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Teacher's Guide

MATHEMATICS

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Mathayom

Based on the Basic Education Curriculum B.E. 2551
(Revised Edition B.E. 2560)

Preface

Why do we have to learn mathematics?

In the 21st century learning, mathematics plays an important role because mathematics helps people to have creative, reasoning and systematic thinking mind and enables people to analyze problems or situations considerably. As a result, they can predict, plan, decide and solve real life problems appropriately, practically and efficiently. Mathematics is also a tool in the study of science, technology and other disciplines, besides being a fundamental of human resource development. In order to develop our country's economy on a par with other countries, the learning of mathematics needs to be updated progressively and accords fully with the current social and economic conditions while the knowledge of advanced science and application of technology must progress fast in the globalized world.

The Basic Education Curriculum B.E. 2551 (Revised Edition B.E. 2560) ensures students to have the skills they need for the 21st century workplace which includes analytical thinking skills, critical thinking skills, creative thinking skills, problem-solving skills, the skills of using technology and communication and collaboration. Consequently, students need to be competitive in order to live in the borderless society due to the changes in the global economy, culture and environment.

A successful mathematics education needs to prepare students for learning new things and life after graduation or furthering their study in higher levels. Therefore, schools should provide the appropriate learning environment according to students' ability.

General learning outcomes in each strand

The subject of mathematics is divided into three strands namely numbers and algebra, measurement and geometry, and statistics and probability.

- **Numbers and algebra**

Learning about the real number system, the properties of numbers, ratios, percentages, estimation, problem-solving involving numbers, the application of real numbers in real life, patterns, the relation of functions and set, logic, expressions, monomial, polynomials, equations, equation systems and inequality, graphs, the interest and values of money, sequences and series, and the application of the knowledge of numbers and algebra in various situations.

- **Measurement and geometry**

Learning about length, distance, weight, area, volume, capacity, money, time, measuring units, estimation for measurements, trigonometric ratios, geometric figures, visualization of geometric models, geometric theories, geometric transformation through translation, reflection and rotation, and the application of the knowledge of measurement and geometry in various situations.

- **Statistics and probability**

Learning about statistical enquiries, data collection, statistic calculations, presentation and interpretation of qualitative and quantitative data, the fundamental of counting principles, probability, the application of the knowledge of statistics and probability in explaining various situations as well as for facilitating decision-making in real life.

Strands and Learning Standards

Strand 1: Numbers and Algebra

Standard M1.1: Understand various ways of numbers presentations, number systems, number operations, the results of number operations and the properties of operations.

Standard M1.2: Understand and analyze patterns, relations, functions, sequences and series and application.

Standard M1.3: Use expressions, equations, inequalities and explanation of relations to solve problems.

Strand 2: Measurement and Geometry

Standard M2.1: Understand the fundamentals of measurements and measure, estimate the sizes of objects and apply them in solving problems.

Standard M2.2: Understand and analyze geometric figures, the properties of geometric figures, the relationships between geometric figures and geometric theories, and apply them in solving problems.

Strand 3: Statistics and Probability

Standard M3.1: Understand the statistical processes and apply them to solve problems.

Standard M3.2: Understand the fundamental counting principles, probability and apply them to solve problems.

Mathematical Skills and Processes

Mathematical skills and processes include the ability of applying the knowledge while learning other subjects in order to gain knowledge and apply it in daily life efficiently. Skills and processes in mathematics as mentioned above focus particularly on the essential ones that need to be developed in learners' abilities as followings:

1. **Problem-solving** is the ability to understand, analyze, plan and solve the problems, as well as to choose the appropriate methods with considerations for the reasoning and validity of the answers.
2. **Mathematical communication and representation** are the abilities to use mathematical language and symbols in communication, presentation and summary accurately and clearly.
3. **Connection** is the ability to use the knowledge of mathematics as a tool in learning mathematics and other disciplines and connect the mathematical knowledge with the real-world situations.
4. **Reasoning** is the ability to give and explain reasons and proofs behind a solution or choice of strategy to a problem and make and investigate mathematical conjectures.
5. **Creative thinking** is the ability to enhance the previous known concept or create new concepts to improve and develop the knowledge further.

Learners' Quality of Grade 9 students

- Have knowledge and understanding of the real numbers, the relationships of real numbers, the properties of real numbers, and apply them to solve real life problems.
- Have knowledge and understanding of proportions and percentages, and apply them to solve real life problems.
- Have knowledge and understanding of exponents with whole number power and apply them to solve real life problems.
- Have knowledge and understanding of linear equations with one variable, the systems of linear equations with two variables, and linear inequalities with one variable, and apply them to solve real life problems.
- Have knowledge and understanding of ordered pairs, graph relationships and quadratic functions, and apply them to solve real life problems.
- Have knowledge and understanding of geometry and geometric tools, for example compass and ruler including the Geometer's Sketchpad Program or other dynamic geometry programs in order to create geometric figures as well as apply them to solve real life problems.
- Have knowledge and understanding of two and three-dimensional geometric figures and use them to find the relationship between two-dimensional geometric figures and three-dimensional geometric figures.
- Have knowledge and understanding of the surface area and the volume of prisms, cylinders, pyramids, cones and spheres as well as apply them to solve real life problems.
- Have knowledge and understanding of the properties of parallels, congruence and similarities of triangles, Pythagoras' theorems and converse as well as apply them to solve real life problems.
- Have knowledge and understanding of transformations and apply them to solve real life problems.
- Have knowledge and understanding of the trigonometric ratios and apply them to solve real life problems.
- Have knowledge and understanding of circle theorems and apply them to solve mathematical problems.

- Have knowledge and understanding of statistics in the presentation, data analysis, data interpretation related to dot diagrams, tree diagrams, histograms, box diagrams and mean as well as apply them including statistics to real life with the use of appropriate technology.
- Have knowledge and understanding of probability and apply them to solve real life problems.

Yearly Teaching Plan

Mathematics **Grade 7 (Mathayom 1)**

11 chapters **120 hours**

Learning area	Duration (hours)
1. Number Sequences and Integers • Number patterns and sequences • Integers • Addition and subtraction of integers • Multiplication and division of integers • Combined operations of integers	**13**
2. Fractions • Rational numbers • Comparing fractions • Addition and subtraction of fractions • Multiplication and division of fractions • Combined operations of fractions	**13**
3. Decimals • Comparing decimals • Addition and subtraction of decimals • Multiplication and division of decimals • Combined operations of decimals	**8**

4. Indices • Indices • Multiplication of numbers in index notation • Division of numbers in index notation • Raising numbers and algebraic terms in index notation to a power • Negative integral indices • Fractional indices • Computation involving laws of indices	**14**
5. Exponential Notation • Exponential notation • Addition and subtraction in exponential notation • Multiplication and division in exponential notation • Combined operations using exponential notation	**7**
6. Ratios, Proportions and Percentages • Ratio of two quantities • Proportion • Ratio of three quantities • Relationships between percentages, fractions and decimals • Computations and problems involving percentages	**14**
7. Linear Equations • Equality • Linear equations in one unknown	**9**

• Solutions of linear equations in one unknown	
8. Linear Equations in Two Variables • Linear equations in two variables • Graphs of linear equations in two variables • Simultaneous linear equations in two variables	**10**
9. Geometrical Constructions • Constructions	**11**
10. Solid Geometry • Cross-sections of solids • Cubes and cuboids • Plan, front elevation and side elevation of 3-D geometrical shapes	**10**
11. Statistics • Statistics • Pictograms, bar charts and line graphs • Constructing pie charts • Obtaining and interpreting information from pie charts • Solving problems involving pie charts	**11**

Note: The hours needed for each subtopic can be changed when necessary. The above allocated hours are just a suggestion. Total hours for this subject is as prescribed in the basic learning time structure, while the learners must attain the standard as prescribed in the learning standards and indicators.

Chapter 1 – Number Sequences and Integers (13 hours)

Strand 1: Numbers and Algebra

Learning Standards and Learning Areas

Learning Standards	Learning Areas
Standard M. 1.1: 1. Understand the rational numbers and the relationship of the rational numbers. Use the properties of the rational numbers to solve mathematical problems and real life problems.	• Number patterns and sequences • Integers • Addition and subtraction of integers • Multiplication and division of integers • Combined operations of integers

Learning Objectives

Students will be taught to:

1. Analyze, recognize and explain given number patterns.
2. Understand, compare and arrange integers in order.
3. Understand the relation, properties and the process of addition, subtraction, multiplication and division of integers. Aware of the validities of the answers too.
4. Perform the computations involving any combination of addition, subtraction, multiplication and division of integers to solve problems.
5. Use estimations to verify the answers.

Learning Outcomes

Students will be able to:

1. Analyze, recognize and explain simple number patterns.

2. Recognize, describe, find the number pattern and find any of the terms required when given a number sequence.
3. Understand what integers including zero are.
4. Represent integers using a number line.
5. Compare two integers.
6. Arrange integers in increasing or decreasing order.
7. Use positive numbers and negative numbers.
8. Understand what addition, subtraction, multiplication and division are and their properties.
9. Perform addition, subtraction, multiplication and division of integers.
10. Solve problems involving addition, subtraction, multiplication and division of integers.
11. Perform computations involving any combination of addition, subtraction, multiplication and division of integers.
12. Solve problems involving combined operations of addition, subtraction, multiplication and division of integers.
13. Explain and aware of the validities of the answers to the operations.
14. Verify answers using estimations.

