is the spinner equally likely to land on?
2. Which two numbers is the spinner equally likely to land on?
3. Which number is the spinner most likely to land on?
4. Which letter is the spinner most likely to land on?
5. Which number is the spinner least likely to land on?



**What is It**

Many events can't be predicted with total certainty. The best we can say is how **likely** they are to happen, using the idea of probability.

### Example #1: Tossing a Coin



When a coin is tossed, there are two possible outcomes:

- heads (H) or
- tails (T)

We say that the probability of the coin landing **H** is  $\frac{1}{2}$

And the probability of the coin landing **T** is  $\frac{1}{2}$

### Example #2: Throwing Dice



Example: Mr. Dumlao wants to see how many times a "double" comes up when throwing 2 dice.

The Sample Space is all possible Outcomes (36 Sample Points):

**{1,1} {1,2} {1,3} {1,4} ... {6,3} {6,4} {6,5} {6,6}**

The Event Mr. Dumlao is looking for is a "double", where both dice have the same number. It is made up of these 6 Sample Points:

**{1,1} {2,2} {3,3} {4,4} {5,5} and {6,6}**

These are Mr. Dumlao's Results:

EXPERIMENT	IS IT DOUBLE?
{3,4}	No
{5,1}	No
{2,2}	Yes
{6,3}	No
...	...

After 100 experiments, Mr. Dumlao has **19 "double" Events** ... is that close to what you would expect?

**Note:**

When a single die is thrown, there are six possible outcomes: **1, 2, 3, 4, 5, 6**.  
The probability of any one of them is  **$\frac{1}{6}$** .



What's More

**Enrichment Activities**

**Study the Letter Tiles and answer the questions below. Write your answers in fraction form.**

**Letter Tiles**

The letter tiles pictured to the right are placed in a bag. Without looking, Mr. Dumlao draws them from the bag one at a time. Each time he draws

A	H	T	E	A
W	C	A	U	E
T	S	E	A	C

1. What is the probability that Mr. Dumlao will draw the letter T from the bag?
2. What is the probability that Mr. Dumlao will draw the letter A from the bag?
3. What is the probability that Mr. Dumlao will draw a vowel from the bag?
4. Is Mr. Dumlao more likely to draw a vowel or a consonant from the bag?
5. What is the probability of Mr. Dumlao drawing one of the letters found in the word cat?
6. What is the probability of Mr. Dumlao drawing one of the letters found in the word seat?
7. What is the probability of Mr. Dumlao drawing one of the letters found in the word cheat?
8. What is the probability of Mr. Dumlao drawing a letters that is not found in the word sauce?



### What I Have Learned

#### What is probability?

**Probability** is the measure of how likely an event or outcome is. Different events have different probabilities!

#### How do we describe probability?

You can describe the probability of an event with the following terms: **certain** (the event is definitely going to happen), **likely** (the event will probably happen, but not definitely), **unlikely** (the event will probably not happen, but it might), **impossible** (the event is definitely not going to happen).

#### How do we express probabilities?

Usually, we express **probabilities as fractions**. The **numerator** shows the **POSSIBLE number** of ways an event can occur. The **denominator** is the **TOTAL number** of possible events that could occur.



### What I Can Do

#### Answer the following.

1. A die is thrown once. What is the probability that the score is a factor of 6?
2. A fair coin is tossed three times. What is the probability of obtaining one Head and two Tails? (A fair coin is one that is not loaded, so there is an equal chance of it landing Heads up or Tails up.)
3. A committee of three is chosen from five councilors - Reyland, Ador, Eddie, Erwin and Ralph. What is the probability that **Reyland** is on the committee?
4. There are **10 counters** in a bag: **3 are red**, **2 are blue** and **5 are green**. The contents of the bag are shaken before Maxine randomly chooses one counter from the bag. What is the probability that she doesn't pick a red counter?
5. There are **5 marbles** in a bag: **4 are blue**, and **1 is red**. What is the probability that a blue marble gets picked?





