Exploring God's Order: Grade 7 Mathematics

**Book Introduction (First Page of Moodle Book)**

**(Image Suggestion: A well-ordered natural scene like a honeycomb, a spiral galaxy, or a nautilus shell)**

**Welcome**

Welcome to Grade 7 Mathematics. The Bible tells us, "The LORD by wisdom hath founded the earth; by understanding hath he established the heavens. By his knowledge the depths are broken up, and the clouds drop down the dew." (Proverbs 3:19-20, KJV).

Mathematics is a special tool that helps us explore and understand the amazing order, patterns, and precision that God built into His creation. From the smallest atom to the vastness of space, we see evidence of His intelligent design and unchanging principles.

In this course, we will approach mathematics with diligence and humility. Our goal is not to boast in our own abilities, but to grow in our understanding of God's world and to develop the skills He has given us to be faithful stewards. We are called to do our work "heartily, as to the Lord, and not unto men" (Colossians 3:23, KJV).

This book follows the South African CAPS curriculum and is divided into four terms. We will cover topics carefully, step-by-step. You will find explanations, examples, and activities to help you practise and apply what you learn. Let us strive to be accurate and honest in our work, reflecting the truthfulness of God Himself.

May this journey through mathematics deepen your appreciation for the Creator and equip you for service.

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**TERM 1**

**(Term 1 Introduction - Optional separate page or start of Chapter 1)**

This term, we begin our exploration by focusing on foundational concepts: Whole Numbers, Exponents, Integers, and Patterns. These are like the building blocks God uses in His creation, showing structure, power, order, and design. Let's approach these topics with prayerful diligence.

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**Chapter 1: Whole Numbers - Foundations of God's Order**

**(Chapter 1 Introduction)**

Whole numbers (0, 1, 2, 3, ...) are the numbers we first learn to count with. They seem simple, yet they form the basis for much of mathematics and help us quantify God's abundant creation – from counting the stars (though only God knows the exact number, Psalm 147:4) to managing resources wisely. We will revise and deepen our understanding of how these numbers work.

**(Image Suggestion: Grains of sand on a beach or stars in the night sky, illustrating vast quantities)**

### 1.1 Revision: Place Value, Ordering, and Comparing

- **Content:** Understanding place value is crucial for working with large numbers. Each digit in a number has a value based on its position (Units, Tens, Hundreds, Thousands, etc.). We use symbols like '$\<$' (less than), '' (greater than), and '=' (equal to) to compare numbers accurately. God's creation has structure and order; place value reflects a similar structure in our number system.
- **Example:** In the number 5 382, the '5' represents 5 Thousands, the '3' represents 3 Hundreds, the '8' represents 8 Tens, and the '2' represents 2 Units. We know that 5 382 > 5 328 because the digit in the Tens place (8) is greater than the other number's Tens digit (2), even though the Thousands and Hundreds are the same.
- **Activity:**
    1. Write the value of the underlined digit: 4<u>7</u> 890; 1<u>2</u>3 456; 90<u>1</u> 835.
    2. Insert <, >, or =: 12 456 ___ 12 546; 98 765 ___ 98 765; 101 010 ___ 100 110.
    3. Arrange these numbers in ascending order: 56 789; 57 689; 56 879; 57 869.
- **H5P Suggestion:** Drag and Drop activity for ordering numbers. Fill in the Blanks for place value identification.

### 1.2 Rounding Off Whole Numbers

- **Content:** Rounding helps us estimate or simplify numbers. We round to the nearest 10, 100, 1000, etc., by looking at the digit to the right of the place we are rounding to. If it's 5 or more, we round up; if it's less than 5, we keep the digit the same. Estimation is useful, but we must also value precision and honesty, reporting exact numbers when required.
- **Rules:**
    1. Nearest 10: Look at the Units digit.
    2. Nearest 100: Look at the Tens digit.
    3. Nearest 1000: Look at the Hundreds digit.
- **Example:** Round 4 783 to the nearest 100. Look at the Tens digit (8). Since 8 is 5 or more, round the Hundreds digit (7) up to 8. So, 4 783 ≈ 4 800.
- **Activity:**
    1. Round 67 892 to the nearest 10, 100, and 1000.
    2. A shop sold 1 237 loaves of bread in a week. Round this number to the nearest 100 to estimate the weekly sales. Is the estimate higher or lower than the actual number?
- **H5P Suggestion:** Quiz with multiple-choice questions on rounding.

### 1.3 Properties of Whole Numbers

- **Content:** God's laws are consistent. Mathematics also has reliable properties that help simplify calculations.
    1. **Commutative Property:** The order doesn't matter for addition or multiplication (e.g., 5+3=3+5; 4times6=6times4).
    2. **Associative Property:** How numbers are grouped doesn't matter for addition or multiplication (e.g., (2+3)+4=2+(3+4); (2times3)times4=2times(3times4)).
    3. **Distributive Property:** Multiplication can be 'distributed' over addition or subtraction (e.g., 5times(2+3)=(5times2)+(5times3)).
    4. **Identity Elements:** Adding 0 or multiplying by 1 doesn't change a number.
- **Activity:**
    1. Identify the property shown: 15+(5+8)=(15+5)+8.
    2. Use the distributive property to calculate: 7times(10+4).
    3. Show that subtraction is *not* commutative using an example.

**1.4 Operations: Addition and Subtraction**

- **Content:** We must be proficient in adding and subtracting whole numbers accurately, often using the column method. Careful work and checking answers are important aspects of diligence. These skills are vital for managing finances, resources, and many other practical tasks God entrusts to us.

**Example (Column Method Addition):**

```
  1 4567
+   8923
---------
  2 3490
---------
  1 1 1   (Carried digits)
```

-
- **Activity:**
    1. Calculate: 56 789 + 12 345; 98 000 - 45 678.
    2. A farmer harvested 12 560 kg of maize in year one and 14 895 kg in year two. How much more did he harvest in year two? What was the total harvest over two years? (Discuss stewardship of harvests).
- **H5P Suggestion:** Arithmetic Quiz focusing on multi-digit addition and subtraction.

**1.5 Operations: Multiplication and Division**

- **Content:** Multiplication (repeated addition) and division (sharing or grouping) are essential. We need mastery of methods like long multiplication and short/long division. Understanding remainders is important. These operations help us understand concepts like growth (multiplication) and distribution (division).

**Example (Long Multiplication):**

```
   158
 x  24
 ----
   632  (158 x 4)
```

3160  (158 x 20)
----
3792
----

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- **Example (Short Division):** 457div3=152textremainder1.
- **Activity:**
    1. Calculate: 345times67; 5892div9.
    2. If 15 buses are needed to transport 975 learners, how many learners must fit in each bus if they are shared equally?
- **H5P Suggestion:** Multiplication and division quizzes, potentially including problems with remainders.

**1.6 Multiples and Factors**

- **Content:**
    1. **Multiples:** The result of multiplying a number by any whole number (e.g., multiples of 4 are 4, 8, 12, 16...).
    2. **Factors:** Numbers that divide exactly into another number (e.g., factors of 12 are 1, 2, 3, 4, 6, 12). Understanding factors and multiples helps in many areas, including finding common denominators later.
- **Activity:**
    1. List the first 5 multiples of 7.
    2. List all the factors of 24.
    3. Which of these numbers are factors of 36: 1, 2, 5, 6, 9, 10, 12, 15, 18, 36?
- **H5P Suggestion:** Simple games identifying multiples or factors of a given number.

**1.7 Prime Numbers and Prime Factorisation**

- **Content:**
    1. **Prime Number:** A whole number greater than 1 that has only two factors: 1 and itself (e.g., 2, 3, 5, 7, 11...).
    2. **Composite Number:** A whole number greater than 1 that has more than two factors (e.g., 4, 6, 8, 9, 10...).
    3. **Prime Factorisation:** Writing a composite number as a product of its prime factors. A factor tree is a useful tool. Prime numbers are like the fundamental building blocks for whole numbers.

**Example (Factor Tree for 36):**
Code snippet
```
graph TD
    36 --> 6 & 6
    6 --> 2 & 3
    6 --> 2 & 3
    subgraph Prime Factors
        P1[2]
        P2[3]
        P3[2]
```

P4[3]
end
2 -- linked --> P1
3 -- linked --> P2
2 -- linked --> P3
3 -- linked --> P4

- So, 36=2times2times3times3=22times32.
- **Activity:**
    1. Identify the prime numbers between 10 and 30.
    2. Find the prime factors of 60 using a factor tree. Write it in exponential form.
- **Illustration Suggestion:** Factor tree diagram. Maybe the Sieve of Eratosthenes chart.

### 1.8 Highest Common Factor (HCF) and Lowest Common Multiple (LCM)

- **Content:**
    1. **HCF:** The largest factor that two or more numbers share.
    2. **LCM:** The smallest multiple that two or more numbers share. We can find these by listing factors/multiples or using prime factorisation. These concepts are practical, for example, in problems involving sharing items equally (HCF) or finding when events coincide (LCM).
- **Methods:**
    1. **Listing:** List factors/multiples and find the highest/lowest common one.
    2. **Prime Factorisation:** Find prime factors of each number. HCF = product of lowest powers of common prime factors. LCM = product of highest powers of all prime factors involved.
- **Example (HCF and LCM of 12 and 18):**
    1. Factors of 12: {1, 2, 3, 4, 6, 12}
    2. Factors of 18: {1, 2, 3, 6, 9, 18}
    3. HCF = 6
    4. Multiples of 12: {12, 24, 36, 48...}
    5. Multiples of 18: {18, 36, 54...}
    6. LCM = 36
    7. Using Prime Factors: 12=22times31; 18=21times32.
    8. HCF = 21times31=6.
    9. LCM = 22times32=4times9=36.
- **Activity:**
    1. Find the HCF of 24 and 40.
    2. Find the LCM of 8 and 10.
    3. Two lighthouses flash their lights, one every 15 seconds and the other every 18 seconds. If they flash together at 6 pm, when will they next flash together? (LCM application)
- **H5P Suggestion:** Quiz requiring calculation of HCF and LCM.

### 1.9 Problem Solving with Whole Numbers

- **Content:** Apply the skills learned to solve word problems. A good approach:

1. **Read and Understand:** Identify what is asked and the information given.
2. **Plan:** Choose the correct operation(s).
3. **Do:** Perform the calculations carefully.
4. **Check:** Does the answer make sense? Check calculations. Solving problems requires diligence and careful thought, applying mathematical tools to real-world situations, often involving stewardship of resources or time. "Whatsoever thy hand findeth to do, do it with thy might..." (Ecclesiastes 9:10a, KJV).

