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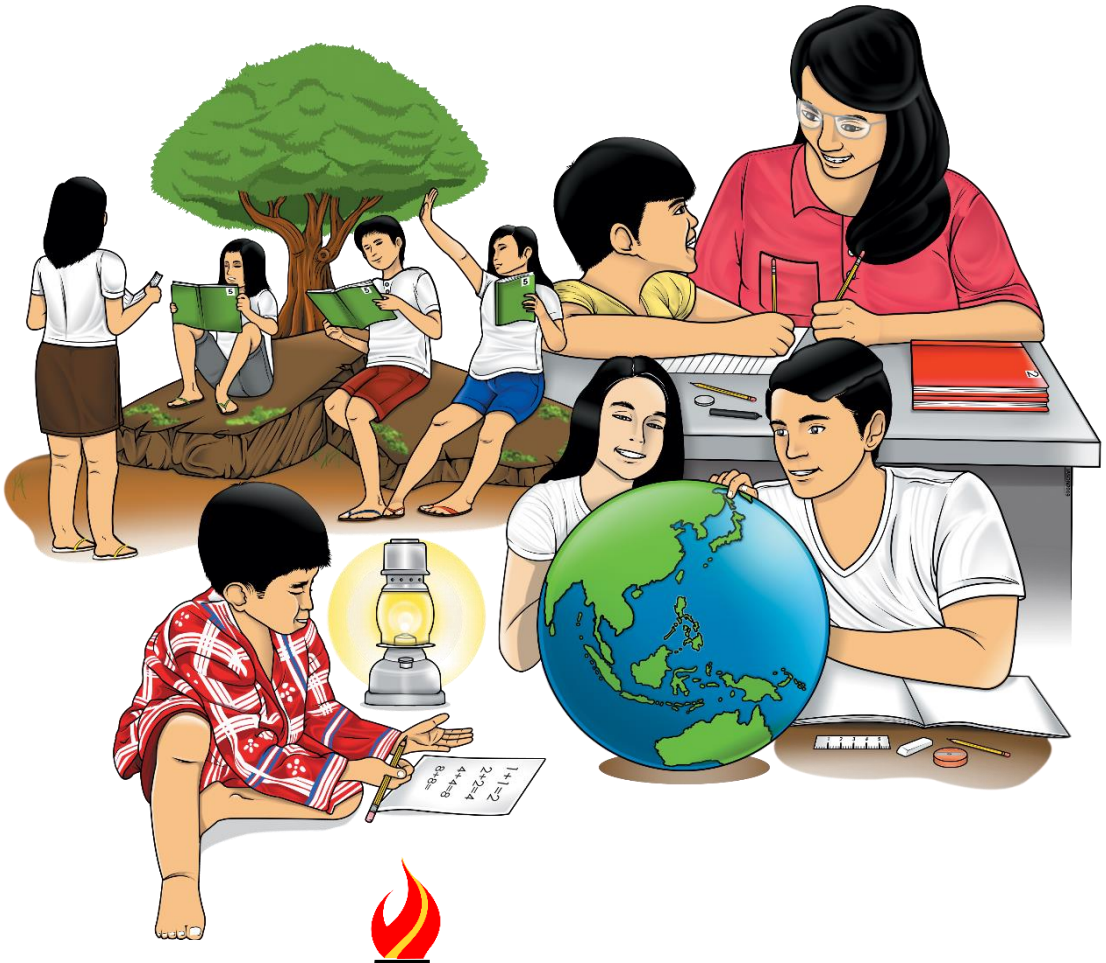
Mathematics

Quarter 4 – Module 2: Solving Routine and Non-Routine Problems Involving Area of a Circle



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Secretary: Leonor Magtolis Briones
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Development Team of the Module