## ASSESSMENT

**Direction:** Read the situation below and write the probability each item. Write your answer in fraction form.

**There are 5 white balls, 8 red balls, 7 yellow balls and 4 green balls in a container. A ball is chosen at random.**

1. What is the probability of choosing red?
2. What is the probability of choosing green?
3. What is the probability of choosing either red or white?
4. What is the probability of choosing neither white nor green?
5. What is the probability of choosing a ball other than yellow?



## ADDITIONAL ACTIVITIES

**Direction:** Read the situation below and write the probability each item. Write your answer in fraction form.

**Numbers from 1 to 50 are written on a piece of paper and dropped into a box. A paper is chosen at random.**

1. Find the probability of choosing multiples of 10.
2. Find the probability of choosing an even number.
3. Find the probability of choosing an odd number.
4. Find the probability of choosing factors of 36.
5. Find the probability of choosing neither odd nor prime.

## Lesson 9

## Perform Experiments and Record Outcomes



### What I need to Know

This Instructional Module in Mathematics 6 is made as a self-taught supplementary material in Fourth Quarter. Using step-by-step process with easy-to-follow examples set in locality of Las Piñas City. This module focuses on the main topic about Statistics and Probability

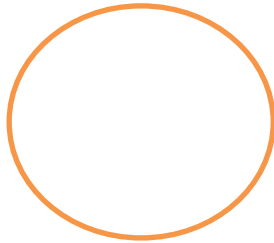
This module focuses on the learning competencies about predicting outcomes. (M6SP-IVg-19). After going through this module, you are expected to:

1. Perform experiments and record outcome



### ***What I Know***

A spinner for a game is a circle and has 8 equal sections. Each section is labelled with numbers 1-8. Draw a picture of the spinner and label each section.



What is the probability of spinning a

2 ?	_____
5 ?	_____
6 ?	_____
9 ?	_____
10 ?	_____

This lesson provides you more opportunities to study more about probability. This is used to describe how likely or unlikely it is that something will happen. Probability may be given in fraction, decimal or percent. We can also perform experiment and predict outcomes using formula.



### ***What's In***

- **When dealing with probabilities**, it is important to be able to identify all the possible outcomes.
- There are methods to be used such as Listing and Tree Diagrams and Theoretical and Experimental Probability.



### ***What's New***

One Sunday morning, Jane's family decided to have a picnic in Tagaytay. She volunteered to bring a basket full of fruits. In the basket were 6 apples, 8 oranges, 3 watermelons, 4 green mangoes and 3 papaya. If her eldest daughter would pick out one fruit at random, what would be the chances of getting an apple from the basket?

The probability of getting an apple can be expressed as  $P(\text{apple})$ . There are 24 possible outcomes, because that is the total number of fruits inside the basket. Each fruit is equally likely to be picked. The apple refers to the favorable outcome and in this case, there are 6 pieces of apples inside it, this means that there are 6 chances in 24 of choosing an apple.

$$\frac{6}{24} \quad \begin{array}{l} \leftarrow \text{number of favorable outcomes} \\ \leftarrow \text{number of possible outcomes} \end{array}$$

The probability of picking an apple is  $\frac{6}{24}$



## What's It

The probability of an event  $P(E)$  defines as the ratio of the number of favorable cases to the total number of equally likely cases.

$$P(E) = \frac{\text{number of favorable cases}}{\text{number of equally likely cases}}$$

If the probability of an event  $P(E)$  is equal to 1, we can conclude that a certain event will surely happen. But if the probability of an event  $P(E)$  is equal to 0, then we can say that the event will **NOT** take place, or in other words, it is an impossible event.

### What do you think is the probability of picking banana?

Since there are no bananas inside the basket, the number of our favorable outcomes is also zero and the probability is 0 (zero).

$$P(\text{banana}) = 0$$

### What is the probability of picking papaya?

Since there are 3 possible favorable outcomes, then,

$$P(\text{papaya}) = \frac{3}{24}$$

**Another example:** A fair die is rolled, what is the probability of getting an odd number?

Experiment : rolling a fair die

Sample space: { 1, 2, 3, 4, 5, 6 }

Sample point : 1, 2, 3, 4, 5, 6

A total of 6 possible outcomes are equally likely to happen, since the die that we use is unbiased. There are 3 possible favorable outcomes that will show up { 1, 3, 5 } as odd numbers.