- **Activity:**
  1. A school needs R45 000 for new computers. They have raised R28 550. How much more money do they need?
  2. If a baker produces 144 loaves of bread each day, how many loaves does he produce in 4 weeks (assuming he bakes 6 days a week)?
  3. A builder has 120 red bricks and 150 blue bricks. He wants to stack them in piles of equal height, without mixing colours. What is the tallest possible height (in number of bricks) for the piles? (HCF application)

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**Chapter 2: Exponents - Understanding God's Power and Growth**

**(Chapter 2 Introduction)**

Exponents provide a shorthand way to write repeated multiplication, like 2times2times2=23. This mathematical tool helps us express very large numbers and understand concepts of rapid growth or power. We can think of God's immense power, or the instruction He gave to "be fruitful, and multiply" (Genesis 1:28, KJV), when we study exponents.

**(Image Suggestion: A rapidly growing tree, or perhaps visual representations of squares and cubes.)**

**2.1 Square Numbers and Square Roots**

- **Content:**
  1. **Square Number:** The result of multiplying a whole number by itself (e.g., 4times4=16. So 16 is a square number, written as 42).
  2. **Square Root:** The number that, when multiplied by itself, gives the original number (e.g., the square root of 16 is 4, written as sqrt16=4). Perfect squares are numbers whose square roots are whole numbers.
- **Example:** 52=5times5=25. sqrt49=7 (since 7times7=49).
- **Activity:**
  1. Calculate: 82; 122.
  2. Find: sqrt64; sqrt121.
  3. List the first 10 perfect squares.
- **Illustration:** Diagrams showing dots forming squares (1x1, 2x2, 3x3...).
- **H5P Suggestion:** Flashcards matching numbers to their squares/roots. Multiple choice quiz.

**2.2 Cube Numbers and Cube Roots**

- **Content:**
    1. **Cube Number:** The result of multiplying a whole number by itself three times (e.g., 3times3times3=27. So 27 is a cube number, written as 33).
    2. **Cube Root:** The number that, when multiplied by itself three times, gives the original number (e.g., the cube root of 27 is 3, written as sqrt[3]27=3). Perfect cubes are numbers whose cube roots are whole numbers.
- **Example:** 23=2times2times2=8. sqrt[3]125=5 (since 5times5times5=125).
- **Activity:**
    1. Calculate: 43; 103.
    2. Find: sqrt[3]8; sqrt[3]64.
    3. List the first 5 perfect cubes.
- **Illustration:** Diagrams showing small blocks forming cubes (1x1x1, 2x2x2, 3x3x3...).
- **H5P Suggestion:** Flashcards or quiz for cubes and cube roots.

### 2.3 Comparing and Representing Numbers in Exponential Form

- **Content:** We write numbers in exponential form using a base and an exponent (power). an means 'a' multiplied by itself 'n' times. We need to be able to compare numbers written this way. For example, is 24 bigger or smaller than 42?
    1. 24=2times2times2times2=16
    2. 42=4times4=16 In this case, they are equal. Always calculate the value to compare accurately.
- **Activity:**
    1. Write 5times5times5times5 in exponential form.
    2. Calculate the value of 34.
    3. Insert <, >, or =: 25 ___ 52; 103 ___ 310 (estimate or calculate); 19 ___ 91.

*(Note: Basic exponent laws like amtimesan=am+n are often introduced later in Grade 7 or in Grade 8 according to CAPS. If required for your specific pacing, they could be added here as a basic introduction.)*

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## Chapter 3: Integers - Order on the Number Line

**(Chapter 3 Introduction)**

God created a world of order, which includes concepts like direction and position. Integers extend the whole numbers to include negative numbers (..., -3, -2, -1, 0, 1, 2, 3, ...). They help us represent ideas like temperatures below zero, depths below sea level, or financial debt. The number line is a key tool for visualising and understanding integers.

**(Image Suggestion: A thermometer showing temperatures above and below zero, or a number line.)**

### 3.1 Representing Integers

- **Content:** Integers include positive whole numbers, negative whole numbers, and zero. We represent them on a number line with zero at the centre, positive numbers to the right, and negative numbers to the left. Each negative number is the opposite of its positive counterpart (e.g., -5 is the opposite of 5).

- **Real-world examples:**
    1. Temperature: -5°C is colder than 2°C.
    2. Elevation: -100 m (below sea level) vs +500 m (above sea level).
    3. Finance: A balance of -R50 (debt) vs +R100 (credit).
- **Activity:**
    1. Draw a number line from -10 to 10. Mark the position of -3, 5, 0, -8, 2.
    2. Represent the following as integers: A debt of R200; A profit of R50; 15 degrees below zero; A height of 1000m above sea level.

### 3.2 Comparing and Ordering Integers

- **Content:** On a number line, numbers increase as you move to the right. Therefore, any positive number is greater than any negative number. For negative numbers, the number closer to zero is greater (e.g., $-2 > -5$).
- **Example:** Order from least to greatest: 3, -4, 0, -1, 5. Using a number line, we see the order is: -4, -1, 0, 3, 5.
- **Activity:**
    1. Insert <, >, or =: -5 ___ 2; -7 ___ -3; 0 ___ -6; -10 ___ -10.
    2. Arrange in descending order: -9, 6, -2, 0, 4, -5.
- **H5P Suggestion:** Drag and Drop activity for ordering integers on a number line.

### 3.3 Adding Integers

- **Content:** Adding integers can be visualised on the number line. Adding a positive number means moving right. Adding a negative number means moving left.
    1. Rules:
        - Same signs: Add the numbers and keep the sign (e.g., $5+3=8$; $-5+(-3)=-8$).
        - Different signs: Find the difference between the numbers (ignoring signs) and take the sign of the number further from zero (e.g., $-5+3$: difference is 2, -5 is further from 0, so answer is -2. $5+(-3)$: difference is 2, 5 is further from 0, so answer is 2).
- **Example (Number line):** $-2+5$. Start at -2, move 5 units right, end at 3. So, $-2+5=3$.
- **Activity:**
    1. Calculate: $7+(-4)$; $(-6)+(-3)$; $(-8)+5$; $10+(-12)$.
    2. The temperature was -4°C. It rose by 6°C. What is the new temperature?
- **H5P Suggestion:** Quiz on integer addition.

### 3.4 Subtracting Integers

- **Content:** Subtracting an integer is the same as adding its opposite. So, change the subtraction sign to addition, and change the sign of the number being subtracted. Then follow the rules for addition. Diligence in applying the correct rule is key.
    1. Rule: $a-b=a+(-b)$; $a-(-b)=a+b$.
- **Example:**
    1. $5-8=5+(-8)=-3$.
    2. $-4-6=-4+(-6)=-10$.

3. $3-(-7)=3+7=10$.
4. $-9-(-2)=-9+2=-7$.

- **Activity:**
  1. Calculate: $12-15$; $(-5)-9$; $8-(-3)$; $(-11)-(-6)$.
  2. A submarine was at a depth of -150m. It descended a further 80m. What is its new depth (represented as an integer)? (Calculation: -150 - 80)
- **H5P Suggestion:** Quiz including both integer addition and subtraction problems.

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**Chapter 4: Numeric and Geometric Patterns - Recognising God's Design**

**(Chapter 4 Introduction)**

"Thus saith the LORD; If my covenant be not with day and night, and if I have not appointed the ordinances of heaven and earth; Then will I cast away the seed of Jacob..." (Jeremiah 33:25-26a, KJV). God's creation is full of patterns – the cycle of seasons, the arrangement of leaves on a stem, the structure of crystals. Studying patterns in mathematics helps us appreciate this designed order and develop logical thinking.

**(Image Suggestion: Repeating patterns in nature like a sunflower head, fern leaf, or ripples on water.)**

**4.1 Investigating and Extending Numeric Patterns**

- **Content:** A numeric pattern (or sequence) is a list of numbers arranged according to a specific rule. We need to identify the rule (e.g., add 5, multiply by 2, subtract 3) and use it to find the next terms in the sequence. Some patterns have a constant difference (arithmetic sequences), others a constant ratio (geometric sequences).
- **Example:** Pattern: 3, 7, 11, 15, ...
  1. Rule: Add 4 to the previous term.
  2. Next three terms: 19, 23, 27.
- **Example:** Pattern: 2, 6, 18, 54, ...
  1. Rule: Multiply the previous term by 3.
  2. Next three terms: 162, 486, 1458.
- **Activity:**
  1. Find the rule and the next three terms for each pattern: a) 5, 11, 17, 23, ... b) 80, 40, 20, 10, ... c) 1, 4, 9, 16, ... (Hint: Think square numbers)
- **H5P Suggestion:** Find the next number/term in a sequence activity.

**4.2 Input, Output, and Describing Rules**

- **Content:** We can represent patterns using tables showing an input value (often the position in the sequence, like 1st, 2nd, 3rd term) and an output value (the term itself). We look for a rule that connects the input (let's call it 'n') to the output (let's call it 'T'). For Grade 7, we often look for rules like T=atimesn+b or T=atimesn−b.
- **Example:** | Input (n) | 1 | 2 | 3 | 4 | 5 | |-----------|---|---|---|----|----| | Output (T)| 5 | 7 | 9 | 11 | ? |

1. Observation: Each time the input increases by 1, the output increases by 2. This suggests the rule involves '2n'.
2. Test: If rule is 2n, outputs would be 2, 4, 6, 8. These are 3 less than the actual outputs (5, 7, 9, 11).
3. Rule: T=2n+3.
4. Check: For n=1, T = 2(1)+3=5. For n=2, T = 2(2)+3=7. It works.
5. For n=5, T = 2(5)+3 = 13.

- **Activity:**
    1. Complete the table and find the rule (T in terms of n): | Input (n) | 1 | 2 | 3 | 4 | 10 | |-----------|---|---|---|---|----| | Output (T)| 6 | 11| 16| ? | ? |
- **H5P Suggestion:** Interactive tables where learners fill in missing values and identify the rule.