Writer:	Maria Leyda C. Carausos
Editor:	Niann L. Atis, Cathrine O. Cueva
Reviewers:	Renato S. Cagomoc, Rolando M. Lacbo, Joshua Sherwin T. Lim, Geraldine P. Sumbise
Layout Artist:	Noel E. Sagayap
Management Team:	Ramir B. Uytico Arnulfo R. Balane Rosemarie M. Guino Joy B. Bihag Ryan R. Tiu Sarah S. Cabaluna Thelma Cabadsan-Quitalig Elena S. De Luna Renato S. Cagomoc Noel E. Sagayap Geraldine P. Sumbise Joshua Sherwin T. Lim

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E-mail Address: region8@deped.gpv.ph

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Mathematics

Quarter 4 – Module 2: Solving Routine and Non-Routine Problems Involving Area of a Circle

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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

Good day Mathletes! This module was designed and written to help you gain an understanding of and to test your ability in solving routine and non-routine word problems involving the area of a circle. We know that the formula serves as a guide in solving for the area of a circle. Knowing how to derive the formula of the area of a circle and how to use it in real-life situations is important.

So, what are you waiting for? Stay focused and start-up.

At the end of this module, you are expected to:

- describe the different terms used in the formula;
- appreciate the importance of the formula in finding the area of a circle; and
- solve routine and non-routine problems involving the area of a circle

Before going any further, let us check your understanding of the formula in finding the area of a circle.

What I Know

Directions: Read carefully each statement below. Choose the letter that corresponds to the best answer. Write the chosen letter on a separate sheet of paper. Please use $\pi = 3.14$.

1. Find the area of the face of a circular wall clock with a radius of 10 cm.

   (A) 37.68 cm^2 (B) 62.8 cm^2 (C) 314 cm^2

2. A circular swimming pool has a diameter of 4.2 m. Find its area.

   (A) 13.188 m^2 (B) 13.8474 m^2 (C) 55.3896 m^2

3. If a circular flower garden has a diameter of 3.2m, what is the area of the circular garden?

   (A) 8.0384 m^2 (B) 20.096 m^2 (C) 32.1536 m^2

4. What is the area of the circular fountain if its radius is 2.3m?

(A) 19.7116 m^2 (B) 16.6106 m^2 (C) 13.8068 m^2

5. If a circular rag has a radius of 25 centimeters, what is the area of the rag?

(A) 1 962.5 cm^2 (B) 490.625 cm^2 (C) 19.625 cm^2

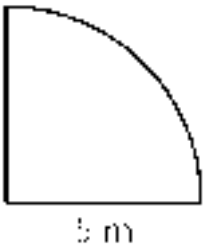
6. Ariel wanted to know the area of a children's swimming pool which he will look after as a life guard. He was informed that its radius is 3.5m. What is its area?

(A) 38.465 m^2 (B) 43.685 m^2 (C) 52.376 m^2

7. The circumference of a circular table is 6.28 m. What is its area?

(A) 3.14 m^2 (B) 6.28 m^2 (C) 12.56 m^2

8. Find the area of the given figure at the right.



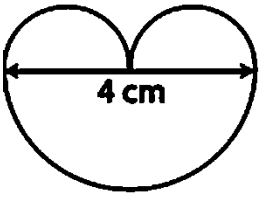
(A) 78.5 m^2

(B) 39.25 m^2

(C) 19.625 m^2

9. Find the area of the given figure at the right.

The figure consists of 3 semicircles.

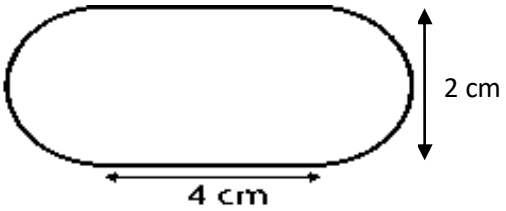


(A) 9.42 cm^2

(B) 6.28 cm^2

(C) 3.14 cm^2

10. Find the area of the given figure at the right. The figure consists of a rectangle and two semicircles.



(A) 11.14 cm^2

(B) 12.56 cm^2

(C) 14.28 cm^2

Lesson 1 Solving Routine and Non-routine Problem Involving Area of a Circle

Learning how to solve routine and non-routine problems involving area of a circle is important in the field of engineering, architecture, electrical jobs and even plumbing. Success in learning this lesson means you know how to find the area of a circle.