Teaching and Learning Activities

1st – 3rd hours (Number Patterns and Sequences)

1. Ask students to do the Flashback to help them recall certain Mathematical concepts.
2. Explain what sequence number and term mean.
3. Explain the few common sequence numbers such as even numbers, odd numbers, square numbers, cube numbers, triangular numbers and Fibonacci numbers.
4. Using Example 1, explain how to obtain a term from a number sequence.

5. Have volunteers work on Questions 1(a) and 1(b) in Test Yourself 1.1. Discuss the methods used and the answers obtained.
6. Have students work individually on the rest of Question 1 in Test Yourself 1.1. Check the answers with students.
7. Ask students to do Questions 1 to 3 on page 2 of the Workbook as their homework.
8. Explain how to find the number pattern and get the required term using Example 2 in the Textbook.
9. Have volunteers to solve Questions 2(a) and 2(b) in Test Yourself 1.1. Discuss the methods used and the answers obtained.
10. Have students work individually on the rest of Question 2 in Test Yourself 1.1. Check the answers with students.
11. Ask students to do Question 4 on page 3 of the Workbook as their homework.

4^{th} - 5^{th} hours (Integers)

1. Explain what integers (inclusive of positive integers, zero and negative integers) are using Examples 3 and 4 in the Textbook.
2. Have students work individually on Questions 1 to 3 in Test Yourself 1.2. Discuss the answers with them.
3. Using Examples 5 to 9 in the Textbook, explain the use of number lines to represent, compare and arrange integers.
4. Have students work individually on Questions 4 to 9 in Test Yourself 1.2. Discuss the answers with them.
5. Give a few examples of real situations that use positive and negative numbers. Refer to the pages 9 and 10.
6. Have students work individually on Questions 10 and 11 in Test Yourself 1.2. Discuss the answers with them.
7. Ask students to do the questions on pages 4 and 5 of the Workbook as their homework.

6th – 8th hours (Addition and Subtraction of Integers)

1. Explain the meaning of addition and its properties using Examples 11 to 14.
2. Have students work individually on Questions 1 to 6 in Test Yourself 1.3. Discuss the answers with them.
3. Ask students to do the questions on pages 6 and 7 of the Workbook as their homework.
4. Explain the meaning of subtraction using Examples 15 to 18.
5. Have volunteers do Questions 7 to 11 in Test Yourself 1.3. Discuss the methods used and answers obtained with them.
6. Ask students to do the questions on pages 8 and 9 of the Workbook as their homework.

9th – 11th hours (Multiplication and Division of Integers)

1. Explain the rules of multiplication by using Examples 19 to 21 in the Textbook.
2. Have students work individually on Questions 1 to 5 in Test Yourself 1.4. Discuss the answers with them.
3. Explain the four properties of multiplication using Example 22 in the Textbook.
4. Ask students to do Questions 1 to 3 on pages 10 and 11 of the Workbook as their homework.
5. Using Examples 23 to 25, show how to divide integers.
6. Test a few students' understanding of division by asking them to solve problems in Questions 6 to 9 in Test Yourself 1.4.
7. Ask students to do Questions 4 and 5 on pages 11 and 12 of the Workbook as their homework.

12th hour (Combined Operations of Integers)

1. Emphasize the sequence of solving problems involving combined operations by using Examples 26 to 30 in the Textbook.
2. Randomly select a few students to show the working method to solve the problems in Test Yourself 1.5.

   Ask students to do the questions in subtopic 1.5 on pages 12 to 14 of the Workbook as their homework.

13th hour (Conclusion)

1. Explain the mistakes shown in the Common Mistakes & the Truth column on page 26.
2. Ensure students understand the terms used in this chapter by referring to the Mathematical Terms column.
3. Revise the lesson using the Quick Revision column on page 27.
4. Encourage them to try the QR Quiz on page 27 by scanning the QR code.
5. Ask 2 students to work out the Spot the Errors on page 15 in the Workbook and discuss with them.
6. Randomly select 5 subjective questions from the Mastery Practice in the Textbook and have students solve them in the class. Have students work on the rest of the questions at home.
7. Ask students to do the Enrichment Exercises in the Workbook to test their understanding of this chapter as their homework.

Emphasized Characteristics:

1. Thinking skill
2. Problem-solving skill
3. Analysing skill

Learning Materials:

- Focus Smart Textbook Mathematics M1
- Focus Smart Workbook Mathematics M1

Learning Outcome Form

Name-Surname: ..... **No.** .....

Mathayom: ..... **Date:** .....

Chapter 1 Number Sequences and Integers

Explanation: Summary of learning outcomes

Feeling after learning this chapter:

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Contents that you need for teacher to explain further:

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Knowledge gained from this chapter:

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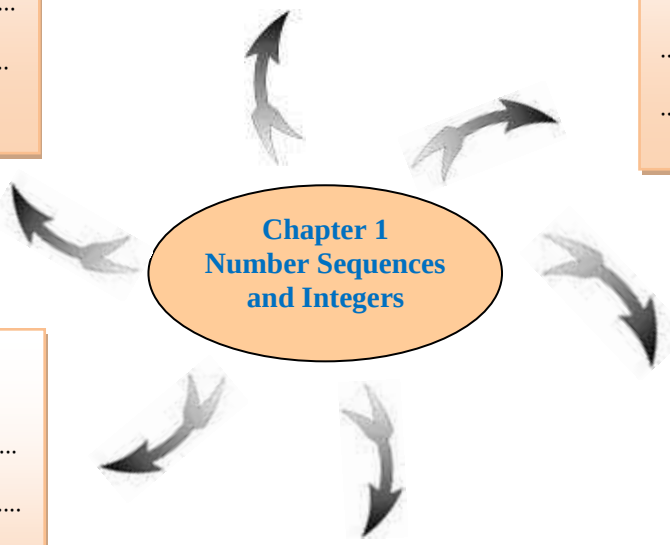

Application of knowledge from this chapter in your daily life:

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Contents that you like the most in this chapter (give your reason):

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Exercises that you like and want to be selected as the outstanding work:

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Chapter 2 – Fractions (13 hours)

Strand 1: Numbers and Algebra

Learning Standards and Learning Areas

Learning Standards	Learning Areas
Standard M. 1.1: 1. Understand the rational numbers and the relationship of the rational numbers. Use the properties of the rational numbers to solve mathematical problems and real life problems.	• Rational numbers • Comparing fractions • Addition and subtraction of fractions • Multiplication and division of fractions • Combined operations of fractions

Learning Objectives

Students will be taught to:

1. Understand rational numbers and the properties of rational numbers.
2. Understand and compare fractions.
3. Understand and perform the computations of addition, subtraction, multiplication and division involving fractions.
4. Perform the computations involving any combination of addition, subtraction, multiplication and division of fractions to solve problems.
5. Aware of the validities of the answers.
6. Use estimations to verify the answers.

Learning Outcomes

Students will be able to:

1. Understand rational numbers and the properties of rational numbers.
2. Compare two fractions and mixed numbers.
3. Perform addition involving
    a. fractions with common denominators
    b. fractions with different denominators
    c. whole numbers and fractions
    d. fractions and mixed numbers
    e. mixed numbers
    f. three fractions
4. Perform subtraction involving
    a. fractions with common denominators
    b. fractions with different denominators
    c. a fraction from a whole number
    d. a fraction from a mixed number
    e. mixed numbers
    f. three fractions
5. Perform multiplication involving
    a. a whole number and a fraction
    b. fractions
    c. mixed numbers
    d. three fractions
6. Perform division involving
    a. fractions by whole numbers
    b. fractions
    c. mixed numbers
    d. three fractions
7. Perform the computations involving any combination of addition, subtraction, multiplication and division of fractions.
8. Solve problems involving combined operations of addition, subtraction, multiplication and division of fractions to solve problems.
9. Explain and aware of the validities of the answers obtained.
10. Verify answers using estimations.

Teaching and Learning Activities

1st – 2nd hours (Rational Numbers)

1. Ask students to do the Flashback to help them recall certain Mathematical concepts.
2. Explain the meaning of a rational number using Example 1.
3. Explain the properties of rational numbers. Refer to pages 30 to 31.
4. Have students work on Questions 1 to 2 in Test Yourself 2.1. Discuss the answers with them.
5. Ask students to do the questions on page 18 of the Workbook as their homework.

3rd – 4th hours (Comparing Fractions)

1. Help students to recall the denominators and numerators of fractions.
2. Explain the values of fractions using a number line.
3. Explain how to compare fractions by using Examples 2 to 4.
4. Have volunteers try Questions 1 and 2 in Test Yourself 2.2. Discuss the answers with them.
5. Ask students to do the exercises on page 19 of the Workbook as their homework.

5th – 7th hours (Addition and Subtraction of Fractions)

1. Using Examples 5 to 10, show students how to add various fractions.
2. Test students' understanding by asking them to do Questions 1 to 3 in Test Yourself 2.3 in the class.
3. Repeat the steps for subtraction by using Examples 11 to 18.
4. Test students' understanding by asking them to do Questions 4 to 6 in Test Yourself 2.3 in the class.
5. Ask students to do the exercises on pages 20 to 25 of the Workbook as their homework.

