MODULE 3: MATHEMATICS AS REASONING

At the end of the module, you should be able to:

1. Differentiate inductive and deductive reasoning;
2. Apply inductive reasoning in predicting a number, making a conjecture, and solving an problem; and
3. Apply deductive reasoning in establishing a conjecture and solving logic puzzles.

INTRODUCTION

Mathematics is also about reasoning. This module discusses the basic types of reasoning in mathematics, namely, inductive and deductive reasoning. Discussions include the uses of inductive reasoning in predicting a number, making a conjecture, and solving an application problem. It also includes a discussion on the uses of deductive reasoning in establishing a conjecture and solving logic puzzles.

SECTION 3.1: TYPES OF REASONING

In mathematics, we have two common types of reasoning: inductive and deductive. The two are defined below and examples are, likewise, given to fully understand the difference between the two types.

INDUCTIVE REASONING

This is a type of reasoning whereby you arrive at a general conclusion based on specific examples.

Example: In the sequence, 4, 7, 10,...

DEDUCTIVE REASONING

This is a type of reasoning whereby you arrive at a conclusion by making use of general principles.

Example: All multiples of 5 have a units' digit of 0 or 5. Hence, the number 231 is not divisible by 5.

SECTION 3.2: USES OF INDUCTIVE REASONING

Some of the uses of inductive reasoning include predicting a number, making a conjecture, and solving an application problem. These three will be discussed in this section.

Predicting a Number

Example: **Predict the next number in each of the following lists by using inductive reasoning.**

a) 21, 24, 27, 30, 33, _____

b) 1, 6, 16, 31, 51, _____

Making A Conjecture

Example 1: Make a conjecture, by use of inductive reasoning, about the product of two consecutive counting numbers.

Solution: Let the numbers be:
4 and 5. The product is 20
7 and 8. The product is 56.
20 and 21. The product is 420.
Conjecture: The result when multiplying two consecutive numbers is an even number.

Making A Conjecture

Example 2: Make a conjecture, by use of inductive reasoning, about the resulting integer as compared to the original integer.

Choose an integer. Multiply this integer by 9. Then to the resulting product add 6. After that, divide the result by 3. Finally, decrease the result by 2.

Solving An Application

Example: Shown in the table below is the diameter of a pizza and its corresponding cost.

Diameter of Pizza	Cost (in pesos)
8 in	Php 32
10 in	Php 50
12 in	Php 72
16 in	Php 128
20 in	Php 200

What occurs to the cost of a pizza when the diameter is doubled?

Solving An Application

Diameter of Pizza	Cost (in pesos)
8 in	Php 32
10 in	Php 50
12 in	Php 72
16 in	Php 128
20 in	Php 200

What should be the cost of the pizza if the diameter is 24 in?

SECTION 3.3: USES OF DEDUCTIVE REASONING

Two of the uses of deductive reasoning will be discussed. The first one is on establishing a conjecture and the other one is on solving logic puzzles.

Establishing a Conjecture

Example: Show, by use of deductive reasoning, that the process written below produces an integer that is three times the original integer.

Process: Choose an integer. Multiply the integer by 9. Then to the product that results, add 12. After that, divide the sum by 3. Finally subtract 4.
Solution: Let n = original integer:
Multiply the integer by 9: 9n
To the product, add 12: 9n + 12
Divide the sum by 3: (9n + 12)/3 =9n/3 + 12/3 = 3n + 4
Subtract 4: 3n + 4 – 4 = 3n

Answer: It is indeed true that the process results to an integer that is three times the original integer.

Solving Logic Puzzles

Example: Four employees, Art, Bea, Candy, and Dave, are working in the same school, but the nature of their work differs: librarian, instructor, registrar, and nurse. From the following clues determine the work of each employee.

- Bea leaves the school after the instructor and the nurse.
- Candy, the last to leave, is not the librarian.
- The instructor is the best friend of Dave.