Are you ready? Let's start.

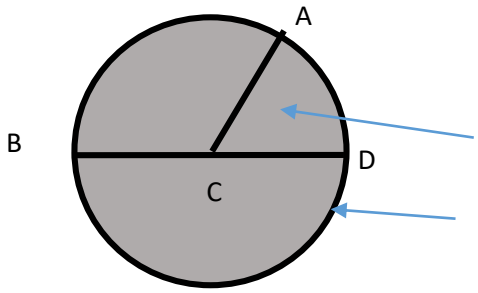
What's In

In the previous lessons, you learned what the area of a circle is. It is the total area enclosed by the circumference of the circle. The shaded portion inside the circle shown at the right represents the area of the circle.

The formula for the area of a circle is:

$$A = \pi r^2 \text{ or } A = \pi \text{ x } r \text{ x } r$$

In this formula, **A**, is, again, the *area*, **r** represents the *radius*, and **π** is a Greek letter pronounced *pi*, which is approximately equal to **3.14**. The **radius** of a circle is half the diameter the distance from any point of the circle to the center. The **diameter** of a circle is the distance from two points of the circle through the center. The value **pi** or **π** is the ratio of a circle's circumference to its diameter. The value of pi is a nonterminating and nonrepeating decimal but we can use the value 3.14 or $\frac{22}{7}$ as its approximation. Radius and diameter may refer to the line segment or its length.



Diameter $\overline{BD}$ with length equal to d = 2r

Radius $\overline{AC}$ with length equal to r units

Area

The shaded region in the circle = πr^2

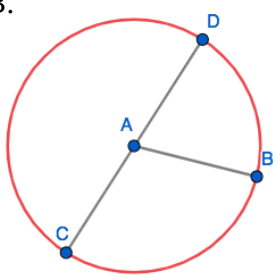
Circumference

The outline around the circle = $2\pi r$

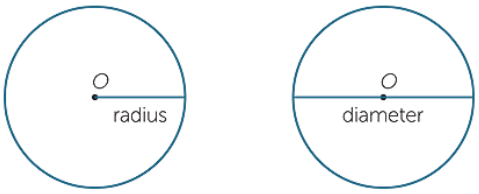
π is a number approximately equal to 3.14

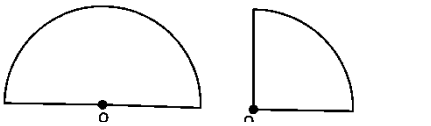
Let us refresh your memory and try to answer the following exercises below by determining if the statement is true or false.

1. The length of segment CD is twice the length of segment AB.
2. The radius is equal to the length of segment AB.
3. The center of the circle is at point A.
4. The length of line segment CD is the diameter of the given circle.
5. The red outline in the figure is the area of the circle.



A diameter divides the circle into two congruent parts. Each part is a semicircle. If we draw a radius perpendicular to the diameter of a semicircle, the semicircle is further divided into two congruent parts, each is one-fourth (or a quarter) of a circle.