#### 4.3 Investigating and Extending Geometric Patterns

- **Content:** Patterns can also involve shapes. We look for changes in shape, size, position, or colour. Describe the pattern in words and draw the next diagram(s) in the sequence. We can also count elements (like dots or squares) in each diagram to create a numeric pattern.
- **Example:**
    1. Diagram 1: * (1 star)
    2. Diagram 2: *** (3 stars)
    3. Diagram 3: ***** (5 stars)
    4. Description: Each diagram adds 2 stars to the previous one, forming a horizontal line.
    5. Numeric Pattern: 1, 3, 5, ... (Rule: Add 2)
    6. Next Diagram (Diagram 4): ******* (7 stars)
- **Activity:**
    1. Consider a pattern made with squares: Diagram 1 is one square. Diagram 2 adds squares above and to the right to make a 2x2 square. Diagram 3 adds squares to make a 3x3 square. a) Draw Diagram 4. b) Describe the pattern. c) How many small squares are in Diagram 5? d) Write a numeric sequence for the number of squares in each diagram.
- **Illustration Suggestion:** Clear diagrams showing the first few stages of various geometric patterns.
- **H5P Suggestion:** Multiple choice asking learners to select the next diagram in a geometric sequence.

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#### Term 1 Conclusion/Reflection (Final page for Term 1)

We have now explored Whole Numbers, Exponents, Integers, and Patterns. We have seen how these mathematical ideas reflect the order, power, structure, and design evident in God's creation. Remember the importance of diligence, accuracy, and honesty in your work. "Study to shew thyself approved unto God, a workman that needeth not to be ashamed, rightly dividing the word of truth." (2 Timothy 2:15, KJV) - and we can apply this principle of careful work to our mathematics too.

Continue to practise these foundational skills, as they will be built upon in the terms to come. May God grant you understanding and wisdom as you learn.

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This structure provides a comprehensive Term 1 plan aligned with your requirements. Remember to flesh out the examples and activities further as needed for the actual Moodle book pages.

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**TERM 2**

**(Term 2 Introduction - Optional separate page or start of Chapter 5)**

In Term 2, we will build upon the foundations from Term 1. Our focus will be on Common Fractions, Decimal Fractions, and Percentage, providing tools for understanding proportions, parts of a whole, and increases or decreases. Let us use these tools responsibly and honestly, as we manage the resources God has given us.

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**Chapter 5: Common Fractions - Parts of God's Whole**

**(Chapter 5 Introduction)**

Common fractions represent parts of a whole (like 1/2, 3/4, 5/8). They help us divide and share things fairly, illustrating concepts of equity and justice, principles we see in God's character. We need to be confident in working with them.

**(Image Suggestion: A pie cut into equal slices, or maybe different containers partially filled with liquid, showing different fractions)**

**5.1 Revision: What are Fractions?**

- **Content:** A fraction shows a part of a whole. It is written as a/b, where 'a' (numerator) is the number of parts we have, and 'b' (denominator) is the total number of equal parts the whole is divided into.
- **Types:**
    1. Proper Fractions: Numerator < Denominator (e.g., 2/5).
    2. Improper Fractions: Numerator >= Denominator (e.g., 7/4).
    3. Mixed Numbers: Whole number + proper fraction (e.g., 1 3/4).
- **Activity:**
    1. What fraction of the shape is shaded? (Include diagrams).
    2. Write 5/8 as a fraction. What is the numerator? What is the denominator?
    3. Give two examples each of a proper fraction, an improper fraction, and a mixed number.
- **H5P Suggestion:** Interactive drag and drop where learners match visual representations to fractions.

### 5.2 Equivalent Fractions

- **Content:** Different fractions can represent the same value (e.g., 1/2 = 2/4 = 3/6). We create equivalent fractions by multiplying or dividing *both* the numerator and denominator by the *same* non-zero number. Maintaining fairness and proportionality is important, reflecting God's justice.
- **Example:** 2/3 = (2 x 2) / (3 x 2) = 4/6 = (2 x 3) / (3 x 3) = 6/9.
- **Activity:**
    1. Find three fractions equivalent to 3/5.
    2. Fill in the missing number: 1/4 = ?/12; 6/8 = 3/?
- **H5P Suggestion:** Matching equivalent fractions.

### 5.3 Simplifying Fractions

- **Content:** Simplifying (or reducing) a fraction means finding an equivalent fraction with the smallest possible numerator and denominator. We divide *both* numerator and denominator by their HCF (Highest Common Factor). Simplest form ensures clarity and accuracy.
- **Example:** Simplify 12/18. HCF of 12 and 18 is 6. So, 12/18 = (12 ÷ 6) / (18 ÷ 6) = 2/3.
- **Activity:** Simplify the following fractions: 8/12; 15/25; 24/36.

### 5.4 Comparing Fractions

- **Content:** To compare fractions, they must have the same denominator (a "common denominator").
    1. If they have the same denominator, the larger numerator means a larger fraction (e.g., 3/5 > 2/5).
    2. If they don't, find equivalent fractions with a common denominator (often the LCM of the original denominators). Then compare numerators.
- **Example:** Compare 2/3 and 3/4. LCM of 3 and 4 is 12. 2/3 = 8/12; 3/4 = 9/12. Since 9/12 > 8/12, then 3/4 > 2/3.
- **Activity:**
    1. Insert <, >, or =: 5/9 ___ 7/9; 1/3 ___ 2/5; 4/6 ___ 6/9.
    2. Arrange in ascending order: 1/2, 3/8, 5/12.
- **H5P Suggestion:** Ordering fractions activity.

### 5.5 Adding and Subtracting Fractions

- **Content:** Again, fractions must have a common denominator before adding or subtracting.
    1. Add/subtract the numerators.
    2. Keep the denominator the same.
    3. Simplify the answer if possible.
- **Example:** 1/4 + 2/4 = (1+2)/4 = 3/4. 5/6 - 1/6 = (5-1)/6 = 4/6 = 2/3.
- If denominators are different, find a common denominator *first*. Example: 1/3 + 1/4 = 4/12 + 3/12 = 7/12.
- **Activity:**
    1. Calculate: 2/7 + 3/7; 9/10 - 3/10; 1/2 + 1/5; 2/3 - 1/6.

- **H5P Suggestion:** Arithmetic quiz with fraction addition and subtraction.

**5.6 Multiplying Fractions**

- **Content:** Multiply the numerators. Multiply the denominators. Simplify if possible.
- **Example:** 2/3 x 3/4 = (2 x 3) / (3 x 4) = 6/12 = 1/2.
- **Activity:** Calculate: 1/2 x 4/5; 2/3 x 5/7; 3/8 x 4/9.

**5.7 Dividing Fractions**

- **Content:** "Keep, Change, Flip": Keep the first fraction. Change the division sign to multiplication. Flip (invert) the second fraction. Then multiply as usual.
- **Example:** 1/2 ÷ 2/3 = 1/2 x 3/2 = (1 x 3) / (2 x 2) = 3/4.
- **Activity:** Calculate: 2/5 ÷ 1/3; 3/4 ÷ 5/6; 1/8 ÷ 3/4.

**5.8 Fractions and Whole Numbers**

- **Content:** We can write a whole number as a fraction with a denominator of 1 (e.g., 5 = 5/1). This helps when multiplying or dividing a fraction by a whole number.
- **Examples:**
  1. 2/3 x 4 = 2/3 x 4/1 = 8/3 (improper fraction) = 2 2/3 (mixed number).
  2. 1/2 ÷ 3 = 1/2 ÷ 3/1 = 1/2 x 1/3 = 1/6.
- **Activity:**
  1. Calculate: 3/5 x 2; 1/4 ÷ 5; 7 x 2/3.

**5.9 Problem Solving with Fractions**

- **Content:** Apply fraction operations to real-world problems. Read the problem carefully. Identify what is being asked. Choose the correct operations. Check that your answer is reasonable.
- **Activity:**
  1. John ate 1/3 of a pizza, and Mary ate 1/4. How much of the pizza did they eat altogether?
  2. A recipe requires 2/5 of a cup of flour. If you want to make half the recipe, how much flour do you need?
  3. A rope is 12 metres long. If you cut off 3/4 of it, how long is the remaining piece?

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**Chapter 6: Decimal Fractions - Reflecting God's Precision**

**(Chapter 6 Introduction)**

Decimal fractions are another way of writing fractions, using a base-ten system (e.g., 0.5, 0.75, 1.2). They are especially useful for measurements (like length, mass, money) and calculations requiring high accuracy. Think of the fine details in God's creation – the veins on a leaf, the structure of a snowflake. Decimals help us describe such precision mathematically. Let us strive for similar precision and honesty in our calculations. "Provide things honest in the sight of all men." (Romans 12:17b, KJV).

**(Image Suggestion: A ruler or micrometer showing precise measurements, or perhaps South African coins and notes illustrating Rand and cents.)**

### 6.1 Revision: What are Decimals? (Continued)

- **Content:** A decimal fraction has a whole number part, a decimal point (or comma, as often used in SA context, but we will stick to the point for consistency here as per typical maths notation), and a fractional part. Each digit to the right of the decimal point has a place value: tenths (1/10), hundredths (1/100), thousandths (1/1000), etc.
- **Example:** In 12.345:
    1. 1 is in the Tens place
    2. 2 is in the Units place
    3. '.' is the decimal point
    4. 3 is in the tenths place (3/10)
    5. 4 is in the hundredths place (4/100)
    6. 5 is in the thousandths place (5/1000) The number means 12+3/10+4/100+5/1000.
- **Activity:**
    1. Identify the place value of the underlined digit: 5.<u>6</u>7; 10.0<u>8</u>2; 0.19<u>3</u>.
    2. Write the following number in words: 23.45.
- **H5P Suggestion:** Place value identification quiz for decimal numbers.

### 6.2 Place Value, Ordering, Comparing Decimals

- **Content:** Comparing decimals requires looking at place values from left to right.
    1. Compare the whole number parts first. The larger whole number makes the larger decimal.
    2. If whole parts are equal, compare the tenths digits.
    3. If tenths are equal, compare the hundredths digits, and so on. You can add trailing zeros after the last decimal digit without changing the value, which helps when comparing (e.g., 0.5 = 0.50).
- **Example:** Compare 1.23 and 1.203.
    1. Whole parts (1) are equal.
    2. Tenths digits (2) are equal.
    3. Hundredths digits: 3 in 1.23, 0 in 1.203. Since 3 > 0, then 1.23 > 1.203.
- **Example:** Order 0.6, 0.55, 0.601 from smallest to largest.
    1. Write with same number of decimal places: 0.600, 0.550, 0.601
    2. Compare: 0.550 is smallest. Then 0.600, then 0.601.
    3. Order: 0.55, 0.6, 0.601.
- **Activity:**
    1. Insert <, >, or =: 4.5 ___ 4.05; 0.78 ___ 0.780; 12.1 ___ 12.099.
    2. Arrange in ascending order: 2.34, 2.4, 2.304, 2.043.
- **H5P Suggestion:** Drag and Drop ordering of decimal numbers.