**Therefore, the probability of getting an odd number  $P(\text{odd})$ , is  $\frac{3}{6}$  or  $\frac{1}{2}$ .**



## What's More

**Activity:** You choose a marble at random from a box containing 4 red marbles, 2 green marbles and 3 blue marbles. Find the event.

1. event in favor of red \_\_\_\_\_
2. event against green \_\_\_\_\_
3. even against red \_\_\_\_\_
4. event in favor of blue \_\_\_\_\_
5. event in favor of yellow \_\_\_\_\_



## What I Have Learned

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.

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

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.

We can also find the probability of an event by doing an experiment. When we do this, we are finding experimental probability.

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



## What I Can Do

Each of the 11 letters of the word “ **MATHEMATICS** ” is written on a separate card. The cards are placed faced down and shuffled. A card is chosen at random. What is the probability that it will show each of the following?

- a. The letter M
- b. A vowel
- c. The letter E
- d. A consonant
- d. The letter S



## Assessment

**Answer the following:**

1. When a die is rolled, what is the probability of getting an odd number? \_\_\_\_\_
2. After two coins are tossed, find the probability that two tails are obtained? \_\_\_\_\_
3. After two dice are rolled, find the probability that the sum is:
  - a. less than 13 \_\_\_\_\_
  - b. equal to 5 \_\_\_\_\_
  - c. more than 12 \_\_\_\_\_
4. A card is drawn at random from deck of 52 playing cards? Find the probability of getting the diamond 5? \_\_\_\_\_
5. A jar contains contains 7 red marbles and 10 white marbles. If a marble is drawn from the jar at random, what is the probability that this marble is white?



## Additional Activities

Perform an experiment for each event, and then list all the possible outcomes:

- a. Tossing 3 coins
- b. Tossing a coin and rolling one regular die

## Lesson 10

Make listings and diagrams of outcomes and tells the number of favorable outcomes and chances using these listings and diagrams



### What I need to Know

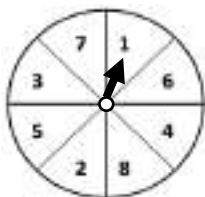
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This modules focuses on the learning competencies on making listings and diagrams of outcomes and tells the number of favorable outcomes and chances using these listings and diagrams . After going through this module, you are expected to:

1. Make listings and diagrams of outcomes and tells the number of favorable outcomes and chances using these listings and diagrams.
2. Draw tree diagrams to show all possible outcomes and chances



### **WHAT I KNOW**



Supposed you spin a spinner numbered 1-8. List down all the possible outcomes.

\_\_\_\_\_



### **WHAT'S IN**

Probability is use to identify all posible outcomes. To calculate probability, we need to know all the different things that can happen. A sample space is a list of all possible outcomes of an activity or experiments. The following are some of the methods that we can use.

#### **Listing and Tree Diagram**

A tree diagram is like a natural tree which starts from a single trunk and spread out into branches, twigs, and leaves. It is simply a way of representing a sequence of events and particularly useful in probability since they record all possible outcomes in a clear and uncomplicated manner.



### **WHAT'S IS IT**



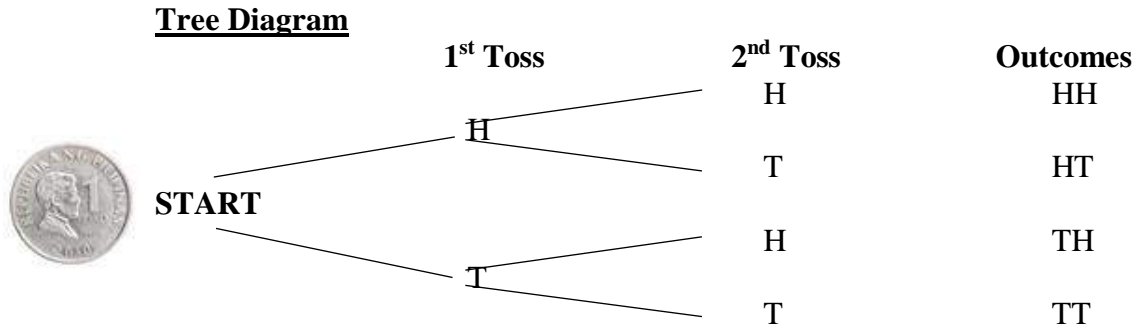
#### ***Problem: Tossing Coins***

How many distinct results are there if a coin is tossed 2 times?