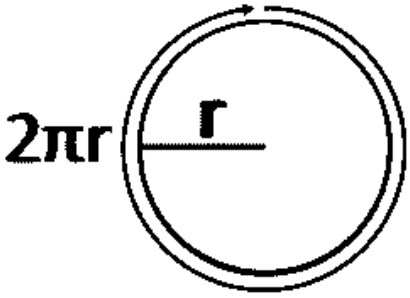


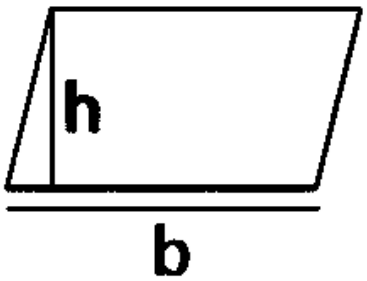


semicircle quarter of a circle

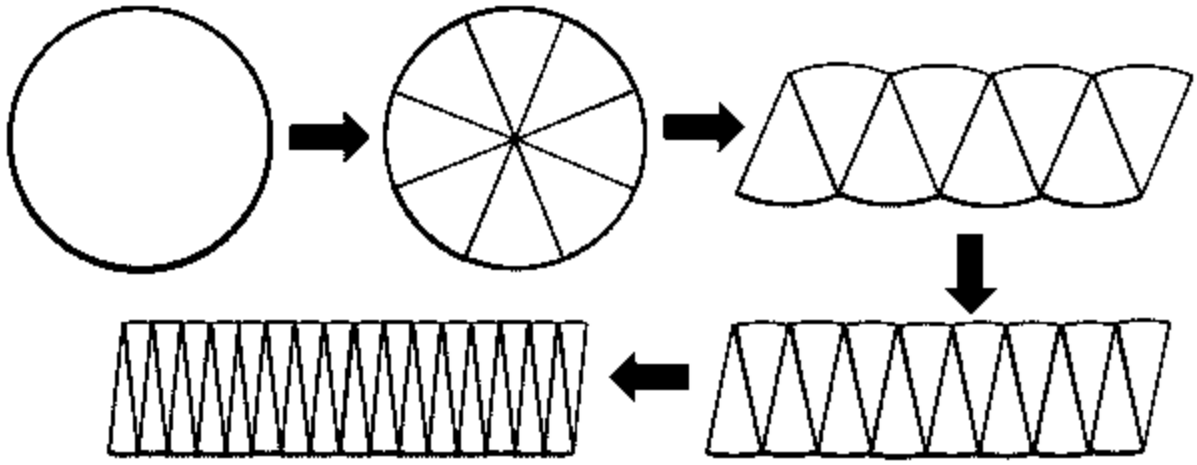
What's New

From the previous lessons, you were taught how to find the circumference of a circle and the area of a parallelogram.

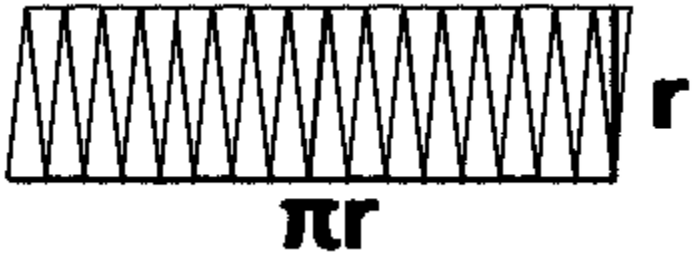




Consider dividing the circle with radius r into equal parts, then arrange them as shown. Notice that as there are more parts the circle is divided into, the more it resembles the parallelogram.



Observe: the base of the parallelogram is one-half the circumference of the circle (1/2 x 2πr = πr) and the height of the parallelogram is the radius r.



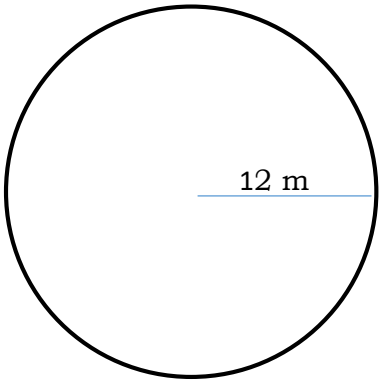
Area of the Circle = Area of the Parallelogram = base x height = πr x r = πr^2

In this lesson, we will deal with solving routine and non-routine word problems involving area of a circle.

You will understand this concept as you go along with this module.

Analyze the problem below:

Consider the figure as a blueprint of a helipad to be installed on top of a building. Suppose that its radius is 12 m. What is the area of the helipad?



Note: A helipad is a landing area or platform for helicopters and powered lift aircraft.

Area of the circle $= \pi r^2$

$= 3.14 \times (12\ m)^2$

$= 3.14 \times 144\ m^2$

$= 452.16\ m^2$

It's your turn. Find the area of the circle given its radius.