### 6.3 Rounding Off Decimal Fractions

- **Content:** Similar to whole numbers, we round decimals to a specific place value (e.g., nearest whole number, nearest tenth, nearest hundredth). Look at the digit *immediately to the right* of the place you are rounding to. If it's 5 or more, round up the digit in the target place. If it's less than 5, keep the digit in the target place the same. Drop all digits to the right of the target place. Accuracy matters, but rounding is useful for estimation or when exact precision isn't needed (e.g., rounding money to the nearest cent).

- **Examples:**
    1. Round 3.14159 to the nearest hundredth: Look at the thousandths digit (1). It's less than 5, so keep the hundredths digit (4) the same. Answer: 3.14.
    2. Round 2.786 to the nearest tenth: Look at the hundredths digit (8). It's 5 or more, so round up the tenths digit (7) to 8. Answer: 2.8.
    3. Round R15.678 to the nearest cent (hundredth): Look at the thousandths digit (8). Round up the hundredths digit (7) to 8. Answer: R15.68.
- **Activity:**
    1. Round 17.853 to the nearest tenth.
    2. Round 0.4962 to the nearest hundredth.
    3. Round R24.995 to the nearest cent.
- **H5P Suggestion:** Quiz with multiple-choice questions on rounding decimals.

### 6.4 Converting Between Common and Decimal Fractions

- **Content:** We need to be able to switch between these forms.
    1. **Common Fraction to Decimal:** Divide the numerator by the denominator (e.g., 3/4 = 3 ÷ 4 = 0.75). Sometimes this results in a recurring decimal (e.g., 1/3 = 0.333...).
    2. **Decimal to Common Fraction:** Read the decimal using place value. Write it as a fraction with a denominator of 10, 100, 1000, etc. Then simplify the fraction. (e.g., 0.6 = six tenths = 6/10 = 3/5; 0.25 = twenty-five hundredths = 25/100 = 1/4).
- **Examples:**
    1. Convert 2/5 to a decimal: 2 ÷ 5 = 0.4.
    2. Convert 0.8 to a fraction: 0.8 = 8/10 = 4/5.
    3. Convert 1.35 to a mixed number: 1 and 35 hundredths = 1 35/100 = 1 7/20.
- **Activity:**
    1. Convert to decimals: 1/2; 3/8; 2/3 (indicate if recurring).
    2. Convert to common fractions in simplest form: 0.5; 0.12; 0.625.
    3. Convert to a mixed number in simplest form: 3.75.
- **H5P Suggestion:** Matching game connecting equivalent common fractions and decimals.

### 6.5 Adding and Subtracting Decimal Fractions

- **Content:** The key is to line up the decimal points vertically. This ensures you are adding or subtracting digits with the same place value (tenths with tenths, hundredths with hundredths, etc.). Add or subtract as you would with whole numbers, bringing the decimal point straight down in your answer. Diligence in lining up the numbers prevents errors.
- **Example:** Calculate 12.34 + 5.6 + 0.789.
  12.340 (Add trailing zero for alignment)

- 5.600 (Add trailing zeros)
- \+ 0.789
- ---------
- 18.729
- ---------
- 
- **Example:** Calculate 9.8 - 1.23.
  9.80 (Add trailing zero)
- \- 1.23
- ---------
- 8.57
- ---------
- 
- **Activity:**
  1. Calculate: 4.56 + 0.123 + 15.7; 25.5 - 9.87.
  2. A piece of wood is 2.5 m long. If 0.85 m is cut off, how long is the remaining piece?
- **H5P Suggestion:** Arithmetic quiz focused on decimal addition and subtraction.

### 6.6 Multiplying Decimal Fractions

- **Content:**
  1. Multiply the numbers as if they were whole numbers (ignore the decimal points initially).
  2. Count the *total* number of decimal places in the original numbers being multiplied.
  3. Place the decimal point in the answer so that it has that total number of decimal places.
- **Example:** Calculate 2.3 x 1.5.
  1. Multiply 23 x 15 = 345.
  2. 2.3 has 1 decimal place. 1.5 has 1 decimal place. Total = 1 + 1 = 2 decimal places.
  3. Place the decimal point in 345 so it has 2 decimal places: 3.45. Answer: 2.3 x 1.5 = 3.45.
- **Example:** Calculate 0.4 x 0.06.
  1. Multiply 4 x 6 = 24.
  2. 0.4 has 1 decimal place. 0.06 has 2 decimal places. Total = 1 + 2 = 3 decimal places.
  3. Place the decimal point in 24 so it has 3 decimal places. We need to add a leading zero: 0.024. Answer: 0.4 x 0.06 = 0.024.
- **Activity:**
  1. Calculate: 5.6 x 4; 1.2 x 3.4; 0.05 x 0.7.
  2. If one item costs R12.55, how much do 3 items cost?

### 6.7 Dividing Decimal Fractions

- **Content:**

1. **Dividing by a Whole Number:** Place the decimal point in the answer directly above the decimal point in the number being divided (the dividend). Divide as usual.
2. **Dividing by a Decimal Number:** Change the divisor (the number you are dividing by) into a whole number by multiplying it by a power of 10 (10, 100, etc.). Multiply the dividend by the *same* power of 10. Then divide as in the case above (dividing by a whole number). This keeps the division equivalent – a principle of fairness.

- **Example (Dividing by Whole):** Calculate 9.6 ÷ 3.
  3.2
- ____
- 3 | 9.6
- 9
- --
- 0 6
- 6
- --
- 0
- Answer: 3.2.
- **Example (Dividing by Decimal):** Calculate 8.4 ÷ 0.2.
  1. Multiply divisor (0.2) by 10 to make it 2.
  2. Multiply dividend (8.4) by 10 to make it 84.
  3. Perform the new division: 84 ÷ 2 = 42. Answer: 8.4 ÷ 0.2 = 42.
- **Activity:**
  1. Calculate: 15.75 ÷ 5; 7.2 ÷ 0.8; 1.25 ÷ 0.05.
  2. If 4 friends share a bill of R130.60 equally, how much does each pay?

### 6.8 Problem Solving with Decimal Fractions

- **Content:** Apply decimal operations to solve practical problems, often involving money, measurements (length, mass, volume), etc. Use the same Read-Plan-Do-Check approach. Ensure answers make sense in the context (e.g., money should usually have two decimal places).
- **Activity:**
  1. Sarah buys items costing R15.50, R8.75, and R22.30. How much does she spend in total? If she pays with R50.00, how much change does she receive?
  2. A car travels 150.5 km on 10 litres of petrol. How many kilometres does it travel per litre (km/l)?
  3. The price of sugar is R28.50 per kilogram. How much would 2.5 kg cost?

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## Chapter 7: Percentages - Understanding Proportion and Change

### (Chapter 7 Introduction)

Percentage means 'out of one hundred' (from Latin *per centum*). It's a special type of fraction where the denominator is always 100. Percentages are widely used to express proportions (like test scores), discounts, interest rates, and changes. Understanding them helps us be wise stewards and discerning consumers. "He that is faithful in that which is least is faithful also in much..." (Luke 16:10a, KJV) – being careful with calculations involving money and proportions is part of this faithfulness.

**(Image Suggestion: A shop window with a 'Sale - 20% Off' sign, or a circle graph (pie chart) showing percentages.)**

**7.1 Introduction: What are Percentages?**

- **Content:** A percentage is a ratio compared to 100. The symbol '%' is used. So, 50% means 50 out of 100, which is equivalent to the fraction 50/100 (or 1/2) and the decimal 0.50 (or 0.5). 100% represents the whole amount.
- **Examples:**
  1. 25% = 25/100
  2. 75% = 75/100
  3. 10% = 10/100
- **Activity:**
  1. What does 40% mean (write as a fraction)?
  2. If 100% of the learners are present, what does that mean?
  3. Shade 60% of a 10x10 grid.
- **H5P Suggestion:** Simple quiz matching percentages to their 'out of 100' fraction form.

**7.2 Converting Between Percentages, Decimals, and Fractions**

- **Content:** It's crucial to be able to convert between these three forms easily.
  1. **Percentage to Decimal:** Divide by 100 (move decimal point 2 places left). E.g., 65% = 0.65.
  2. **Decimal to Percentage:** Multiply by 100 (move decimal point 2 places right). E.g., 0.4 = 40%.
  3. **Percentage to Fraction:** Write the percentage over 100 and simplify. E.g., 20% = 20/100 = 1/5.
  4. **Fraction to Percentage:** First convert the fraction to a decimal (divide numerator by denominator), then convert the decimal to a percentage. E.g., 3/4 = 0.75 = 75%. (Alternatively, find an equivalent fraction with denominator 100, e.g., 3/4 = 75/100 = 75%).
- **Conversion Summary Table:** | Form | To Decimal | To Percentage | To Fraction | |------------|--------------------------|-------------------------|------------------------| | Percentage | Divide by 100 | - | Put over 100 & simplify | | Decimal | - | Multiply by 100 | Use place value & simplify | | Fraction | Divide numerator by denom | Convert to decimal first | - |
- **Activity:**
  1. Convert 35% to a decimal and a fraction.
  2. Convert 0.8 to a percentage and a fraction.
  3. Convert 2/5 to a decimal and a percentage.
  4. Complete a table with missing conversions (give one form, ask for the other two).
- **H5P Suggestion:** Drag and Drop matching equivalent percentages, decimals, and fractions. Fill in the blanks conversion exercises.

### 7.3 Calculating the Percentage of a Whole Number

- **Content:** To find a percentage of an amount, convert the percentage to either a fraction or a decimal, then multiply by the amount. Using the decimal form is often easier for calculations. "Of" usually means multiply.
- **Example (Using Decimal):** Find 15% of R200.
  1. Convert 15% to decimal: 0.15
  2. Multiply: 0.15 x 200 = 30
  3. Answer: R30.
- **Example (Using Fraction):** Find 25% of 80 kg.
  1. Convert 25% to fraction: 25/100 = 1/4
  2. Multiply: 1/4 x 80 = 80/4 = 20
  3. Answer: 20 kg.
- **Activity:**
  1. Calculate: 50% of 60; 10% of 150; 75% of R400; 5% of 120.
  2. A test is out of 50 marks. You score 80%. How many marks did you get?