To solve this problem,we can use the listing and tree Diagram method.

Solution:

Use H for Head and T for Tail.



There are 4 possible outcomes. (HH, HT, TH, TT)

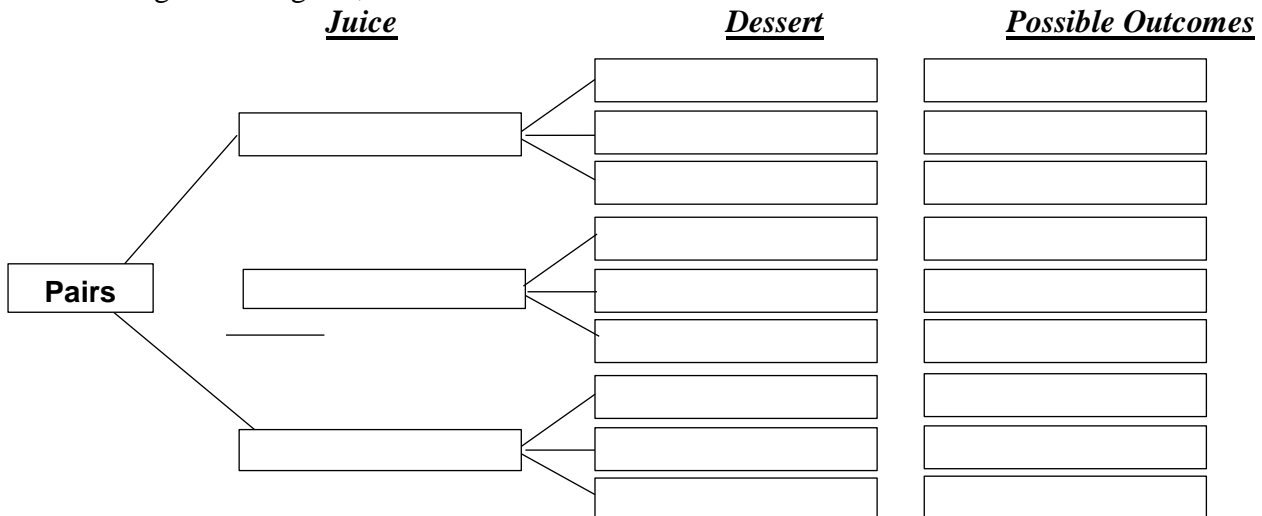


**WHAT'S MORE**

Activity 1: In Liza's birthday party, a guest has a choice of juice drink: orange, pomelo, apple; and dessert: ice cream, cake, or fruit salad. How many distinct juice – dessert pairs are possible?

*Solution:*

Using Tree Diagram, fill in the box with correct items.



- How many distinct juice – dessert pairs are possible?



**WHAT I HAVE LEARNED**

To tell the number of favorable outcomes and chances, we can use listings and tree diagrams. A tree diagram is a simple method to represent sequence of event and to enumerate the list of all possible outcomes.



## **ASSESSMENT**



Two cards are drawn from a well-shuffled 7 lettered cards. Make a tree diagram and answer the following questions.

How many chances of drawing a card having the following letter/s:

- |            |               |
|------------|---------------|
| a. M , T   | d. Y          |
| b. A and L | e. L, O, V, E |
| c. M,      |               |

## **Lesson 11**

**Make simple predictions of events based on the results of experiments**



### **What I need to Know**

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This modules focuses on the learning competencies on making simple predictions of events based on the results of experiments. **(M6SP-IVi-23)**  
After going through this module, you are expected to:

1. Make simple prediction of events based on the results of experiment..



### **WHAT I KNOW**

#### **Test yourself**

**How good are you at predicting the future? Try these. Write C if the events are certain to happen. Write I if you think it is impossible to happen.**

- \_\_\_\_\_ 1. The sun will rise tomorrow.
- \_\_\_\_\_ 2. It will snow in Las Piñas on December 2021.