1. r = 11 cm A = _____
2. r = 20 cm A = _____
3. r = 1.5 m A = _____
4. r = 2.2 m A = _____
5. r = 8 m A = _____

What Is It

The area of a circle is the number of square units inside that circle. It can be computed by using the formula $A=\pi r^2$. Solving the area of a circle is a helpful tool in Mathematics and real-life situations, because areas occur frequently in daily life and help to simplify many of our interactions by putting numbers into perspective.

1. The fence surrounding a circular garden is 31.4 m. What is the area of the garden?

To find the area of the circular garden, we need the radius. Let's use the given length of the garden's fence.

Length of the garden's fence = Circumference of the circle = $2\pi r$

$31.4 \text{ m} = 2 \times \pi \times r$

$31.4 \text{ m} = 2 \times 3.14 \times r$

$31.4 \text{ m} = 6.28 \times r$

$r = \frac{31.4}{6.28} \text{ m} = 5 \text{ m}$

Area of the circular garden = πr^2

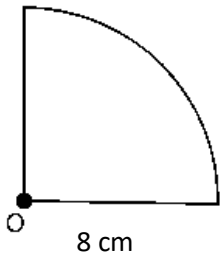
$= 3.14 \times (5 \text{ m})^2$

$= 3.14 \times 25 \text{ m}^2$

$= 78.5 \text{ m}^2$

Answer: The area of the circular garden is 78.5 m^2

2. Find the area of the given figure.

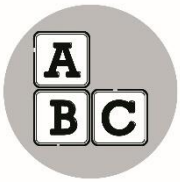


The given figure is one-fourth of a circle. So, its area is

¼ time πr^2 = ¼ x 3.14 x $(8\ cm)^2$

= ¼ x 3.14 x 64 cm^2

= 50.24 cm^2



What's More

Activity 1: Solve It!

Directions: Solve the given problems.

1. A circle's diameter is 10 m. What is its radius?
2. John draws a circle with a radius of 26 centimeters. What is the circumference of the circle?
3. A placemat has a diameter equal to 6 cm. If a red thread is to be knitted around it, how long is the knitted part of the circle?
4. Maria drew parallel horizontal lines around a flower pot as its design. How long is the flower pot's diameter if each horizontal line measures 314 cm?
5. How long is the radius of a circle if its circumference is 251.2 cm?

Activity 2: Find My Area!

Read, analyze each problem below. Write your solutions and answer in an extra sheet of paper.

1. The bottom of a children's swimming pool is circular with a radius of 4 meters is made up of green tiles. How many square meters is the circular swimming pool?
2. A water sprinkler sprays water within a radius of 3.5 m. What is the area of the surface that the sprinkler waters?
3. A circular pool has a diameter 2.8 meters long. What is the area of that pool?
4. The face of a circular clock with a diameter of 25 centimeters is attached to a wall. How much area does it cover?
5. Khalil rides a bike a distance of 94.2 m around a circular rink. What is the area of that rink?

What I Have Learned

Directions: Answer the following. *Let's see what have you learned so far.*

A. Fill in the blanks

The area of a circle is the number of (1) _____ units inside the circle. It may be computed by (2) A=_____ where r is the (3) _____ and pi or π is approximately equal to (4) _____ or _____.

What I Can Do

Directions: Answer the problem below. Show your complete solution. You may use a model or an illustration to help you solve the problem.

Mang Raul has a farm somewhere along the Diversion Road of Calbayog City. He has plenty of chickens and goats. He has this one goat who doesn't want to be with the rest of the goats. So, Mang Raul would tether his goat by a rope of 3.5 m long, far from the other animals. Find the maximum area in which the goat can graze.

Just two more activities and you are done with this module.

Assessment

Directions: Read each problem carefully. Choose the letter that corresponds to the best answer. Write the chosen letter on a separate sheet of paper.