### 7.4 Calculating Percentage Increase and Decrease

- **Content:** This involves finding the percentage change and then adding (for increase) or subtracting (for decrease) it from the original amount.
  1. Calculate the amount of the increase/decrease (find the percentage *of* the original amount).
  2. Add this amount to the original (for increase) or subtract it from the original (for decrease).
- **Example (Increase):** Increase R80 by 10%.
  1. Increase amount = 10% of R80 = 0.10 x 80 = R8.
  2. New amount = Original + Increase = R80 + R8 = R88.
- **Example (Decrease / Discount):** Decrease 150 kg by 20%.
  1. Decrease amount = 20% of 150 kg = 0.20 x 150 = 30 kg.
  2. New amount = Original - Decrease = 150 kg - 30 kg = 120 kg.
- **Activity:**
  1. Increase 50 by 30%.
  2. Decrease R250 by 15% (e.g., a discount).
  3. Last year, a farm produced 500 bags of potatoes. This year, production increased by 8%. How many bags were produced this year?

### 7.5 Problem Solving with Percentages

- **Content:** Apply percentage concepts to practical situations like discounts, price increases (inflation), VAT (Value Added Tax - currently 15% in SA on most goods), simple interest (Interest = Principal x Rate x Time, where rate is per year and time is in years), or analysing statistics. Read carefully, identify what needs to be calculated, and show your working. Be honest and accurate in calculations involving money.
- **Activity:**
  1. A shop offers a 25% discount on a jacket priced at R480. What is the sale price?

2. The price of bread increased by 5%. If it previously cost R14.00, what is the new price?
3. *(Optional Simple Interest, if included)* You deposit R1000 in a savings account that pays 6% simple interest per year. How much interest will you earn after 1 year? What is the total amount in the account after 1 year?
4. In a class of 30 learners, 60% are girls. How many boys are there?

- **H5P Suggestion:** Word problems presented as quizzes requiring percentage calculations.

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**Term 2 Conclusion/Reflection (Final page for Term 2)**

During Term 2, we have explored Common Fractions, Decimal Fractions, and Percentages. These tools are essential for working with parts of a whole, ensuring precision, and understanding changes and proportions in the world around us – from managing money wisely to interpreting information accurately. Remember Paul's encouragement: "whatsoever things are true, whatsoever things are honest, whatsoever things are just... think on these things." (Philippians 4:8, KJV). Applying mathematical truth accurately and honestly reflects this principle.

Continue practising these skills diligently. They form a vital part of the mathematical understanding needed for everyday life and further studies.

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**TERM 3**

**(Term 3 Introduction - Optional separate page or start of Chapter 8)**

This term, we delve into Geometry and Measurement. We will explore the properties of lines, angles, and shapes, and learn how to measure perimeter, area, and volume. Geometry reveals the underlying structure and beauty in God's creation – from the precise angles in a crystal to the shapes of leaves and shells. Measurement helps us quantify the space and resources He has given us. "For by grace are ye saved through faith; and that not of yourselves: it is the gift of God: Not of works, lest any man should boast. For we are his workmanship, created in Christ Jesus unto good works, which God hath before ordained that we should walk in them." (Ephesians 2:8-10, KJV). Let us appreciate the 'workmanship' in creation as we study its geometric forms and learn to measure them accurately as part of our 'good works' of understanding and stewardship.

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**Chapter 8: Geometry of Straight Lines - Order in Angles and Lines**

**(Chapter 8 Introduction)**

Lines and angles form the basic building blocks of shapes and structures. God's creation exhibits incredible order and precision in how lines and angles are used, from the parallel rays of sunlight to the specific angles in honeycomb cells. Understanding the rules governing lines and angles helps us see this underlying structure.

**(Image Suggestion: Parallel lines in nature like tree trunks in a forest, railway lines, or intersecting lines like roads or branches.)**

**8.1 Introduction: Lines and Angles in God's Design**

- **Content:** Define basic terms:
    - **Point:** A specific location, often marked with a dot and a capital letter (e.g., Point A).
    - **Line:** A straight path extending infinitely in both directions (e.g., line AB, denoted AB ).
    - **Line Segment:** A part of a line with two endpoints (e.g., segment CD, denoted CD).
    - **Ray:** A part of a line with one endpoint, extending infinitely in one direction (e.g., ray EF, denoted EF ).
    - **Angle:** Formed by two rays sharing a common endpoint (vertex). Measured in degrees (°).
- **Activity:** Draw and label examples of a point, line, line segment, and ray. Identify the vertex and arms of a given angle.

**8.2 Naming and Classifying Angles**

- **Content:** Angles are named using three capital letters (vertex in the middle, e.g., ∠ABC or ∠CBA) or just the vertex letter if unambiguous (e.g., ∠B), or sometimes a number or symbol inside the angle.
    1. **Classification by Size:**
        - **Acute Angle:** Between 0° and 90°.
        - **Right Angle:** Exactly 90°. (Indicated by a square symbol)
        - **Obtuse Angle:** Between 90° and 180°.
        - **Straight Angle:** Exactly 180° (forms a straight line).
        - **Reflex Angle:** Between 180° and 360°.
        - **Revolution (Full Angle):** Exactly 360°.
- **Illustration:** Clear diagrams illustrating each type of angle with typical degree measures.
- **Activity:**
    1. Name the given angles in three different ways (if possible).
    2. Classify angles with the following measures: 35°, 90°, 110°, 180°, 200°, 360°.
    3. Estimate the size of given angles and classify them.
- **H5P Suggestion:** Drag and Drop matching angle measures/diagrams to their classifications. Quiz identifying angle types.

**8.3 Relationships Between Lines**

- **Content:**
    - **Intersecting Lines:** Lines that cross at a point.
    - **Parallel Lines:** Lines in the same plane that never intersect, always the same distance apart. (Marked with arrows: > or >>).
    - **Perpendicular Lines:** Lines that intersect at a right angle (90°). (Marked with a square symbol at the intersection).
- **Illustration:** Diagrams showing examples of intersecting, parallel (with markings), and perpendicular lines (with markings).
- **Activity:** Identify pairs of intersecting, parallel, and perpendicular lines in diagrams or real-world pictures (e.g., window frame, road map).

**8.4 Angles on a Straight Line & Around a Point**

- **Content:** Geometric truths reflect God's consistency.
    - **Angles on a Straight Line:** Angles that share a vertex and lie on a straight line add up to 180°. (Adjacent angles on a straight line are supplementary).
    - **Angles Around a Point:** Angles that share a common vertex and fill the space around the point add up to 360°. (Angles around a point form a revolution).
- **Example (Straight Line):** If $\angle A=120°$ and $\angle B$ are adjacent on a straight line, then $\angle B=180°-120°=60°$. Reason: ($\angle$s on a str. line)
- **Example (Around Point):** If $\angle X=90°$, $\angle Y=100°$, and $\angle Z$ meet at a point, then $\angle Z=360°-(90°+100°)=360°-190°=170°$. Reason: ($\angle$s around a pt.)
- **Activity:** Calculate the size of unknown angles in diagrams, giving reasons.
- **H5P Suggestion:** Interactive diagrams where learners calculate missing angles based on these rules.

**8.5 Vertically Opposite Angles**

- **Content:** When two lines intersect, the angles opposite each other at the vertex are equal. These are called vertically opposite angles.
- **Illustration:** Diagram showing two intersecting lines, highlighting pairs of vertically opposite angles.
- **Example:** If two lines intersect and one angle is 70°, the angle vertically opposite it is also 70°. The other two vertically opposite angles would each be $180°-70°=110°$ (using angles on a straight line). Reason: (vert. opp. $\angle$s)
- **Activity:** Find the value of all unknown angles in diagrams involving intersecting lines, giving reasons.

**8.6 Angles Formed by Parallel Lines**

- **Content:** When a line (transversal) intersects two parallel lines, specific pairs of angles are equal or supplementary (add up to 180°). These relationships reveal the inherent order when parallel lines are involved.
    - **Corresponding Angles:** Angles in the same relative position at each intersection are equal. (Look for an 'F' shape).

- **Alternate Angles:** Angles on opposite sides of the transversal and between the parallel lines are equal. (Look for a 'Z' or 'N' shape).
- **Co-interior Angles:** Angles on the same side of the transversal and between the parallel lines are supplementary (add up to 180°). (Look for a 'C' or 'U' shape).

- **Illustration:** Clear diagrams showing parallel lines cut by a transversal, highlighting each type of angle pair (Corresponding, Alternate, Co-interior) with different colours or markings.
- **Activity:** Identify pairs of corresponding, alternate, and co-interior angles in diagrams. Calculate unknown angles in diagrams involving parallel lines, giving reasons (e.g., corr. ∠s, || lines; alt. ∠s, || lines; co-int. ∠s, || lines).
- **H5P Suggestion:** Interactive diagrams identifying angle relationships. Quizzes calculating angles using parallel line properties.

**8.7 Solving Geometric Problems Involving Lines and Angles**

- **Content:** Combine the rules learned (angles on straight line, around point, vertically opposite, parallel lines) to solve more complex problems involving unknown angles. It often requires multiple steps and giving clear reasons for each step. Diligence and logical thinking are needed.
- **Example:** A diagram with parallel lines and intersecting lines, requiring finding several unknown angles using a combination of rules.
- **Activity:** Solve multi-step geometric problems, writing down calculations and the geometric reason for each step.

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**Chapter 9: Geometry of 2D Shapes - Exploring God's Forms**

**(Chapter 9 Introduction)**

God filled the world with an amazing variety of shapes. From the triangular structure supporting a bridge to the hexagonal cells of a honeycomb or the circular shape of the sun, 2D shapes are fundamental. In this chapter, we study the properties of common polygons (shapes with straight sides) and circles. "He hath made every thing beautiful in his time..." (Ecclesiastes 3:11a, KJV). Appreciating the properties of shapes helps us see this beauty.