8th – 10th hours (Multiplication and Division of Fractions)

1. By using Examples 19 to 23, show how to multiply fractions.
2. Randomly choose a few students to try Questions 1 to 5 in Test Yourself 2.4.
3. Show students the way to divide fractions using Examples 24 to 29. Emphasize writing the divisor as its reciprocal.
4. Have students work individually on Questions 6 and 7 in Test Yourself 2.4.
5. Have two volunteers try out Questions 8 and 9 in Test Yourself 2.4. Discuss the answers with them.
6. Ask students to do the exercises of this subtopic on pages 26 to 31 of the Workbook as their homework.

11th – 12th hours (Combined Operations of Fractions)

1. Emphasize the steps to perform the computation of combined operations.
2. Show students the way to perform the computation of combined operations by using Examples 30 to 34.
3. Have students work individually on Questions 1 to 5 in Test Yourself 2.5.
4. Ask students to do the exercises of this subtopic on page 31 to 34 of the Workbook as their homework.

13th hour (Conclusion)

1. Explain the mistakes shown in the Common Mistakes & the Truth column on page 54.
2. Ensure students understand the terms used in this chapter by referring to the Mathematical Terms column.
3. Revise the lesson using the Quick Revision column on page 55.

4. Encourage them to try the QR Quiz on page 55 by scanning the QR code.
5. Ask 2 students to work out the Spot the Errors on page 35 in the Workbook and discuss with them.
6. Randomly select 5 questions from the Mastery Practice in the Textbook and have students solve them in the class. Have students work on the rest of the questions at home.
7. Ask students to do the Enrichment Exercises in the Workbook to test their understanding of this chapter as their homework.

Emphasized Characteristics

1. Thinking skill
2. Problem-solving skill
3. Analysing skill

Learning Materials

- Focus Smart Textbook Mathematics M1
- Focus Smart Workbook Mathematics M1

Learning Outcome Form

Name-Surname: ..... **No.** .....

Mathayom: ..... **Date:** .....

Chapter 2 Fractions

Explanation: Summary of learning outcomes

Feeling after learning this chapter:

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Contents that you need for teacher to explain further:

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Knowledge gained from this chapter:

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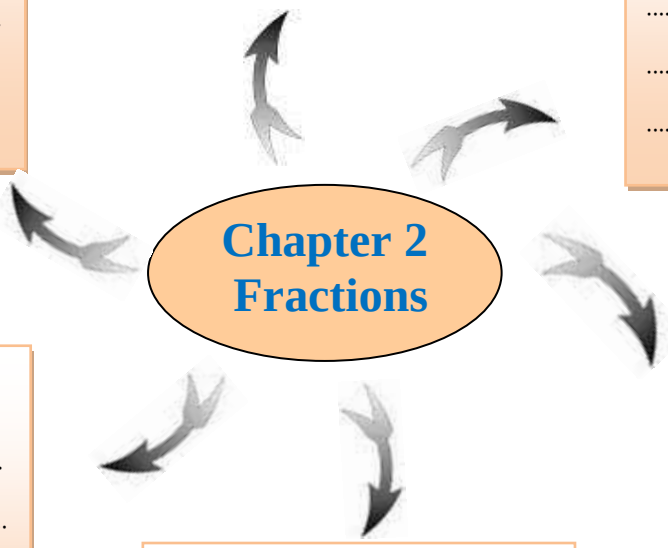

Application of knowledge from this chapter in your daily life:

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Contents that you like the most in this chapter (give your reason):

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Exercises that you like and want to be selected as the outstanding work:

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Chapter 3 – Decimals (8 hours)

Strand 1: Numbers and Algebra

Learning Standards and Learning Areas

Learning Standards	Learning Areas
Standard M. 1.1: 1. Understand the rational numbers and the relationship of the rational numbers. Use the properties of the rational numbers to solve mathematical problems and real life problems.	• Comparing decimals • Addition and subtraction of decimals • Multiplication and division of decimals • Combined operations of decimals

Learning Objectives

Students will be taught to:

1. Understand and compare decimals.
2. Understand and perform the computations of addition, subtraction, multiplication and division involving decimals.
3. Perform the computations involving any combination of addition, subtraction, multiplication and division of decimals to solve problems.
4. Aware of the validities of the answers.
5. Use estimations to verify the answers.

Learning Outcomes

Students will be able to:

1. Compare decimals.
2. Perform addition, subtraction, multiplication and division involving decimals.
3. Perform the computations involving any combination of addition, subtraction, multiplication and division of decimals.
4. Solve problems involving combined operations of addition, subtraction, multiplication and division of decimals.
5. Explain and aware of the validities of the answers obtained.
6. Verify answers using estimations.

Teaching and Learning Activities

1st hour (Comparing Decimals)

1. Ask students to do the Flashback to help them recall certain Mathematical concepts.
2. Explain the values of decimals using a number line.
3. Explain how to compare fractions by using Example 1.
4. Have volunteers try Question 1 in Test Yourself 3.1.
5. Ask students to do the exercises on page 39 of the Workbook as their homework.

2nd – 3rd hours (Addition and Subtraction of Decimals)

1. Using Examples 2 to 5, show students how to add and subtract decimals.
2. Remind students to align the numbers vertically according to their place values.

3. Test the students' understanding by asking them to do Questions 1 to 6 in Test Yourself 3.2. Discuss the answers with them.
4. Ask students to do the exercises on pages 40 to 42 of the Workbook as their homework.

4th – 6th hours (Multiplication and Division of Decimals)

1. Show students how to multiply and divide decimals by 0.1, 0.01, 0.001, 10, 100 and 1,000. Use Examples 6, 7, 10 and 11.
2. By using Examples 8 to 9, and Examples 12 to 15, show how to multiply and divide decimals.
3. Randomly choose a few students to try Questions 1 to 8 from Test Yourself 3.3.
4. Have three volunteers try Questions 9 to 10 in Test Yourself 3.3. Discuss the answers with them.
5. Ask students to do the exercises of this subtopic on page 43 to 46 of the Workbook as their homework.

7th hour (Combined Operations of Decimals)

1. Emphasize the steps to perform the computation of combined operations.
2. Show students the way to perform the computation of combined operations by using Examples 16 to 18.
3. Have students work individually on Questions 1 to 4 in Test Yourself 3.4.
4. Ask students to do the exercises of this subtopic on pages 46 and 47 of the Workbook as their homework.

8th hour (Conclusion)

1. Explain the mistakes shown in the Common Mistakes & the Truth column on page 70.
2. Ensure students understand the terms used in this chapter by referring to the Mathematical Terms column.
3. Revise the lesson using the Quick Revision column on page 71.
4. Encourage them to try the QR Quiz on page 71 by scanning the QR code.
5. Ask 2 students to work out the Spot the Errors on page 48 in the Workbook and discuss with them.
6. Randomly select 5 from the Mastery Practice in the Textbook and have students solve them in the class. Have students work on the rest of the questions at home.
7. Ask students to do the Enrichment Exercises in the Workbook to test their understanding of this chapter as their homework.

Emphasized Characteristics

1. Thinking skill
2. Problem-solving skill
3. Analysing skill

Learning Materials

- Focus Smart Textbook Mathematics M1
- Focus Smart Workbook Mathematics M1

Learning Outcome Form

Name-Surname: ..... **No.** .....

Mathayom: ..... **Date:** .....

Chapter 3 Decimals

Explanation: Summary of learning outcomes

Feeling after learning this chapter:

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Contents that you need for teacher to explain further:

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Knowledge gained from this chapter:

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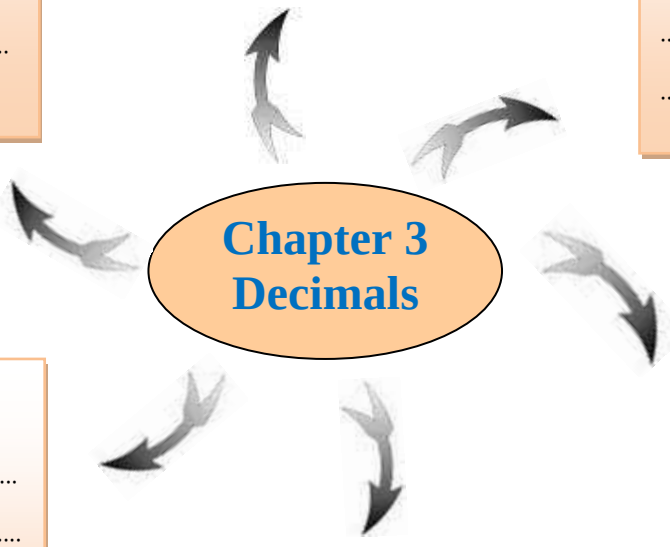

Application of knowledge from this chapter in your daily life:

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Contents that you like the most in this chapter (give your reason):

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Exercises that you like and want to be selected as the outstanding work:

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Chapter 4 – Indices (14 hours)

Strand 1: Numbers and Algebra

Learning Standards and Learning Areas

Learning Standards	Learning Areas
Standard M. 1.1: 1. Understand the rational numbers and the relationship of the rational numbers. Use the properties of the rational numbers to solve mathematical problems and real life problems.	• Indices • Multiplication of numbers in index notation • Division of numbers in index notation • Raising numbers and algebraic terms in index notation to a power • Negative integral indices • Fractional indices • Computation involving laws of indices

Learning objectives

Students will be taught to:

1. Understand the concept of integral indices.
2. Perform computations involving multiplication and division of numbers in index notation.
3. Raise numbers and algebraic terms in index notation to a power.
4. Understand negative integral indices.
5. Understand fractional indices.
6. Perform computation involving Law of indices.