- \_\_\_\_\_ 3. You will reach 250 years of age.  
 \_\_\_\_\_ 4. It will rain within this month.  
 \_\_\_\_\_ 5. It will rain this weekend.



### **WHAT'S IN**

#### **Review:**

1. A fair coin is tossed.
  - a) What are the possible outcomes? \_\_\_\_\_
  - b) What is the chance of showing head? \_\_\_\_\_
  - c) What is the chance of showing tail? \_\_\_\_\_
2. Kate has 3 blouses and 4 skirts. How many different outfits can she make?



### **WHAT'S NEW**

**Close to 0,  $\frac{1}{2}$ , or 1, exactly 0 or exactly 1**

Consider the following situations in terms of:

Close to 0 – <b><u>unlikely to happen</u></b>	Exactly 0 – <b><u>impossible</u></b>
<b><u>to happen</u></b>	
Close to 1 – <b><u>likely to happen</u></b>	Exactly 1 – <b><u>certain to</u></b>
<b><u>happen</u></b>	
Close to $\frac{1}{2}$ – <b><u>fair or even chance to happen</u></b>	

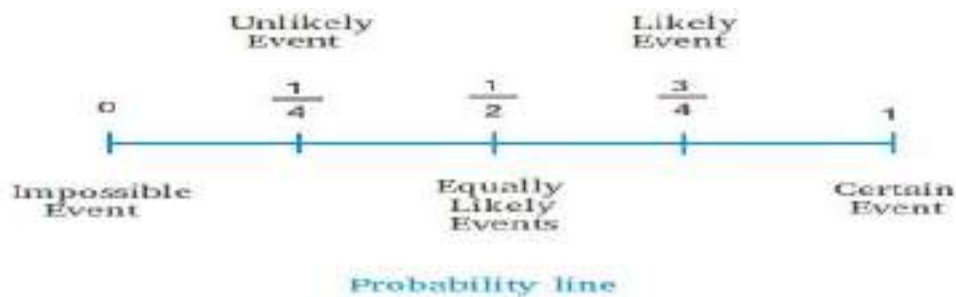
Write your answer before the number.

- \_\_\_\_\_ 1. When a pupil is present, he is ready for the day's school work.  
 \_\_\_\_\_ 2. When a child is happy, he is healthy.  
 \_\_\_\_\_ 3. When one stares at nothing, he has depression.  
 \_\_\_\_\_ 4. Whales are mammals.  
 \_\_\_\_\_ 5. The sun rises in the west.



### **WHAT IS IT**

Let us use number line to show the probability of an event.



We can see on the number line that if the probability is less than  $\frac{1}{2}$ , an event is unlikely to happen. If the probability is more than  $\frac{1}{2}$  the event is likely to happen. A probability of 1 means that the event will certainly happen and probability of 0 means the event is impossible to happen.

The probability of  $\frac{1}{2}$  is what we commonly refer to as “50-50” chance. This means that the event is equally likely and unlikely to happen.

Use **impossible, most unlikely, as likely as unlikely, most likely,** and **certain** to describe each of the following statements.

a. It will snow tomorrow.

The climate of the Philippines is tropical, it is impossible to snow.

b. The likelihood that 2 people in any group of 15 will have the same birthday is about 8%.

Since the probability is closer to 0%, matching birthdays in a group of 15 is most

unlikely (but not impossible).

c. The weather forecaster says there is a 50% chance of rain today.

This means that the chance to rain today is as likely as it is unlikely.

It does not mean

that it will rain nor will not rain today.

d. The sports’ analyst says that Manny Pacquiao has 75% chance of winning his fight.

This means that Manny Pacquiao is likely to win his fight. It does not mean that he

will win the fight. So, if he does not win, don’t say the analyst is wrong.

e. The sun will rise tomorrow.