**(Image Suggestion: Montage of shapes in nature and man-made objects - e.g., triangular leaf, rectangular building, hexagonal snowflake, circular ripples.)**

**9.1 Introduction: Shapes in Creation**

- **Content:** Define Polygons (closed shapes with straight sides). Classify polygons by number of sides (Triangle - 3, Quadrilateral - 4, Pentagon - 5, Hexagon - 6, Heptagon - 7, Octagon - 8...). Introduce concepts of Regular Polygons (all sides equal, all angles equal) vs Irregular Polygons.
- **Activity:** Identify and name different polygons. Classify them as regular or irregular.

**9.2 Triangles: Classification and Properties (Sides, Angles)**

- **Content:** Triangles are fundamental shapes in structure and geometry.
    - **Classification by Sides:**
        - **Equilateral:** All 3 sides equal. (All 3 angles are also equal - 60° each).
        - **Isosceles:** 2 sides equal. (Angles opposite the equal sides are also equal).
        - **Scalene:** No sides equal. (No angles are equal).
    - **Classification by Angles:**
        - **Acute-angled:** All 3 angles are acute (< 90°).
        - **Right-angled:** One angle is a right angle (90°).
        - **Obtuse-angled:** One angle is obtuse (> 90°).
- **Illustration:** Diagrams illustrating each type of triangle, with markings for equal sides/angles.
- **Activity:** Classify given triangles by both sides and angles. Identify equal sides/angles in isosceles triangles.
- **H5P Suggestion:** Triangle classification quiz (matching names to diagrams).

**9.3 The Sum of Angles in a Triangle**

- **Content:** A fundamental truth: The three interior angles of *any* triangle always add up to 180°. This consistency reflects God's reliable design.
- **Example:** If a triangle has angles 50° and 70°, the third angle is $180°-(50°+70°)=180°-120°=60°$. Reason: (sum of ∠s in Δ)
- **Activity:** Calculate the size of unknown angles in triangles, giving reasons. Find the base angles of an isosceles triangle given the third angle.
- **H5P Suggestion:** Interactive triangles where learners calculate the missing angle.

**9.4 Quadrilaterals: Types and Properties**

- **Content:** Quadrilaterals (4-sided polygons) have specific properties based on their sides and angles.
    - **Parallelogram:** 2 pairs of parallel sides. Opposite sides equal. Opposite angles equal.
    - **Rectangle:** Parallelogram with 4 right angles.
    - **Square:** Rectangle with 4 equal sides. (Also a Rhombus).
    - **Rhombus:** Parallelogram with 4 equal sides. Opposite angles equal.
    - **Trapezium:** *One* pair of parallel sides.
    - **Kite:** 2 pairs of adjacent sides equal. One pair of opposite angles equal.
- **Illustration:** Diagrams of each quadrilateral type, showing properties (parallel sides, equal sides, right angles) with markings. A hierarchy diagram showing relationships (e.g., a square is a rectangle and a rhombus) can be useful.
- **Activity:** Identify different quadrilaterals. List the properties of each type. Solve problems involving angles or sides of quadrilaterals using their properties (e.g., find angles in a parallelogram).

**9.5 Circles: Basic Terminology**

- **Content:** A circle is a set of points equidistant from a central point.
    - **Centre:** The middle point.
    - **Radius (r):** Distance from the centre to any point on the circle.

  - **Diameter (d):** Distance across the circle through the centre (d = 2r).
  - **Circumference (C):** The distance around the circle (the perimeter).
  - **Chord:** A line segment connecting two points on the circle.
  - **Arc:** A part of the circumference.
  - *(Maybe briefly: Sector - pizza slice shape; Segment - area cut off by a chord)*.
- **Illustration:** Clear diagram of a circle labeling all the parts.
- **Activity:** Identify and label the parts of a circle. Given the radius, find the diameter, and vice versa.

**9.6 Congruence and Similarity (Basic concept introduction)**

- **Content:** Introduce the concepts:
  - **Congruent Shapes:** Exactly the same size and shape (identical). They can be superimposed perfectly. Think of identical copies.
  - **Similar Shapes:** Same shape but different sizes. Corresponding angles are equal, and corresponding sides are in the same ratio (proportional). Think of enlargements or reductions.
- **Illustration:** Show pairs of shapes that are congruent, and pairs that are similar but not congruent. Show corresponding sides/angles.
- **Activity:** Identify whether pairs of shapes appear congruent, similar, or neither. Match corresponding sides/angles in similar shapes.

**9.7 Solving Geometric Problems Involving 2D Shapes**

- **Content:** Apply knowledge of triangles, quadrilaterals, and potentially basic circle properties to solve problems. This might involve finding unknown angles, side lengths, or classifying shapes based on given information.
- **Activity:** Solve problems combining properties of different shapes. (e.g., Find angles in a diagram containing a triangle inside a parallelogram).

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**Chapter 10: Measurement - Quantifying God's Space**

**(Chapter 10 Introduction)**

God created a world we can measure – length, area, volume. Measurement allows us to build, to trade fairly, and to manage resources. We need standard units (like metres, square metres, cubic metres) and formulas to measure accurately and consistently. "A false balance is abomination to the LORD: but a just weight is his delight." (Proverbs 11:1, KJV). Accurate measurement is a form of honesty.

**(Image Suggestion: Tools for measurement - ruler, tape measure, measuring jug, scale. Maybe someone measuring a plot of land or timber.)**

**10.1 Perimeter of Polygons**

- **Content:** Perimeter is the total distance around the outside of a 2D shape. For polygons, add the lengths of all sides. Use standard units (mm, cm, m, km).
- **Formulas:**

    - Square: P = 4 x side length (4s)
    - Rectangle: P = 2 x (length + breadth) (2(l+b))
- **Example:** Perimeter of a triangle with sides 5cm, 7cm, 8cm is 5+7+8 = 20cm. Perimeter of a rectangle 6m long and 4m wide is 2(6+4) = 2(10) = 20m.
- **Activity:** Calculate the perimeter of various squares, rectangles, triangles, and other polygons given side lengths. Solve word problems involving perimeter (e.g., fencing a garden).

**10.2 Area of Squares and Rectangles**

- **Content:** Area is the amount of surface a 2D shape covers. Measured in square units ($mm^2$, $cm^2$, $m^2$, $km^2$).
- **Formulas:**
    - Square: Area = side length x side length ($s^2$)
    - Rectangle: Area = length x breadth (l x b)
- **Example:** Area of a square with side 5cm is 5x5 = 25 $cm^2$. Area of a rectangle 6m long and 4m wide is 6x4 = 24 $m^2$.
- **Activity:** Calculate the area of squares and rectangles. Solve word problems involving area (e.g., tiling a floor, cost of carpet).

**10.3 Area of Triangles**

- **Content:** The area of a triangle is half the area of a rectangle with the same base and height. The height must be the *perpendicular* height from the base to the opposite vertex.
- **Formula:** Area = 1/2 x base x perpendicular height (1/2 bh)
- **Illustration:** Show how two identical triangles form a parallelogram/rectangle. Show the base and *perpendicular* height clearly, especially in obtuse triangles.
- **Example:** A triangle with base 10cm and perpendicular height 6cm has area = 1/2 x 10 x 6 = 30 $cm^2$.
- **Activity:** Calculate the area of various triangles, ensuring correct identification of base and perpendicular height.

**10.4 Circumference of a Circle (Introduction to Pi, π)**

- **Content:** Circumference (C) is the perimeter of a circle. There is a special constant ratio between a circle's circumference and its diameter, called Pi (π). Pi is an irrational number, approximately equal to 3.14 or 22/7. π is one of God's constants embedded in creation.
- **Formulas:**
    - C = π x diameter ($\pi$d)
    - C = 2 x π x radius (2$\pi$r) (since d=2r)
- **Example:** Find the circumference of a circle with radius 5cm (use π≈3.14). C = 2$\pi$r = 2 x 3.14 x 5 = 31.4 cm.
- **Activity:** Calculate the circumference of circles given the radius or diameter. Use the value of π specified (e.g., 3.14 or 22/7).

**10.5 Area of a Circle**

- **Content:** The area (A) of a circle is calculated using Pi and the radius.
- **Formula:** A = π x radius x radius ($\pi r2$)
- **Example:** Find the area of a circle with radius 5cm (use π≈3.14). A = $\pi r2$ = 3.14 x $(5)^2$ = 3.14 x 25 = 78.5 $cm^2$.
- **Activity:** Calculate the area of circles given the radius or diameter.

**10.6 Volume of Rectangular Prisms and Cubes**

- **Content:** Volume is the amount of space a 3D object occupies. Measured in cubic units ($mm^3$, $cm^3$, $m^3$). Also related to capacity (litres, millilitres: 1 $cm^3$ = 1 ml; 1000 $cm^3$ = 1 litre; 1 $m^3$ = 1000 litres).
- **Formulas:**
    - Cube: Volume = side x side x side ($s^3$)
    - Rectangular Prism: Volume = length x breadth x height (l x b x h)
- **Illustration:** Diagrams of a cube and rectangular prism showing length, breadth, height.
- **Example:** Volume of a cube with side 4cm is 4x4x4 = 64 $cm^3$. Volume of a box 10cm long, 5cm wide, 3cm high is 10x5x3 = 150 $cm^3$.
- **Activity:** Calculate the volume of cubes and rectangular prisms. Convert between cubic units and capacity units ($cm^3$ to ml, $m^3$ to l). Solve problems involving volume (e.g., capacity of a fish tank).

**10.7 Solving Measurement Problems (Perimeter, Area, Volume)**

- **Content:** Combine skills to solve practical problems that might involve multiple steps, different shapes, or conversions between units. Emphasise choosing the right formula and units, and presenting work clearly.
- **Activity:** Solve complex word problems involving calculating perimeter, area, and volume in practical contexts (e.g., finding the area of an L-shaped room, calculating the volume of soil needed for a rectangular planter box).

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**Term 3 Conclusion/Reflection (Final page for Term 3)**

In Term 3, we explored the ordered world of Geometry and Measurement. We saw how shapes fit together, how lines and angles follow consistent rules, and how we can measure the space these occupy. These principles reflect the order and wisdom of our Creator. May we continue to use these tools with accuracy and diligence, appreciating the structure He has provided. "The heavens declare the glory of God; and the firmament sheweth his handywork." (Psalm 19:1, KJV).

Try and ensure you are comfortable with the concepts and formulas learned this term as we move forward.