Learning Outcomes

Students will be able to:

1. Express repeated multiplication as a^n and vice versa.
2. Find the value of a^n.
3. Express numbers in index notation.
4. Perform computations involving multiplication of
    a. numbers and algebraic terms in index notation with the same base.
    b. numbers and algebraic terms in index notation with different bases.
5. Perform computation involving division of numbers and algebraic terms expressed in index notation with the same base.
6. Simplify numbers and algebraic terms expressed in index notation raised to a power.
7. Perform computation involving multiplication and division of numbers and algebraic terms expressed in index notation with different bases raised to a power.
8. Perform combined operations involving multiplication, division and raised to a power on numbers and algebraic terms.
9. State $a^{-n} = 1/(a^n)$ and vice versa.
10. Perform combined operations involving negative indices on numbers and algebraic terms.
11. State $a^{(1/n)}$ as $\sqrt[n]{a}$ and vice versa.
12. Find the value $a^{(1/n)}$.
13. State $a^{(m/n)}$.
14. Perform combined operations involving fractional indices on numbers and algebraic terms.
15. Find the value $a^{(m/n)}$.
16. Perform computation involving multiplication, division and raised to a power or combined operations on several numbers expressed in index notation.

17. Perform computation involving multiplication, division and raised to a power involving positive, negative and fractional indices.

Teaching and Learning Activities

1st – 2nd hours (Indices)

1. Ask students to do the Flashback to help them recall certain Mathematical concepts.
2. Explain the meaning of index and base to students.
3. Teach them how to express repeated multiplication in index notation and vice versa by using Examples 1 and 2.
4. Using Examples 3 and 4, show how to find the values of numbers expressed in index notation and express numbers in index notation.
5. Test students' understanding by having them work on the questions in Test Yourself 4.1.
6. Ask students to do the exercises of this subtopic on pages 51 to 52 of the Workbook as their homework.

3rd – 4th hours (Multiplication of Numbers in Index Notation)

1. Show students how to multiply numbers and algebraic terms in index notation with the same base by using Example 5.
2. Have six volunteers work out the answers for Questions 1 and 2 in Test Yourself 4.2.
3. Then, show them how to multiply numbers and algebraic terms in index notation with different bases by using Example 6.
4. Ask students to work in groups on Questions 3 and 4 in Test Yourself 4.2. Discuss the answers with them.
5. Ask students to do the exercises of this subtopic on pages 52 and 53 of the Workbook as their homework.

5th – 6th hours (Division of Numbers in Index Notation)

1. Show students how to divide numbers and algebraic terms in index notation with the same base by using Example 7.
2. Have four students to work out the answers for the questions in Test Yourself 4.3. Discuss the answers with them.
3. Ask students to do the exercises of this subtopic on page 53 of the Workbook as their homework.

7th – 8th hours (Raising Numbers and Algebraic Terms in Index Notation to a Power)

1. Show students how to simplify numbers and algebraic terms expressed in index notation raised to a power by using Example 8.
2. Have students work on Questions 1 and 2 in Test Yourself 4.4. Discuss the answers with them.
3. Show students how to simplify multiplication and division of numbers and algebraic terms expressed in index notation raised to a power by using Examples 9 and 10.
4. Have students work on Questions 3 to 6 in Test Yourself 4.4. Discuss the answers with them.
5. Write Questions 7(f) and 8(e) in Test Yourself 4.4 on the board and have two students work on them. Discuss with them how to perform computation on combined operations.
6. Have students work on the rest of the questions individually.
7. Ask students to do the exercises of this subtopic on pages 53 to 55 of the Workbook as their homework.

9th – 10th hours (Negative Integral Indices)

1. Show how to state a^{-n} to $1/(a^n)$ and vice versa. Use Examples 13 and 14.
2. Using Examples 15 and 16, show students how to perform the computation of combined operations involving negative indices on numbers and algebraic terms.
3. Test students' understanding by asking them to work on Questions 1 to 4 in Test Yourself 4.5.
4. Ask students to do the exercises of this subtopic on pages 55 and 56 of the Workbook as their homework.

11th – 12th hours (Fractional Indices)

1. Show how to state $a^{1/n}$ as $\sqrt[n]{a}$ and vice versa, using Examples 17 and 18 in the Textbook.
2. Have students try out Questions 1 and 2 in Test Yourself 4.6.
3. Show students how to find the value of $a^{1/n}$ and state $a^{m/n}$. Use Example 19.
4. By using Examples 20 and 21, guide students on how to perform computation on combined operations involving fractional indices on numbers and algebraic terms.
5. Guide them to find the value of $a^{m/n}$.
6. Have students try out Questions 3 to 8 in Test Yourself 4.6.
7. Ask students to do the exercises of this subtopic on pages 56 and 58 of the Workbook as their homework.

13th hour (Computation Involving Laws of Indices)

1. Remind students the law of indices.
2. Guide them to do computation involving combined operations of numbers and algebraic terms in index notation by using Examples 23 to 25.

3. Have students try out Questions 1 to 3 in Test Yourself 4.7.
4. Ask students to do the exercises of this subtopic on page 59 of the Workbook as their homework.

14th hour (Conclusion)

1. Explain the mistakes shown in the Common Mistakes & the Truth column on page 92.
2. Ensure students understand the terms used in this chapter by referring to the Mathematical Terms column.
3. Revise the lesson using the Quick Revision column on page 93.
4. Encourage them to try the QR Quiz on page 93 by scanning the QR code.
5. Ask 3 students to work out the Spot the Errors on page 60 in the Workbook and discuss with them.
6. Randomly select 5 questions from the Mastery Practice in the Textbook and have students solve them in the class. Have students work on the rest of the questions at home.
7. Ask students to do the Enrichment Exercises in the Workbook to test their understanding of this chapter as their homework.

Emphasized Characteristics

1. Thinking skill
2. Problem-solving skill
3. Analysing skill

Learning Materials

- Focus Smart Textbook Mathematics M1
- Focus Smart Workbook Mathematics M1

Learning Outcome Form

Name-Surname: ..... **No.** .....

Mathayom: ..... **Date:** .....

Chapter 4 Indices

Explanation: Summary of learning outcomes

Feeling after learning this chapter:

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Contents that you need for teacher to explain further:

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Knowledge gained from this chapter:

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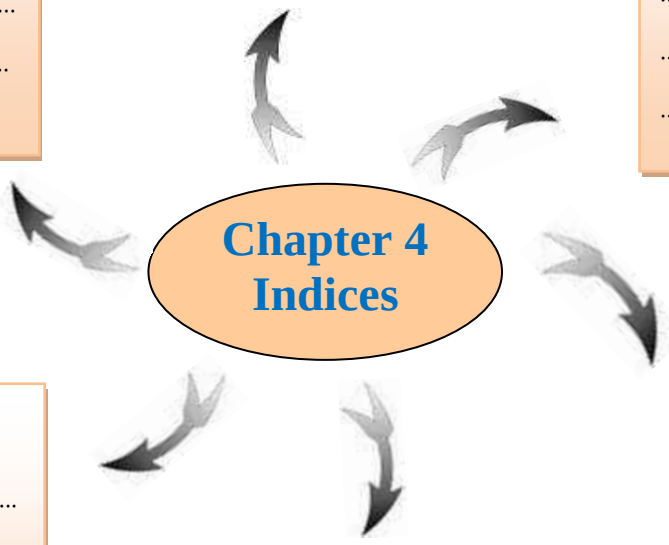

Application of knowledge from this chapter in your daily life:

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Contents that you like the most in this chapter (give your reason):

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Exercises that you like and want to be selected as the outstanding work:

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Chapter 5 – Exponential Notation (7 hours)

Strand 1: Numbers and Algebra

Learning Standards and Learning Areas

Learning Standards	Learning Areas
Standard M. 1.1: 2. Understand and use the properties of exponential notation with positive integer exponents to solve mathematical and real life problems.	• Exponential notation • Addition and subtraction in exponential notation • Multiplication and division in exponential notation • Combined operations using exponential notation

Learning Objectives

Students will be taught to:

1. Understand the concept of exponential notation.
2. Perform computations involving addition, subtraction, multiplication and division of numbers using exponential notation.
3. Perform computations involving combined operations of addition, subtraction, multiplication and division of numbers using exponential notation to solve problems.

Learning Outcomes

Students will be able to:

1. Understand and write numbers using exponential notation.
2. Write exponential notation for numbers between 1 and 10.

3. Perform computation involving addition and subtraction of numbers using exponential notation.
4. Perform computation involving multiplication and division of numbers using exponential notation.
5. Perform computations involving any combination of addition, subtraction, multiplication and division of numbers using exponential notation.

Teaching and Learning Activities

1st hour (Exponential Notation)

1. Ask students to do the Flashback to help them recall certain Mathematical concepts.
2. Explain to students what exponential notation is, by using Examples 1 to 3.
3. Test students' understanding by having them to work individually on Test Yourself 5.1.
4. Ask students to do the exercises of this subtopic on page 63 of the Workbook as their homework.

2nd – 3rd hours (Addition and Subtraction in Exponential Notation)

1. Guide students to add and subtract numbers in exponential notation using Examples 4 to 7. Remind them that the numbers in exponential notation that have the same power of base number 10 can be added or subtracted directly.
2. Test their understanding using the questions in Test Yourself 5.2.
3. Ask students to do the exercises of this subtopic on pages 63 to 65 of the Workbook as their homework.