1. Find the area of a plate with a radius of 11 cm.
   (A) 372.8 cm^2 (B) 379.94 cm^2 (C) 391.74 cm^2

2. A children's pool has a diameter of 8.7m. Find its area.
   (A) 59.41665 m^2 (B) 57.8965 m^2 (C) 53.184 m^2

3. If a circular table has a diameter of 1.3 m, what is the area of the circular table?
   (A) 1.805 m^2 (B) 1.32665 m^2 (C) 1.13545 m^2

4. What is the area of a circular fountain if its radius is 3.1m?
   (A) 11.9764 m^2 (B) 30.1754 m^2 (C) 38.4374 m^2

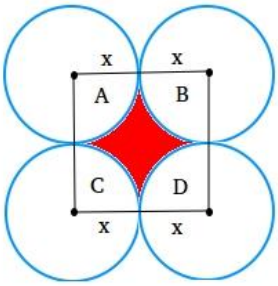
5. If a circular mat has a radius of 32 centimeters, what is the area of the mat?
   (A) 3 215.36 m^2 (B) 213.76 m^2 (C) 64.56 m^2

6. Meryll made a pancake with a circumference of 125.6 cm. What is its area?
   (A) 884 cm^2 (B) 1 256 cm^2 (C) 1 468 cm^2

7. If Amiel made a burger patty with a diameter of 8 centimeters, what is the area of the patty?
   (A) 200.96 cm^2 (B) 50.24 cm^2 (C) 25.12 cm^2

8. Jed drew figure at the right. Each circle has a radius equal to 10 cm. What is the area of the red region?

   (A) 400 cm^2
   (B) 314 cm^2
   (C) 86 cm^2



9. Joyce made a pancake with a diameter of 24 centimeters, while Jude's pancake has a radius of 13 centimeters. Who made the bigger pancake?
   (A) Joyce (B) Jude (C) Both

10. Refer to number 9 problem. How much bigger is the larger pancake than the other?
    (A) 30.6 cm^2 (B) 52.16 cm^2 (C) 78.5 cm^2

You made it! Finally, you're on the last activity. Answer it all correctly so you could climb at the top and get your trophy.

Additional Activities

Directions: Read, analyze and solve each problem.

1. The bottom surface of a circular pond with a diameter of 6 m will be tiled. Find the area of the surface that will be tiled.

2. Find the area of a manhole with a radius of 12 inches.

3. The table top has a diameter of 12 dm. What is the area of the glass to be put on top of the table?

4. Find the area of a pail's circular cover with a diameter of 32 cm.

5. If the area of the circular bed cover is 254.34 cm^2, what is its radius?

Answer Key

What I Know

1. C	6. A
2. B	7. A
3. A	8. C
4. B	9. A
5. A	10. A

What's New

1. 379.94 cm^2
2. 1 256 cm^2
3. 7.065 m^2
4. 15.1976 m^2
5. 200.96 m^2

What's In

1. True
2. True
3. True
4. True
5. False

What's More

Activity 1: Solve It!

1. 5 m
2. 163.28 cm
3. 18.84 cm
4. 100 cm
5. 40 cm

Activity 2: Find my Area

1. 50.24 m^2
2. 38.465 m^2
3. 6.1544 m^2
4. 490.625 cm^2
5. 706.5 m^2

What I Have Learned

A. 1. Square
2. πr^2
3. radius
4. 3.14 or 22/7

What I Can Do

Radius of the circle is the length of the rope.

Then, the radius is = 3.5 m

So, A = πr^2

$= 3.14 \times (3.5\ m)^2$
$= 3.14 \times (12.25\ m^2)$
$= 38.465\ m^2$

Assessment

1. B	6. B
2. A	7. B
3. B	8. C
4. B	9. B
5. A	10. C

Additional Activities

1. 28.26 m^2
2. 452.16 in^2
3. 113.04 dm^2
4. 803.84 cm^2
5. 9 cm

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For inquiries or feedback, please write or call:

Department of Education - Bureau of Learning Resources (DepEd-BLR)

Ground Floor, Bonifacio Bldg., DepEd Complex
Meralco Avenue, Pasig City, Philippines 1600

Telefax: (632) 8634-1072; 8634-1054; 8631-4985

Email Address: blr.lrqad@deped.gov.ph * blr.lrpd@deped.gov.ph