It is certain that the sun will rise every day. So, the probability of the sun rising is 100%.



### **WHAT’S MORE**

**Classify the situation based on the scale:**

0 = impossible to happen

$\frac{1}{4}$  = unlikely to happen

$\frac{1}{2}$  = equally likely to happen

$\frac{3}{4}$  = likely to happen

1 = certain to happen

Write your answer before the number.

- \_\_\_\_\_ 1. Bats are birds.
- \_\_\_\_\_ 2. Fish can live on land.
- \_\_\_\_\_ 3. A good reader understands well.
- \_\_\_\_\_ 4. A rich man is always happy.
- \_\_\_\_\_ 5. A crocodile always lives in water.



### **WHAT I HAVE LEARNED**

#### **Match Column A with Column B**

<b>A</b>	<b>B</b>
_____ 1. Close to 0	a. certain to happen
_____ 2. Exactly 0	b. fair or even chance to happen
_____ 3. Close to $\frac{1}{2}$	c. likely to happen
_____ 4. Exactly 1	d. impossible to happen
_____ 5. Close to 1	e. unlikely to happen



### **WHAT I CAN DO**

**Make simple predictions out of the following situations.**

<b>SITUATIONS</b>	<b>PREDICTION/S</b>
1. A flashlight fails to light.	
2. There are many people in the house.	
3. A boy is crying because he cannot copy what is written on the board.	
4. The food remains uncooked.	
5. The door is locked.	



### ASSESSMENT

Which of the following situations can be considered as unlikely to happen, likely to happen, equally likely to happen, impossible to happen, or certain to happen. Write the answer before the number.

- |       |   |
|-------|---|
| _____ | 1. When one is seated, he is rested.                      |
| _____ | 2. When a man sleeps, he snores.                          |
| _____ | 3. Reading books makes a man wiser.                       |
| _____ | 4. Fever indicates that one is sick.                      |
| _____ | 5. When the cloud is low and dark, it means it will rain. |

## Lesson 12

Solve routine and non-routine problems involving experimental and theoretical probability



### What I need to Know

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This modules focuses on the learning competencies on **solving routine and non-routine problems involving experimental and theoretical probability.**

After going through this module, you are expected to:

1. **solve routine and non-routine problems involving experimental and theoretical probability.**



### WHAT I KNOW

#### Test yourself

**A. Give the probability of the event as described in each.**

**A box contains the following number cards**

2	4	2	6	3	7	8	2	4	8
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- \_\_\_\_\_ 1. Find the probability of picking a card with numeral 3.
- \_\_\_\_\_ 2. Find the probability of picking a card with an even number.
- \_\_\_\_\_ 3. Find the probability of picking a card with number more than 5.

**B. A Spinner numbered 1 to 8 is spun.**

What is the probability of spinning:

- \_\_\_\_\_ 1. An odd number?
- \_\_\_\_\_ 2. A factor of 9



**WHAT'S**  
**IN**

**Review:**

Make a simple prediction on the following situations. Use **impossible**, **unlikely**, **even**, **likely**, and **certain** to describe each of the following situations. Write your answer before the number.

- \_\_\_\_\_ 1. Once a teacher always a teacher.
- \_\_\_\_\_ 2. When a man sleeps, he snores.
- \_\_\_\_\_ 3. When one is seated, he is rested.
- \_\_\_\_\_ 4. When the cloud is low and dark, it means it will rain.
- \_\_\_\_\_ 5. A noisy can is empty.



**WHAT'S NEW**

Predictions can be certain, most likely, equally likely to happen, less likely to happen, and impossible to happen.

Problem A: Theoretical Probability

A bowl contains 12 slips of paper, each with different name of a month. Find the theoretical probability that a slip selected at random from the bowl has a name of a month that starts with letter J.

There are 12 months in a year, so there are twelve possible outcomes.

There are three months that starts with letter J: January, June and July.

**Understand**

a. What is asked?

The theoretical probability that a slip selected at random from the bowl has a name of a month that starts with letter J.

b. What are the given facts?