4th – 5th hours (Multiplication and Division in Exponential Notation)

1. Guide students to multiply and divide numbers in exponential notation using Examples 8 and 9.
2. Test their understanding using questions in Test Yourself 5.3.
3. Ask students to do the exercises of this subtopic on pages 65 and 66 of the Workbook as their homework.

6th hour (Combined Operations Using Exponential Notation)

1. Remind students the steps to perform the computation involving combined operations.
2. Using Examples 10 and 11, show the steps in detail.
3. Have students work out the questions in Test Yourself 5.4 individually. Discuss the answers with them.
4. Ask students to do the exercises of this subtopic on pages 66 to 68 of the Workbook as their homework.

7th hour (Conclusion)

1. Explain the mistakes shown in the Common Mistakes & the Truth column on page 105.
2. Ensure students understand the terms used in this chapter by referring to the Mathematical Terms column.
3. Revise the lesson using the Quick Revision column on page 106.
4. Encourage them to try the QR Quiz on page 106 by scanning the QR code.
5. Ask 2 students to work out the Spot the Errors on page 68 in the Workbook and discuss with them.
6. Randomly select 5 questions from the Mastery Practice in the Textbook and have students solve them in the class. Have students work on the rest of the questions at home.
7. Ask students to do the Enrichment Exercises in the Workbook to test their understanding of this chapter as their homework.

Emphasized Characteristics

1. Thinking skill
2. Problem-solving skill
3. Analysing skill

Learning Materials

- Focus Smart Textbook Mathematics M1
- Focus Smart Workbook Mathematics M1

Learning Outcome Form

Name-Surname: ..... **No.** .....

Mathayom: ..... **Date:** .....

Chapter 5 Exponential Notation

Explanation: Summary of learning outcomes

Feeling after learning this chapter:

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Contents that you need for teacher to explain further:

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Knowledge gained from this chapter:

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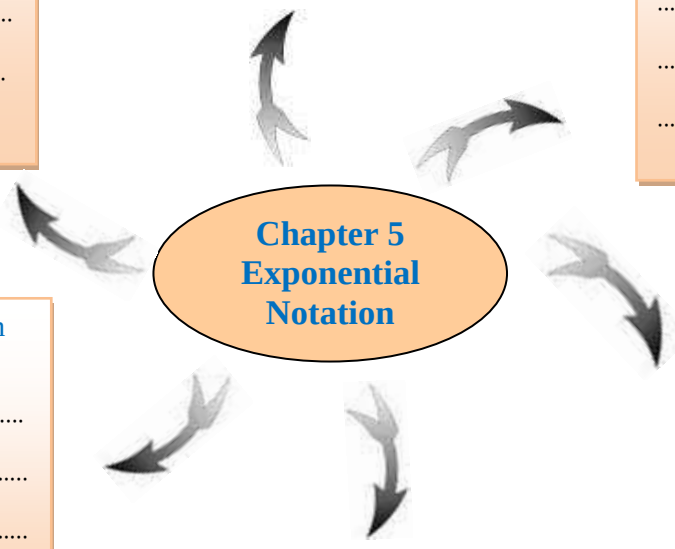

Application of knowledge from this chapter in your daily life:

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Contents that you like the most in this chapter (give your reason):

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Exercises that you like and want to be selected as the outstanding work:

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Chapter 6 – Ratios, Proportions and Percentages (14 hours)

Strand 1: Numbers and Algebra

Learning Standards and Learning Areas

Learning Standards	Learning Areas
Standard M. 1.1: 1. Understand the rational numbers and the relationship of the rational numbers. Use the properties of the rational numbers to solve mathematical problems and real life problems.	• Ratio of two quantities • Proportion • Ratio of three quantities • Relationships between Percentages, fractions and decimals • Computations and problems involving percentages

Learning Objectives

Students will be taught to:

1. Compare ratio of two quantities.
2. Understand proportions.
3. Compare ratio of three quantities.
4. Identify relationships between percentages, fractions and decimals.
5. Solve computations and problems involving percentages.

Learning Outcomes

Students will be able to:

1. Compare ratio of two quantities.
2. Determine whether given ratios are equivalent.

3. Simplify ratios to the lowest terms.
4. State ratios related to a given ratio.
5. State whether two pairs of quantities are a proportion.
6. Determine if two quantities are proportional, given their values.
7. Find the value of a quantity, given the ratio of the two quantities and the value of another quantity.
8. Find the value of a quantity, given the ratio and the sum of the two quantities.
9. Find the sum of two quantities, given their ratio and the difference between the quantities.
10. Solve problems involving ratios and proportions.
11. Compare ratio of three quantities.
12. Determine whether given ratios are equivalent.
13. Simplify a ratio of three quantities to the lowest term.
14. State the ratio of any two quantities, given the ratio of three quantities.
15. Find the ratio of $a : b : c$, given the ratio of $a : b$ and $b : c$.
16. Find the values of the other two quantities, given the ratio of three quantities and the value of one of the quantities.
17. Find the value of each quantity in a ratio.
18. Find the sum of three quantities, given the ratio and the difference between two of the three quantities.
19. Solve problems involving ratio of three quantities.
20. Express percentages as the numbers of parts in every 100.
21. Change fractions and decimals into percentages and vice versa.
22. Find the percentage of a quantity.
23. Find the percentage of a number out of another.
24. Find the number represented by a percentage.
25. Find the percentage increase or decrease.
26. Solve problems involving percentages.

Teaching and Learning Activities

1st – 2nd hours (Ratio of Two Quantities)

1. Ask students to do the Flashback to help them recall certain Mathematical concepts.
2. Explain to students what ratio of two quantities by using Example 1.
3. By using Example 2, show how to determine whether given ratios are equivalent.
4. Explain to students to simplify ratios to the lowest terms and state ratios related to a given ratio using Examples 3 to 4.
5. Test students' understanding by having them to work on Questions 1 to 4 in Test Yourself 6.1.
6. Ask students to do the exercises of this subtopic on pages 71 to 72 of the Workbook as their homework.

3rd – 5th hours (Proportion)

1. By using Example 5, guide students to state whether two pairs of quantities are a proportion.
2. Show how to determine if two quantities are proportional, given their values by using Example 6.
3. Explain to students to find the value of a quantity and the sum of two quantities using Examples 7 to 11.
4. Show how to solve problems involving ratios and proportions using Examples 12 to 13.
5. Test their understanding using the questions in Test Yourself 6.2.
6. Ask students to do the exercises of this subtopic on pages 73 to 75 of the Workbook as their homework.

6th – 8th hours (Ratio of Three Quantities)

1. Guide students to compare three quantities using Example 14.
2. By using Examples 15 and 16, show how to determine whether given ratios are equivalent and simplify a ratio of three quantities.
3. Have students work on Questions 1 to 3 in Test Yourself 6.3. Discuss the answers with them.
4. Explain to students on how to state the ratio of any two quantities and find the ratio of *a:b:c* using Examples 17 to 18.
5. Guide students to find the values of the other two quantities, the value of each quantity in a ratio and the sum of three quantities using Examples 19 to 22.
6. Test their understanding using Questions 4 to 8 in Test Yourself 6.3.
7. Explain how to solve problems involving ratios of three quantities using Examples 23 to 24.
8. Have students work individually on Questions 9 to 14 in Test Yourself 6.3. Discuss the answers with them.
9. Ask students to do the exercises of this subtopic on pages 75 and 80 of the Workbook as their homework.

9th – 10th hours (Relationships between Percentages, Fractions and Decimals)

1. Show how to express percentages as the numbers of parts in every 100 by using Example 25.
2. Explain to students to change fractions and decimals into percentages and vice versa using Examples 26 to 29.
3. Have students work out the questions in Test Yourself 6.4 individually. Discuss the answers with them.
4. Ask students to do the exercises of this subtopic on pages 81 to 82 of the Workbook as their homework.

11th – 13th hours (Computations and Problems Involving Percentages)

1. Explain to students on how to find the percentage of a quantity and the percentage of a number out of another using Examples 30 to 33.
2. By using Examples 34 to 37, show to find the number represented by a percentage, and the percentage increase or decrease.
3. Explain how to solve problems involving ratios of three quantities using Examples 38 to 43.
4. Have students work out the questions in Test Yourself 6.5. Discuss the answers with them.
5. Ask students to do the exercises of this subtopic on pages 82 to 84 of the Workbook as their homework.

14th hour (Conclusion)

1. Explain the mistakes shown in the Common Mistakes & the Truth column on page 137.
2. Ensure students understand the terms used in this chapter by referring to the Mathematical Terms column.
3. Revise the lesson using the Quick Revision column on pages 138 and 139.
4. Encourage them to try the QR Quiz on page 139 by scanning the QR code.
5. Ask 2 students to work out the Spot the Errors on page 85 in the Workbook and discuss with them.
6. Randomly select 5 questions from the Mastery Practice in the Textbook and have students solve them in the class. Have students work on the rest of the questions at home.
7. Ask students to do the Enrichment Exercises in the Workbook to test their understanding of this chapter as their homework.

Emphasized Characteristics

1. Thinking skill
2. Problem-solving skill
3. Analysing skill

Learning Materials

- Focus Smart Textbook Mathematics M1
- Focus Smart Workbook Mathematics M1

Learning Outcome Form

Name-Surname: ..... **No.** .....

Mathayom: ..... **Date:** .....