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**TERM 4**

**(Term 4 Introduction - Optional separate page or start of Chapter 11)**

Welcome to the final term of Grade 7 Mathematics. This term, we will explore Functions and Relationships, introduce Algebra, look at how shapes move with Transformation Geometry, study 3D Objects, and learn how to handle Data. These topics further reveal the logic, structure, and patterns God has woven into creation and give us tools to describe and understand them better. Let us finish the year diligently, "giving thanks always for all things unto God and the Father in the name of our Lord Jesus Christ" (Ephesians 5:20, KJV) for the ability to learn and understand His world.

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**Chapter 11: Functions and Relationships - Exploring God's Ordered Connections**

**(Chapter 11 Introduction)**

God created the world with cause and effect, inputs and outputs. Sowing leads to reaping (Galatians 6:7). Actions have consequences. In mathematics, functions describe relationships where one value (input) determines another (output) according to a specific rule. Understanding these helps us see connections and predict outcomes based on God's established order.

**(Image Suggestion: A simple machine showing input/output, like a water wheel or gears, or a flowchart.)**

**11.1 Introduction: Input, Processing, Output in Creation**

- **Content:** Relate the mathematical concept of input -> rule -> output to everyday examples and natural processes (e.g., planting a seed -> growth -> fruit; ingredients -> recipe -> cake). Define input variable, output variable, and the rule (relationship) connecting them.
- **Activity:** Identify input, rule, and output in given scenarios (e.g., "If you buy apples at R5 each, the input is the number of apples, the rule is multiply by 5, the output is the total cost.").

**11.2 Flow Diagrams and Tables (Revisit/Extend)**

- **Content:** Review how flow diagrams visually represent a rule, and how tables systematically list input and output pairs. Ensure learners can work forwards (find output from input) and backwards (find input from output) using inverse operations.
- **Example:**
    - Flow Diagram: [Input] -> (x 3) -> (+ 2) -> [Output]
    - Table: | Input | 1 | 2 | 3 | ? | |--------|---|---|----|---| | Output | 5 | 8 | 11 | 20|
    - Working backwards for output 20: (20 - 2) ÷ 3 = 18 ÷ 3 = 6. The input is 6.
- **Activity:** Complete flow diagrams and tables. Find the input given the output.
- **H5P Suggestion:** Interactive flow diagrams/tables to complete.

**11.3 Finding the Rule (Linear Relationships)**

- **Content:** Given a table of input/output values for a *linear* relationship (constant difference between outputs), determine the rule connecting them. Look for the constant difference, which relates to the multiplier of the input variable (let's use 'n' for input, 'T' for output). Then adjust with addition/subtraction. Rule form: $T=a\times n+b$ or $T=a\times n-b$.

- **Example:** Find the rule for the table in 11.2.
    - Inputs increase by 1. Outputs increase by 3 (constant difference). Rule involves '3n'.
    - Test: If $T=3n$, outputs would be 3, 6, 9. These are 2 less than the actual outputs (5, 8, 11).
    - Rule: $T=3n+2$.
- **Activity:** Determine the rule for various linear patterns given in tables.

**11.4 The Cartesian Plane: Locating Points in God's Space**

- **Content:** Introduce the Cartesian coordinate system (named after René Descartes) with a horizontal x-axis and a vertical y-axis, intersecting at the origin (0,0). Explain how ordered pairs (x, y) specify a unique location. This system provides an orderly way to map space, reflecting God's organisation. Cover all four quadrants (positive and negative coordinates).
- **Illustration:** A clear diagram of the Cartesian plane showing axes, origin, quadrants, and labelled points.
- **Activity:** Plot given coordinate points on a Cartesian plane. Read the coordinates of points shown on a plane.
- **H5P Suggestion:** Drag and drop points onto a coordinate plane. Click the graph H5P type.

**11.5 Plotting Graphs of Simple Linear Relationships**

- **Content:** Represent the input/output pairs from a table (like those in 11.2, 11.3) as coordinate points (input = x, output = y). Plot these points on the Cartesian plane. For linear relationships, the points should lie on a straight line. Draw the line connecting the points.
- **Example:** Plot the relationship $T=2n+1$. Create a table: (n=0, T=1), (n=1, T=3), (n=2, T=5). Plot points (0,1), (1,3), (2,5) and draw the line.
- **Activity:** Create a table of values for a given linear rule. Plot the points on a Cartesian plane and draw the resulting straight line graph.

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**Chapter 12: Introduction to Algebra - Using Symbols for God's Quantities**

**(Chapter 12 Introduction)**

Algebra uses letters and symbols to represent unknown numbers or changing quantities. This allows us to express mathematical ideas and rules generally, moving from specific examples to universal principles, much like God's principles apply universally. It is a powerful tool given to us for reasoning and problem-solving. "Let your communication be, Yea, yea; Nay, nay: for whatsoever is more than these cometh of evil." (Matthew 5:37, KJV). Algebra demands precision and clarity in our 'communication'.

**(Image Suggestion: A balance scale representing equality in equations, or perhaps abstract symbols mixed with numbers.)**

### 12.1 Introduction: Letters for Numbers

- **Content:** Explain the concept of a variable (a letter representing a value that can change or is unknown, e.g., x, y, a, n). Define constants (fixed numbers) and terms (parts of an expression separated by + or -, e.g., 3x, 5y, 7). Define coefficient (number multiplying a variable, e.g., the '3' in 3x). Define expression (combination of numbers, variables, operations, e.g., 2x + 5).
- **Activity:** Identify variables, constants, coefficients, and terms in given algebraic expressions.

### 12.2 Writing Algebraic Expressions

- **Content:** Translate word problems or descriptions into algebraic expressions. Practice understanding key phrases: "sum" (+), "difference" (-), "product" (x), "quotient" (÷), "more than" (+), "less than" (-). Remember conventions like 3x means 3 times x.
- **Examples:**
  - "The sum of a number and 5": x + 5
  - "Three less than twice a number": 2y - 3
  - "The cost of 'p' pencils at R4 each": 4p
- **Activity:** Write algebraic expressions for given word phrases.

### 12.3 Simplifying Algebraic Expressions (Collecting Like Terms)

- **Content:** Like terms have the exact same variable(s) raised to the same power(s). We can simplify expressions by combining like terms through addition or subtraction of their coefficients. Think of it as grouping similar items – 3 apples + 2 apples = 5 apples translates to 3a + 2a = 5a.
- **Examples:**
  - Simplify 3x + 5 + 2x - 1: Combine x terms (3x + 2x = 5x). Combine constants (5 - 1 = 4). Simplified expression: 5x + 4.
  - Simplify 4a + 2b - a + 3b: Combine 'a' terms (4a - a = 3a). Combine 'b' terms (2b + 3b = 5b). Simplified expression: 3a + 5b.
- **Activity:** Simplify various algebraic expressions by collecting like terms.
- **H5P Suggestion:** Drag and drop terms to group like terms before simplifying. Quiz on simplifying expressions.

### 12.4 Substitution into Expressions

- **Content:** If we know the value of the variable(s), we can substitute these values into an expression to find its numerical value. Replace the letter with the given number and perform the calculation using order of operations (BODMAS/BEDMAS).
- **Example:** Find the value of 2x + 5 if x = 3.
  - Substitute: 2(3) + 5
  - Calculate: 6 + 5 = 11.
- **Example:** Find the value of 3a - 2b if a = 4 and b = 1.

    - Substitute: 3(4) - 2(1)
    - Calculate: 12 - 2 = 10.
- **Activity:** Evaluate expressions for given variable values.

### 12.5 Solving Simple Linear Equations (Inverse Operations)

- **Content:** An equation has an equals sign (=), stating that two expressions are equal. Solving an equation means finding the value of the unknown variable that makes the statement true. Use inverse operations (addition/subtraction, multiplication/division) to isolate the variable on one side of the equation. Whatever you do to one side, you must do to the other to maintain balance (equality), reflecting fairness.
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- **Examples:**
    - Solve x + 5 = 12. Subtract 5 from both sides: x + 5 - 5 = 12 - 5 => x = 7.
    - Solve 3y = 18. Divide both sides by 3: 3y/3 = 18/3 => y = 6.
    - Solve 2a - 1 = 9. Add 1 to both sides: 2a - 1 + 1 = 9 + 1 => 2a = 10. Divide both sides by 2: 2a/2 = 10/2 => a = 5.
- **Activity:** Solve various simple linear equations using inverse operations. Check solutions by substitution.
- **H5P Suggestion:** Equation solving quizzes. Interactive exercises showing balancing steps.

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## Chapter 13: Transformation Geometry - Movement and Change in God's Creation

### (Chapter 13 Introduction)

While God is unchanging (Malachi 3:6), His creation is full of movement and change – the orbit of planets, the growth of a plant, the reflection in water. Transformation geometry studies how shapes move or change position and orientation in an orderly way: translation (sliding), reflection (flipping), and rotation (turning). These transformations often reveal symmetry, a key element of beauty in God's design.

**(Image Suggestion: Reflections in water, rotational symmetry in a flower or starfish, tessellations/tiling patterns.)**

### 13.1 Introduction: Symmetry and Movement

- **Content:** Briefly review line symmetry (reflectional symmetry) and introduce rotational symmetry (shape looks the same after a rotation less than 360°). Discuss transformations as movements that preserve certain properties (like size and shape in rigid transformations).
- **Activity:** Identify lines of symmetry in shapes. Determine the order of rotational symmetry for given shapes.

### 13.2 Translation (Slides)

- **Content:** A translation slides every point of a shape the same distance in the same direction. Describe translations using instructions like "5 units right, 2 units up" or using coordinate changes (e.g., (x, y) -> (x+5, y+2)). The translated shape (image) is congruent to the original shape (pre-image).

- **Illustration:** Diagram showing a shape (pre-image) and its translated position (image), with arrows indicating the movement.
- **Activity:** Translate shapes on grid paper according to instructions. Describe the translation needed to move from a pre-image to an image. Give coordinates of vertices after translation.
- **H5P Suggestion:** Interactive where learners drag a shape to perform a translation.

**13.3 Reflection (Flips)**

- **Content:** A reflection flips a shape across a line (the line of reflection or mirror line). Each point on the image is the same perpendicular distance from the mirror line as the corresponding point on the pre-image, but on the opposite side. The image is congruent to the pre-image but reversed (like looking in a mirror). Reflect across horizontal, vertical, and possibly simple diagonal lines (y=x).
- **Illustration:** Diagram showing a shape, a mirror line, and its reflected image, with perpendicular distance lines shown for some points.
- **Activity:** Reflect shapes across given mirror lines on grid paper. Identify the mirror line given a shape and its reflection. Give coordinates of vertices after reflection.
- **H5P Suggestion:** Interactive reflection tool.