12 slips of paper, 12 months in a year, and three months that starts with letter J: January, June and July

**Plan**

Division

**Solve**

$$P = \frac{3}{12}$$

Probability =

Number ways it can happen

Number of total outcomes

$$P = \frac{1}{4}$$

The probability of picking a month that begins with the letter J is  $\frac{1}{4}$ .**Problem B: Experimental Probability**

The table below shows the results of a card experiment.  
Each time a card was picked, it was returned to the bag.

CARD EXPERIMENT	
OUTCOME	NUMBER
YELLOW	27
GREEN	15
RED	8
TOTAL	50

**Questions**

- How many trials of picking a card were made?
- How many times was yellow card picked?
- What is the experimental probability of picking a red card?
- If 10 yellow cards were in the bag, how many green cards would you predict were there?

**Understand**

a. What is asked?

- the number of trials made by picking a card
- the number of times the yellow card was picked
- the experimental probability of picking a red card
- the number of predicted green cards if 10 yellow cards were in the bag

b. What are the given facts?

- 28 yellow cards, 7 green cards, and 15 red cards were picked

**Plan**

We can conduct the experiment of picking a card, returning it to the bag, and the recording the result. Applying the formula could also be a good help

### Solve

1. We will get the sum of the number of yellow, green, and red cards:  $27 + 15 + 8 = 50$
2. The yellow card was picked 27 times as recorded in the table.
3. A red card was picked 8 times out of 50 trials.

$$P = \frac{8}{50}$$

Probability =	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Number of times a red card was</div> <div style="border-top: 3px double black; padding: 2px; display: inline-block;">Number of total trials</div>
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$$P = \frac{4}{25}$$

The experimental probability of picking a red cards is  $4/25$

4. Based on the provided results. Picking up yellow card is about twice the chance of picking up a green card. The number of green cards maybe 5.

### Check

Appropriate application of pattern or formula in getting the experimental probability will make our answers correct.



### WHAT IS IT

A bag has 1 blue, 3 green, 2 red, and 2 yellow marbles.

Find the probability

1. 1 blue marble
2. 3 green marbles
3. 2 red marbles
4. 2 yellow marbles



### WHAT'S MORE

**Solve the following:**

1. One card is chosen at random from deck. What is the probability of getting a queen?
2. A day is chosen from a week. Find the probability of choosing Tuesday.
3. A die has 6 sides. The sides have the numbers 1, 2, 3, 4, 5, and 6. If the die is thrown once, what is the probability of rolling a number 5?
4. A card is drawn from a deck of 52 cards. What is the probability of getting a king?



### **WHAT I HAVE LEARNED**

Steps in solving routine and non-routine problems

#### **1. Understand**

What is asked?

What are the given facts?

#### **2. Plan**

What is the strategy to solve the problem?

What is/are the operation to be used?

What is the number sentence?

#### **3. Solve**

Carry out the plan

#### **4. Check**

Look back the process



### **WHAT I CAN DO**

**Solve the following problems:**

1. There are 10 white balls, 7 yellow balls, 5 red balls, and 2 green balls in a box. A ball is chosen at random. What is the probability of choosing yellow?
2. You roll a die. What is the probability of getting even numbers?



### **ASSESSMENT**

**Solve the following problems:**

1. A bag contains 7 blue sticks, 3 red sticks, and 2 orange sticks and you ask your friend to pick one without looking. What is the probability that stick will be red?



2. When a pair of die rolled, what is the probability that the number rolled will be five?
3. You ask a friend to think of a number from 5 to 10. What is the probability that this number will be 7?



### **ADDITIONAL ACTIVITY**

#### **Solve the following:**

1. A teacher must select 2 high school students to represent their school in a conference. He randomly picks names from a hat that contains the names of 3 Grade 7, 2 Grade 8, 4 Grade 9, and 4 Grade 10. What is the probability that a Grade 8 and then Grade 7 are chosen?
2. On a popular television game show, a contestant must choose one of five envelopes. One envelop contains the grand prize, a car. Find the probability of not choosing a car.

### **References**

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