Chapter 6 Ratios, Proportions and Percentages

Explanation: Summary of learning outcomes

Feeling after learning this chapter:

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Contents that you need for teacher to explain further:

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Knowledge gained from this chapter:

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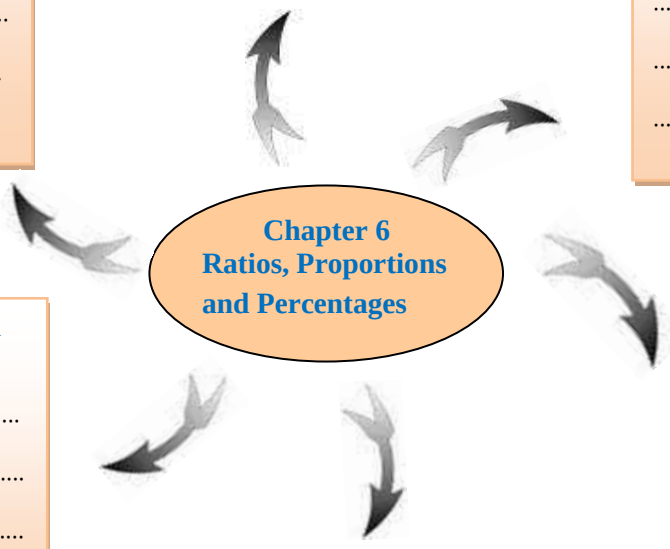

Application of knowledge from this chapter in your daily life:

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Contents that you like the most in this chapter (give your reason):

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Exercises that you like and want to be selected as the outstanding work:

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Chapter 7 – Linear Equations (9 hours)

Strand 1: Numbers and Algebra

Learning Standards and Learning Areas

Learning Standards	Learning Areas
Standard M. 1.3: 1. Understand and apply the properties of equality and numbers to analyze and solve the problems by using linear equations in one unknown. 3. Understand and apply the knowledge about linear relations to solve mathematical and real life problems.	• Equality • Linear equations in one unknown • Solutions of linear equations in one unknown

Learning Objectives

Students will be taught to:

1. Understand and state the relationship between two quantities using the symbol '=' or '≠'.
2. Understand the concept of linear algebraic terms, linear algebraic expressions and linear equations.
3. Understand and write linear equations in one unknown.
4. Perform the concept of linear equation in one unknown to solve problems.
5. Aware of the validity of the answers.

Learning Outcomes

Students will be able to:

1. Understand and state the relationship between two quantities using the symbol '=' or '≠'.
2. Determine linear algebraic terms, linear algebraic expressions and linear equations.
3. Write linear equations in one unknown for given statements and vice versa.
4. Determine if a numerical value is a solution of a given linear equation in one unknown.
5. Determine the solution of a linear equation in one unknown by trial and improvement method.
6. Solve equations in the form of
    a. $x + a = b$
    b. $x - a = b$
    c. $ax = b$
    d. $\frac{x}{a} = b$
    e. $ax + b = c$
7. Solve linear equations in one unknown.
8. Solve problems involving linear equations in one unknown.

Teaching and Learning Activities

1st – 2nd hours (Equality)

1. Ask students to do the Flashback to help them recall certain Mathematical concepts.
2. Explain the meaning of equality using the symbol '=' and '≠' using Examples 1 to 3.
3. Test their understanding by asking them to work on Questions 1 to 4 in Test Yourself 7.1.

4. Ask students to do the questions in this subtopic on page 88 of the Workbook as their homework.

3rd – 5th hours (Linear Equations in One Unknown)

1. Explain the meaning of linear algebraic term, linear algebraic expression, linear equation and linear equation in one unknown using Examples 4 to 7.
2. Test their understanding using Questions 1 to 4 in Test Yourself 7.2.
3. Guide students on how to write linear equations in one unknown for given statements and vice versa. Use Examples 8 and 9.
4. Test their understanding by asking them to work on Questions 5 to 7 in Test Yourself 7.2.
5. Ask students to do the exercises in this subtopic on pages 88 to 90 of the Workbook as their homework.

6th – 8th hours (Solutions of Linear Equations in One Unknown)

1. Explain using Example 10 how to determine if a number is a solution of a given linear equation in one unknown.
2. Have three students try Questions 1(a), 1(c) and 1(f) in Test Yourself 7.3. Discuss the answers with them.
3. Also, show them how to use trial and improvement method to determine the solution of a linear equation in one unknown by using Example 11.
4. By using Examples 12 to 16, guide students on how to solve linear equations in one unknown.
5. Test their understanding by having them to work out Questions 2 to 10 in Test Yourself 7.3.
6. Guide students to solve problems involving linear equations in one unknown by using Examples 17 and 18.

7. Have seven volunteers to solve problems in Questions 11 and 12 in Test Yourself 7.3.
8. Ask students to do the exercises in this subtopic on pages 90 to 94 of the Workbook as their homework.

9th hour (Conclusion)

1. Explain the mistakes shown in the Common Mistakes & the Truth column on page 156.
2. Ensure students understand the terms used in this chapter by referring to the Mathematical Terms column.
3. Revise the lesson using the Quick Revision column on page 157.
4. Encourage them to try the QR Quiz on page 157 by scanning the QR code.
5. Ask 2 students to work out the Spot the Errors on page 94 in the Workbook and discuss with them.
6. Randomly select 5 questions from the Mastery Practice in the Textbook and have students solve them in the class. Have students work on the rest of the questions at home.
7. Ask students to do the Enrichment Exercises in the Workbook to test their understanding of this chapter as their homework.

Emphasized Characteristics

1. Thinking skill
2. Problem-solving skill
3. Analysing skill

Learning Materials

- Focus Smart Textbook Mathematics M1
- Focus Smart Workbook Mathematics M1

Learning Outcome Form

Name-Surname: ..... **No.** .....

Mathayom: ..... **Date:** .....

Chapter 7 Linear Equations

Explanation: Summary of learning outcomes

Feeling after learning this chapter:

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Contents that you need for teacher to explain further:

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Knowledge gained from this chapter:

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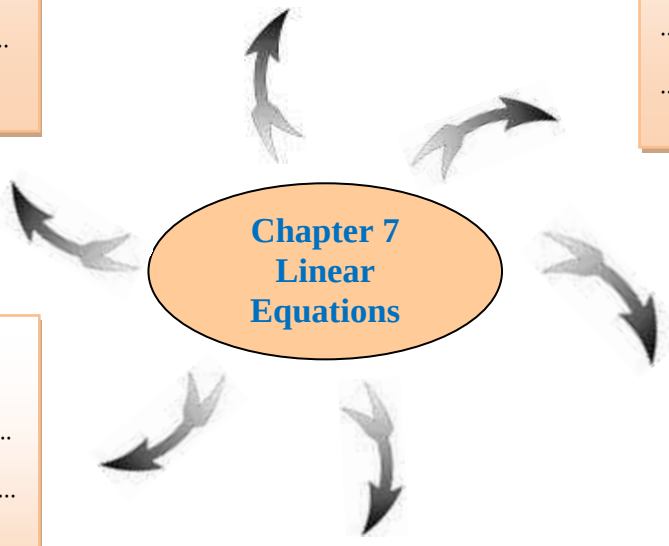

Application of knowledge from this chapter in your daily life:

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Contents that you like the most in this chapter (give your reason):

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Exercises that you like and want to be selected as the outstanding work:

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Chapter 8 – Linear Equations in Two Variables (10 hours)

Strand 1: Numbers and Algebra

Learning Standards and Learning Areas

Learning Standards	Learning Areas
Standard M. 1.3: 1. Understand and apply the properties of equality and numbers to analyze and solve the problems by using linear equations in one unknown. 2. Understand and use the knowledge about graphs to solve mathematical and real life problems. 3. Understand and apply the knowledge about linear relations to solve mathematical and real life problems.	• Linear equations in two variables • Graphs of linear equations in two variables • Simultaneous linear equations in two variables

Learning Objectives

Students will be taught to:

1. Understand linear equations in two variables.
2. Understand graphs of linear equations in two variables.
3. Solve problems involving linear equations in two variables.
4. Determine simultaneous linear equations in two variables.
5. Solve problems involving two simultaneous linear equations with two variables.

Learning Outcomes

Students will be able to:

1. Understand linear equations in two variables.
2. Write linear equations in two variables from given information.
3. Determine the value of a variable given the other variable.
4. Determine the possible solutions for a linear equation in two variables.
5. Construct tables of values from linear equations in two variables.
6. Draw graphs using given scales.
7. Determine the values of variables from graph.
8. Solve problems involving linear equations in two variables.
9. Determine simultaneous linear equations in two variables.
10. Solve two simultaneous linear equations in two variables.
11. Solve problems involving two simultaneous equations in two variables.

Teaching and Learning Activities

1st – 2nd hours (Linear Equations in Two Variables)

1. Ask students to do the Flashback to help them recall certain Mathematical concepts.
2. Explain the meaning of linear equation in two variables using Example 1.
3. By using Examples 2 to 3, show students on how to write linear equations in two variables from the given information.
4. Explain how to determine the value of a variable and the possible solutions for a linear equation in two variables using Examples 4 to 5.
5. Test their understanding by asking them to work on Questions 1 to 8 in Test Yourself 8.1.
6. Ask students to do the questions in this subtopic on pages 98 to 99 of the Workbook as their homework.

3rd – 5th hours (Graphs of Linear Equations in Two Variables)

1. Explain how to construct tables of values using Example 6.
2. By using Examples 7 to 11, show how to draw graphs using given scales and determine the values of variables from graph.
3. Guide students to solve problems involving graphs by using Example 12.
4. Test their understanding using Questions 1 to 5 in Test Yourself 8.2.
5. Ask students to do the exercises in this subtopic on pages 100 to 105 of the Workbook as their homework.