**13.4 Rotation (Turns) about a Point**

- **Content:** A rotation turns a shape around a fixed point (the centre of rotation) through a specific angle (angle of rotation) in a specific direction (clockwise or anti-clockwise). The image is congruent to the pre-image. Focus on rotations of 90°, 180°, 270° about the origin or a vertex of the shape.
- **Illustration:** Diagram showing a shape, centre of rotation, angle/direction of rotation, and the rotated image.
- **Activity:** Rotate shapes on grid paper around a given point by a specified angle and direction. Describe the rotation (centre, angle, direction) needed to move from a pre-image to an image. Give coordinates of vertices after rotation.
- **H5P Suggestion:** Interactive rotation tool.

**(Optional: 13.5 Enlargement/Reduction)**

- **Content:** An enlargement or reduction changes the size of a shape but not its proportions (produces similar shapes). It involves a centre of enlargement and a scale factor. Scale factor > 1 means enlargement; scale factor < 1 means reduction.
- **Activity:** Enlarge/reduce simple shapes from a centre point using a given scale factor (e.g., scale factor 2, scale factor 1/2).

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**Chapter 14: Geometry of 3D Objects - Recognising God's Solid Forms**

**(Chapter 14 Introduction)**

Our world is three-dimensional. God created solid objects with length, breadth, and height. Understanding the properties of these 3D shapes (like cubes, prisms, pyramids, spheres) helps us appreciate the structure and function of objects in nature and those designed by humans, reflecting God's wisdom as the Master Builder.

**(Image Suggestion: Various 3D objects - cube, pyramid, sphere, cone, cylinder. Perhaps some natural crystals or fruit shapes.)**

### 14.1 Introduction: Shapes with Depth

- **Content:** Distinguish between 2D (flat) shapes and 3D (solid) objects. Introduce key terms for polyhedra (solids with flat faces):
    - **Face:** Flat surface of the solid.
    - **Edge:** Line segment where two faces meet.
    - **Vertex (plural: Vertices):** Point where edges meet (corner).
- **Activity:** Identify faces, edges, and vertices on models or diagrams of 3D objects. Count them for simple polyhedra like cubes and pyramids.

### 14.2 Identifying Prisms and Pyramids

- **Content:**
    - **Prism:** Has two identical, parallel bases (polygons) connected by rectangular faces. Named after the shape of its base (e.g., triangular prism, rectangular prism, pentagonal prism, cube - a special square prism).
    - **Pyramid:** Has one base (a polygon) and triangular faces that meet at a single point (apex). Named after the shape of its base (e.g., square-based pyramid, triangular-based pyramid/tetrahedron).
- **Illustration:** Clear diagrams of different prisms and pyramids, highlighting bases and other faces.
- **Activity:** Identify and name various prisms and pyramids. Describe their properties (shape of base, number/shape of other faces, number of vertices/edges). Euler's formula ($F + V - E = 2$) could be explored.

### 14.3 Other Solids (Spheres, Cylinders, Cones)

- **Content:** Introduce common solids with curved surfaces:
    - **Sphere:** Perfectly round ball shape. All points on the surface are equidistant from the centre.
    - **Cylinder:** Two identical circular bases connected by a curved surface.
    - **Cone:** One circular base and a curved surface tapering to a single apex.
- **Illustration:** Diagrams of sphere, cylinder, cone.
- **Activity:** Identify these shapes in diagrams and real-world objects. Discuss their basic properties (e.g., a cylinder has 2 flat faces and 1 curved surface).

### 14.4 Nets of 3D Objects

- **Content:** A net is a 2D pattern that can be folded to make a 3D object. Understanding nets helps visualise how 3D shapes are constructed. Explore different

possible nets for the same solid (e.g., a cube). Requires planning and spatial reasoning, gifts from God.
- **Illustration:** Examples of nets for cubes, rectangular prisms, pyramids, cylinders, cones.
- **Activity:** Match nets to their corresponding 3D objects. Draw nets for simple objects like cubes and rectangular prisms on grid paper. Build solids from given nets.
- **H5P Suggestion:** Interactive matching game (net to solid). Quiz identifying correct nets.

**(Optional: 14.5 Surface Area of Cubes and Rectangular Prisms)**

- **Content:** Surface area is the total area of all the faces of a 3D object. For a cube or rectangular prism, find the area of each face and add them together. Use the net to help visualise all the faces.
- **Formula:**
    - Cube (side s): SA = 6 x (area of one face) = $6s^2$
    - Rectangular Prism (l, b, h): SA = 2(lb) + 2(lh) + 2(bh) = 2(lb + lh + bh)
- **Activity:** Calculate the surface area of given cubes and rectangular prisms.

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**Chapter 15: Data Handling - Gathering and Understanding God's Information**

**(Chapter 15 Introduction)**

God provides us with information through His creation and His Word. Data handling is the process of collecting, organising, representing, and interpreting information (data) to understand patterns, draw conclusions, and make informed decisions. We must do this honestly and clearly, avoiding misrepresentation. "The integrity of the upright shall guide them..." (Proverbs 11:3a, KJV).

**(Image Suggestion: Various graphs and charts - bar graph, pie chart, line graph. Maybe people collecting data with clipboards.)**

**15.1 Introduction: Making Sense of Information**

- **Content:** Define data. Discuss different types (categorical - labels, numerical - numbers). Explain the data handling cycle: Collect -> Organise -> Represent -> Interpret -> Conclude. Discuss reasons for collecting data.
- **Activity:** Brainstorm examples of data collection in daily life (weather, sports scores, surveys). Classify given data examples as categorical or numerical.

**15.2 Collecting and Organising Data**

- **Content:** Methods of collecting data (surveys, questionnaires, observation, experiments). Organising raw data using tally marks and frequency tables. Grouping numerical data into intervals if necessary.
- **Example:** Data on favourite colours of learners. Organise using a tally chart and frequency table. | Colour | Tally | Frequency | |--------|----------|-----------| | Red | IIII I | 6 | | Blue | IIII IIII| 9 | | Green | III | 3 | | Yellow | II | 2 |

- **Activity:** Conduct a small class survey (e.g., birth month, favourite subject). Organise the collected data into a frequency table.

**15.3 Representing Data**

- **Content:** Choose appropriate graphical representations for different data types. Ensure graphs have titles, labelled axes (with scales), and keys where necessary. Honesty in representation is key.
    - **Bar Graph:** Compares frequencies of distinct categories. Bars are separate.
    - **Pie Chart:** Shows proportions of a whole (percentages or fractions). Calculate angles for sectors (Frequency / Total Frequency x 360°).
    - **Histogram:** Shows frequencies of continuous or grouped numerical data. Bars touch each other.
    - **Line Graph:** Shows trends over time or continuous change.
- **Illustration:** Examples of each graph type, clearly labelled.
- **Activity:** Draw a bar graph and a pie chart for the favourite colour data from 15.2. Draw a histogram for grouped data (e.g., heights of learners). Draw a line graph for data changing over time (e.g., temperature).
- **H5P Suggestion:** Interactive graph creation tools (e.g., based on input data). Quiz matching data types to appropriate graph types.

**15.4 Interpreting Data Representations**

- **Content:** Reading information directly from graphs and tables. Making comparisons. Identifying trends (increasing, decreasing, stable). Drawing simple conclusions based *only* on the presented data, avoiding unwarranted assumptions.
- **Activity:** Answer questions based on given bar graphs, pie charts, histograms, and line graphs (e.g., "Which category was most popular?", "What percentage represents X?", "During which period was the increase greatest?").

**15.5 Measures of Central Tendency (Mean, Median, Mode)**

- **Content:** These values summarise the 'centre' or 'typical' value in a numerical data set.
    - **Mean:** The average (sum of all values ÷ number of values). Can be affected by extreme values (outliers).
    - **Median:** The middle value when data is arranged in order. If even number of values, it's the average of the two middle values. Less affected by outliers.
    - **Mode:** The value(s) that occur most frequently. Can be no mode, one mode (unimodal), or multiple modes (bimodal, multimodal). Useful for categorical data too.
- **Example:** Data set: 2, 5, 3, 5, 7, 4.
    - Order: 2, 3, 4, 5, 5, 7.
    - Mean: (2+3+4+5+5+7) / 6 = 26 / 6 ≈ 4.33
    - Median: Middle two are 4 and 5. Median = (4+5)/2 = 4.5
    - Mode: 5 (occurs twice).
- **Activity:** Calculate the mean, median, and mode for given sets of numerical data. Discuss which measure might be most appropriate in different situations.
- **H5P Suggestion:** Quiz calculating mean, median, mode.

### 15.6 Measure of Spread: Range

- **Content:** The range measures how spread out the data is. It is the difference between the highest value and the lowest value.
- **Formula:** Range = Highest Value - Lowest Value.
- **Example:** For data set 2, 3, 4, 5, 5, 7: Range = 7 - 2 = 5.
- **Activity:** Calculate the range for given data sets. Compare the ranges of two data sets.

### (Optional: 15.7 Basic Probability Concepts)

- **Content:** Introduce probability as the measure of how likely an event is to occur. Probability = (Number of favourable outcomes) / (Total number of possible outcomes). Express as fraction, decimal, or percentage. Values range from 0 (impossible) to 1 (certain). Discuss simple events (e.g., rolling a die, tossing a coin). God is sovereign, but probability helps us understand likelihoods in uncertain situations.
- **Example:** Probability of rolling a 4 on a standard 6-sided die is 1/6. Probability of getting heads when tossing a coin is 1/2.
- **Activity:** Calculate probabilities for simple events involving dice, coins, or spinners.

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### Term 4 Conclusion/Reflection (Final page for Term 4 & Book)

We have reached the end of our Grade 7 Mathematics journey. This term, we explored Functions, Algebra, Transformations, 3D Objects, and Data Handling, adding more tools to help us understand and describe God's ordered and complex creation. From abstract algebra to concrete shapes and the interpretation of data, mathematics provides a language to appreciate His wisdom and precision.

"Great is the LORD, and greatly to be praised; and his greatness is unsearchable." (Psalm 145:3, KJV). As you continue your studies, may you always use the knowledge and skills you gain, including mathematics, responsibly and diligently, for His glory and the benefit of others. May God bless your future learning.