6th – 9th hours (Simultaneous Linear Equations in Two Variables)

1. By using Examples 13 to 16, explain simultaneous linear equations in two variables.
2. Test their understanding by having them to work out Questions 1 to 4 in Test Yourself 8.3.
3. Guide students to solve problems involving linear equations in two variables by using Example 17.
4. Have students to solve problems in Questions 5 and 9 in Test Yourself 8.3.
5. Ask students to do the exercises in this subtopic on pages 106 to 110 of the Workbook as their homework.

10th hour (Conclusion)

1. Explain the mistakes shown in the Common Mistakes & the Truth column on page 179.
2. Ensure students understand the terms used in this chapter by referring to the Mathematical Terms column.
3. Revise the lesson using the Quick Revision column on page 180.

4. Encourage them to try the QR Quiz on page 180 by scanning the QR code.
5. Ask 2 students to work out the Spot the Errors on page 111 in the Workbook and discuss with them.
6. Randomly select 5 questions from the Mastery Practice in the Textbook and have students solve them in the class. Have students work on the rest of the questions at home.
7. Ask students to do the Enrichment Exercises in the Workbook to test their understanding of this chapter as their homework.

Emphasized Characteristics

1. Thinking skill
2. Problem-solving skill
3. Analysing skill

Learning Materials

- Focus Smart Textbook Mathematics M1
- Focus Smart Workbook Mathematics M1

Learning Outcome Form

Name-Surname: ..... **No.** .....

Mathayom: ..... **Date:** .....

Chapter 8 Linear Equations in Two Variables

Explanation: Summary of learning outcomes

Feeling after learning this chapter:

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Contents that you need for teacher to explain further:

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Knowledge gained from this chapter:

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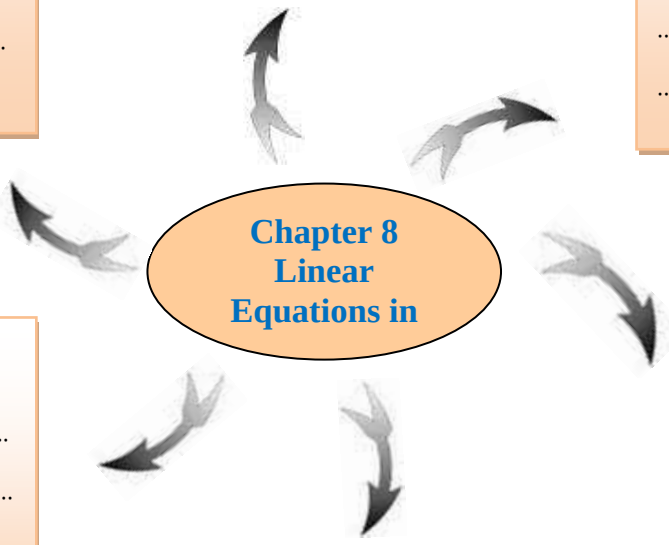

Application of knowledge from this chapter in your daily life:

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Contents that you like the most in this chapter (give your reason):

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Exercises that you like and want to be selected as the outstanding work:

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Chapter 9 – Geometrical Constructions (11 hours)

Strand 2: Measurement and Geometry

Learning Standards and Learning Areas

Learning Standards	Learning Areas
Standard M. 2.2: 1. Use the knowledge of geometry and tools such as compasses and straightedges including the Geometer's Sketchpad or other dynamic geometry programs to create geometric shapes as well as apply the knowledge of geometrical constructions to solve the problems in real life.	• Constructions

Learning Objectives

Students will be taught to:

1. Construct basic geometric construction.
2. Construct two-dimensional geometric figures using basic geometric construction.
3. Explain the steps taken.

Learning Outcomes

Students will be able to:

1. Construct
   a. line segments
   b. triangles of given sides
   c. perpendicular lines

d. angles and angle bisectors
e. triangles of given sides and angles
f. parallel lines

2. Explain the steps taken.

Teaching and Learning Activities

1st – 10th hours (Constructions)

1. Ask students to do the Flashback to help them recall certain Mathematical concepts.
2. Introduce to students ruler, compasses and set square.
3. Teach and guide students on how to construct
    a. line segments
    b. triangles of given sides
    c. perpendicular lines
    d. angles and angle bisectors
    e. triangles of given sides and angles
    f. parallel lines
4. Explain each step to construct the geometrical figures as students carry out the steps accordingly. Make sure they have a set of the tools of their own and draw on a big piece of blank paper.
5. Use Examples 1 to 14. Have them try out the questions in Test Yourself 9.1 as they progress. Explain the notes in the Hot Tips columns to make them understand better.
6. Ask students to do the exercises of this subtopic on pages 114 to 120 of the Workbook as their homework.

11th hour (Conclusion)

1. Explain the mistakes shown in the Common Mistakes & the Truth column on page 202.
2. Ensure students understand the terms used in this chapter by referring to the Mathematical Terms column.
3. Revise the lesson using the Quick Revision column on page 202.
4. Encourage them to try the QR Quiz on page 202 by scanning the QR code.
5. Ask a student to work out the Spot the Errors on page 120 in the Workbook and discuss with them.
6. Randomly select 5 questions from the Mastery Practice in the Textbook and have students solve them in the class. Have students work on the rest of the questions at home.
7. Ask students to do the Enrichment Exercises in the Workbook to test their understanding of this chapter as their homework.

Emphasized Characteristics

1. Thinking skill
2. Problem-solving skill
3. Analysing skill
4. Drawing skill

Learning Materials

- Focus Smart Textbook Mathematics M1
- Focus Smart Workbook Mathematics M1

Learning Outcome Form

Name-Surname: ..... **No.** .....

Mathayom: ..... **Date:** .....

Chapter 9 Geometrical Constructions

Explanation: Summary of learning outcomes

Feeling after learning this chapter:

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Contents that you need for teacher to explain further:

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Knowledge gained from this chapter:

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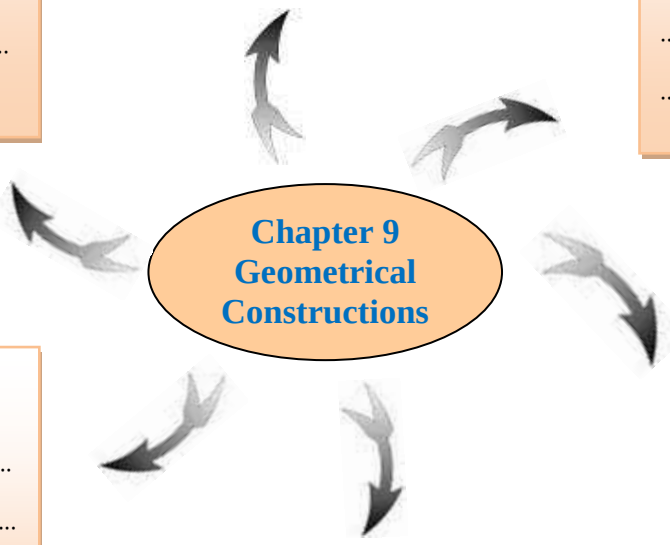

Application of knowledge from this chapter in your daily life:

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Contents that you like the most in this chapter (give your reason):

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Exercises that you like and want to be selected as the outstanding work:

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Chapter 10 – Solid Geometry (10 hours)

Strand 2: Measurement and Geometry

Learning Standards and Learning Areas

Learning Standards	Learning Areas
Standard M. 2.2: 2. Understand and use the knowledge of geometry to analyze the relationship between two-dimensional geometric figures and three-dimensional geometric figures.	• Cross-sections of solids • Cubes and cuboids • Plan, front elevation and side elevation of 3-D geometrical shapes

Learning Objectives

Students will be taught to:

1. Understand the cross-sections of three-dimensional geometrical figures.
2. Explain the geometrical properties of cubes and cuboids.
3. Identify two-dimensional images from the top view, front elevation view and side view of a given three-dimensional geometrical figure.
4. Draw or create a three-dimensional figure when given two-dimensional images from its top view, front elevation view and side view.

Learning Outcomes

Students will be able to:

1. Identify the cross-sections of three-dimensional geometrical figures.
2. Explain the characteristics of cubes and cuboids.
3. Draw cubes and cuboids on square grids and blank paper.

4. Identify plan, front elevation and side elevation of 3-D geometrical shapes.
5. Identify geometrical shapes composed of cubes.

Teaching and Learning Activities

1st hour (Cross-sections of Solids)

1. Ask students to do the Flashback to help them recall certain Mathematical concepts.
2. Explain how to identify the cross-sections of some solids using Example 1 in the Textbook.
3. Using Example 2, show students how to identify the shapes resulting from a vertical, angled and horizontal cross-section of a cylinder.
4. Have students work individually on Questions 1 to 3 in Test Yourself 10.1. Discuss the answers with them.
5. Ask students to do the questions on page 123 of the Workbook as their homework.

2nd hour (Cubes and Cuboids)

1. Show students the characteristics of cubes and cuboids. Guide them on how to draw these figures.
2. Test students' understanding using Test Yourself 10.2.
3. Ask students to do the exercises of this subtopic on pages 124 to 125 of the Workbook as their homework.

3rd – 9th hours (Plan, Front Elevation and Side Elevation of 3-D Geometrical Shapes)

1. Using some 3-D block models, explain plan, front elevation and side elevation of the model. Ask students to draw the views on paper.
2. Using Examples 3 to 5, help students to imagine and draw the plans, front elevations and side elevations of the figures.

3. Test their understanding by asking them to work on Questions 1 and 2 in Test Yourself 10.3.
4. Ask students to do the exercises on pages 126 and 127 of the Workbook as their homework.
5. Using small cubes, compose some geometrical shapes and explain how to imagine and draw the plans, front elevations and side elevations of the figures with the depths indicated.
6. Explain and guide students with Examples 6 and 7 in the Textbook.
7. Test their understanding by asking them to work on Questions 3 and 4 in Test Yourself 10.3.
8. Ask students to do the exercises on pages 128 and 129 of the Workbook as their homework.

10th hour (Conclusion)

1. Explain the mistakes shown in the Common Mistakes & the Truth column on page 222.
2. Ensure students understand the terms used in this chapter by referring to the Mathematical Terms column.
3. Revise the lesson using the Quick Revision column on page 223.
4. Encourage them to try the QR Quiz on page 223 by scanning the QR code.
5. Ask 2 students to work out the Spot the Errors on page 130 in the Workbook and discuss with them.
6. Randomly select 5 questions from the Mastery Practice in the Textbook and have students solve them in the class. Have students work on the rest of the questions at home.
7. Ask students to do the Enrichment Exercises in the Workbook to test their understanding of this chapter as their homework.

Emphasized Characteristics

1. Thinking skill
2. Problem-solving skill
3. Analysing skill
4. Drawing skill

Learning Materials

- Focus Smart Textbook Mathematics M1
- Focus Smart Workbook Mathematics M1
- 3-D blocks
- Small cubes

Learning Outcome Form

Name-Surname: ..... **No.** .....

Mathayom: ..... **Date:** .....

Chapter 10 Solid Geometry

Explanation: Summary of learning outcomes

Feeling after learning this chapter:

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Contents that you need for teacher to explain further:

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Knowledge gained from this chapter:

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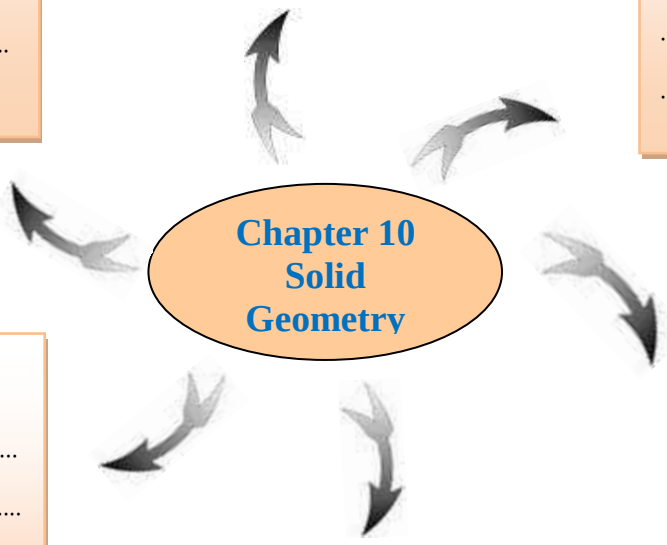

Application of knowledge from this chapter in your daily life:

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Contents that you like the most in this chapter (give your reason):

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Exercises that you like and want to be selected as the outstanding work:

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Chapter 11 – Statistics (11 hours)

Strand 3: Statistics and Probability

Learning Standards and Learning Areas

Learning Standards	Learning Areas
Standard M. 3.1: 1. Understand and use the knowledge of statistics to present and interpret data and apply statistics in real life using an appropriate technology.	• Statistics • Pictograms, bar charts and line graphs • Constructing pie charts • Obtaining and interpreting information from pie charts • Solving problems involving pie charts

Learning Objectives

Students will be taught to:

1. Define statistics.
2. Collect data and present data in pictograms, bar charts and line graphs.
3. Construct pictograms, bar charts, line graphs and pie charts, and obtain information from them.
4. Solve problems involving pictograms, bar charts, line graphs and pie charts.
5. Apply statistics in daily life.

Learning Outcomes

Students will be able to:

1. Ask statistical questions.
2. Collect data by using existing records or by carrying out surveys.
3. Construct pictograms to represent data and obtain information from pictograms.
4. Construct bar charts to represent data and obtain information from bar charts.
5. Represent data using line graphs and obtain information from line graphs.
6. Construct pie charts, and obtain and interpret information from pie charts.
7. Solve problems involving pictograms, bar charts, line graphs and pie charts.

Teaching and Learning Activities

1st – 2nd hour (Statistics)

1. Ask students to do the Flashback to help them recall certain Mathematical concepts.
2. Explain the meaning of statistics and how to ask a statistical question using Example 1 in the Textbook.
3. Show students how to collect data by using existing records or by carrying out surveys. Refer to Example 2.
4. Have students work individually on Questions 1 to 3 in Test Yourself 11.1. Discuss the answers with them.
5. Ask students to do the questions of this subtopic on page 134 of the Workbook as their homework.

3rd – 6th hour (Pictograms, Bar Charts and Line Graphs)

1. Show students how to construct a pictogram to represent data by using Example 3.
2. Using Examples 4 and 5, explain how to obtain information from a pictogram and solve problems involving pictograms.
3. Have three volunteers work out the answers for Questions 1 to 3 in Test Yourself 11.2.
4. Show students to construct a bar chart to represent data by using Example 6.
5. Guide students to obtain information from bar charts to solve problems by using Examples 7 and 8.
6. Have three students try Questions 4 to 6 in Test Yourself 11.2. Discuss the answers with them.
7. Explain steps to construct a line graph to represent data that have been collected over a time period. Refer to Example 9.
8. By using Examples 10 and 11, show how to obtain information from line graphs to solve problems.
9. Have students try Questions 7 to 9 in Test Yourself 11.2.
10. Ask students to do the exercises of this subtopic on pages 134 to 139 of the Workbook as their homework.

7th hour (Constructing Pie Charts)

1. Show students to construct a pie chart to represent data by using Example 12.
2. Test their understanding by asking them to work questions in Test Yourself 11.3.
3. Ask students to do the exercises of this subtopic on pages 140 and 141 of the Workbook as their homework.

8th hour (Obtaining and Interpreting Information from Pie Charts)

1. Show students to obtain and interpret information from a pie chart by using Example 13.
2. Have students try out questions in Test Yourself 11.4.
3. Ask students to do the exercises of this subtopic on pages 141 and 142 of the Workbook as their homework.

9th – 10th hours (Solving Problems Involving Pie Charts)

1. Explain how to solve problems involving pie charts by using Examples 14 and 15.
2. Test the students' understanding by asking them to do questions in Test Yourself 11.5. Discuss the answers with them.
3. Ask students to do the exercises of this subtopic on pages 142 and 144 of the Workbook as their homework.

11th hour (Conclusion)

1. Explain the mistakes shown in the Common Mistakes & the Truth column on page 248.
2. Ensure students understand the terms used in this chapter by referring to the Mathematical Terms column.
3. Revise the lesson using the Quick Revision column on page 249.
4. Encourage them to try the QR Quiz on page 249 by scanning the QR code.
5. Ask a student to work out the Spot the Errors on page 144 in the Workbook and discuss with them.
6. Randomly select 8 questions from the Mastery Practice in the Textbook and have students solve them in the class. Have students work on the rest of the questions at home.
7. Ask students to do the Enrichment Exercises in the Workbook to test their understanding of this chapter as their homework.

Emphasized Characteristics

1. Thinking skill
2. Problem-solving skill
3. Analysing skill
4. Drawing skill

Learning Materials

- Focus Smart Textbook Mathematics M1
- Focus Smart Workbook Mathematics M1

Learning Outcome Form

Name-Surname: ..... **No.** .....

Mathayom: ..... **Date:** .....

Chapter 11 Statistics

Explanation: Summary of learning outcomes

Feeling after learning this chapter:

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Contents that you need for teacher to explain further:

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Knowledge gained from this chapter:

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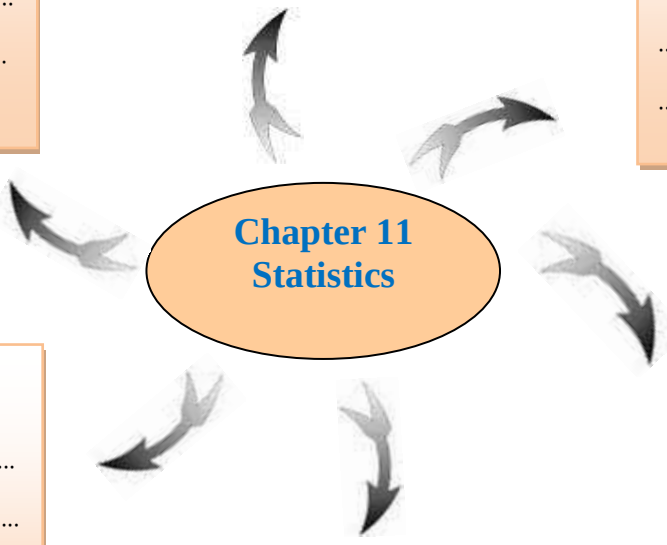

Application of knowledge from this chapter in your daily life:

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Contents that you like the most in this chapter (give your reason):

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Exercises that you like and want to be selected as the outstanding work:

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