Ministry of
Education,
Science and
Technology

Lesson plans for

JSS
Mathematics

JSS
1

TERM
3

Foreword

Our country's future lies in the education of our children. The Government of Sierra Leone is committed to doing whatever it takes to secure this future.

As Minister of Education, Science and Technology since 2007, I have worked every day to improve our country's education. We have faced challenges, not least the Ebola epidemic which as we all know hit our sector hard. The Government's response to this crisis – led by our President – showed first-hand how we acted decisively in the face of those challenges, to make things better than they were in the first place.

One great success in our response was the publication of the Accelerated Teaching Syllabi in August 2015. This gave teachers the tools they needed to make up for lost time whilst ensuring pupils received an adequate level of knowledge across each part of the curriculum. The Accelerated Teaching syllabi also provided the pedagogical resource and impetus for the successful national radio and TV teaching programs during the Ebola epidemic.

It is now time to build on this success. I am pleased to issue new lesson plans across all primary and JSS school grades in Language Arts and Mathematics. These plans give teachers the support they need to cover each element of the national curriculum. In total, we are producing 2,700 lesson plans – one for each lesson, in each term, in each year for each class. This is a remarkable achievement in a matter of months.

These plans have been written by experienced Sierra Leonean educators together with international experts. They have been reviewed by officials of my Ministry to ensure they meet the specific needs of the Sierra Leonean population. They provide step-by-step guidance for each learning outcome, using a range of recognised techniques to deliver the best teaching.

I call on all teachers and heads of schools across the country to make best use of these materials. We are supporting our teachers through a detailed training programme designed specifically for these new plans. It is really important that these Lesson Plans are used, together with any other materials you may have.

This is just the start of education transformation in Sierra Leone. I am committed to continue to strive for the changes that will make our country stronger.

I want to thank our partners for their continued support. Finally, I also want to thank you – the teachers of our country – for your hard work in securing our future.

Dr. Minkailu Bah

Minister of Education, Science and Technology

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Introduction
to the Lesson Plan Manual

These lesson plans are based on the National Curriculum
and meet the requirements established
by the Ministry of Education, Science and Technology.

1 The lesson plans will not take the whole term, so use spare time to review material or prepare for exams.

2 Teachers can use other textbooks alongside or instead of these lesson plans.

3 Read the lesson plan before you start the lesson. Look ahead to the next lesson, and see if you need to tell pupils to bring   materials for next time.

4 Make sure you understand the learning outcomes, and have teaching aids and other preparation ready – each lesson plan shows these using the symbols on the right.

Learning outcomes

Teaching aids

Preparation

5 Quickly review what you taught last time before starting each lesson.

6 Follow the suggested time allocations for each part of the lesson. If time permits, extend practice with additional work.

7 Lesson plans have a mix of activities for the whole class and for individuals or in pairs.

8 Use the board and other visual aids as you teach.

9 Interact with all pupils in the class – including the quiet ones.

10 Congratulate pupils when they get questions right! Offer solutions when they don't, and thank them for trying.

Lesson Title: Identifying Number Patterns	Theme: Algebra	
Lesson Number: M-07-106	Class/Level: JSS 1	Time: 35 minutes

	Learning Outcomes		Teaching Aids		Preparation
	By the end of the lesson pupils will be able to identify and describe an arithmetic pattern from a list of numbers.		Number patterns		Write the number patterns, in the Opening, Introduction to the New Material, Guided Practice, and Independent Practice, on the board.

Opening *(3 minutes)*

1. Read the question on the board: What are the first 6 multiples of 4?
2. Ask pupils to write the answer in their exercise books.
3. Ask pupils to call out the list of numbers one at a time, and write their answers on the board. (Answer: 4, 8, 12, 16, 20, 24)
4. **Say:** The lesson for today is how to identify and describe an arithmetic pattern from a list of numbers.

Introduction to the New **Material** *(15 minutes)*

1. Read the following set of numbers on the board: 1, 4, 7, 10, 13, 16, 19
2. Ask pupils to look at the list of numbers on the board for a moment. Then, ask them what they notice. (Example answers: 3 is added to each number to get the next number, the list is counting in 3s from 1 onward)
3. **Say:** In this list, each number is 3 plus the number that comes before it. It counts in 3s.
4. **Say:** In Mathematics, when a list of numbers follow a certain pattern can be referred to as a sequence. A pattern where the same number is added again and again to previous numbers is called an arithmetic pattern or arithmetic sequence.
5. Write on the board: 5, 7, 9, 11, 13
6. **Ask:** Is the pattern on the board an arithmetic pattern? (Answer: yes)
7. **Say:** This is an arithmetic pattern because the same number is added each time. It doesn't matter what number the pattern starts with, so it's okay to start at 5.
8. **Ask:** What is the number being added to this pattern each time? (Answer: 2)
9. Write on the board: 8, 6, 4, 2, 0, -2
10. Ask pupils to look at the list of numbers on the board for a moment. Then, ask them what they notice. (Example answers: 2 is subtracted from each number to get the next number, the list is counting down in 2s.)
11. **Say:** In this list, each number is found by subtracting 2 from the previous number. It counts down in 2s.
12. **Say:** Patterns that count down, or subtract a number each time, are also arithmetic patterns.
13. Write on the board: 2, 3, 5, 8, 12, 17

14. Ask pupils to look at the list of numbers on the board for a moment. Then, ask them what they notice. (Example answers: different numbers are added to each term to make the next term; the numbers added to each term are 1, 2, 3, 4, and 5)
15. **Say:** This list of numbers does not follow an arithmetic pattern. This is not an arithmetic sequence of numbers. For an arithmetic pattern, the same number must be added or subtracted each time. In this list, a different number is added each time.
16. Ask pupils to look at the list of multiples of 4 that they wrote in their exercise books (during the opening).
17. Ask them what they notice about the list and allow them to share.
    (Example answer: the list of multiples of 4 is an arithmetic pattern)
18. **Say:** Any list of multiples of a given number follows an arithmetic pattern. That is because the same number is added each time to get the next number, which is the next multiple of the given number.
19. Ask pupils to write down the first 6 multiples of 5 in their exercise books. Ask one pupil to write the list on the board. (Answer: 5, 10, 15, 20, 25, 30)
20. Ask pupils what they notice about the list of numbers.
    (Answer: it follows an arithmetic pattern, 5 is added each time)

Guided Practice *(5 minutes)*

1. Ask pupils to work in pairs.
2. Read the following on the board:
   Choose from the lists of numbers which ones are arithmetic patterns. Discuss with your partner.
         a. 20, 30, 40, 50, 60
         b. 4, 8, 16, 20, 28, 32
         c. 21, 17, 13, 9, 5, 1
         d. 10, 20, 40, 70, 110
3. Allow pupils to share ideas with their partners.
4. Walk around the class checking for understanding and clearing misconceptions.
5. Ask a few pairs to share their answers with the class and explain their reasons. (Answers: a is an arithmetic pattern because 10 is added each time; c is an arithmetic pattern because 4 is subtracted each time)

Independent Practice *(10 minutes)*

1. Read the following on the board:
      a. Write all multiples of 3 greater than 20 but less than 40.
      b. Write the first 6 multiples of 7.
2. Ask pupils to work independently (allow pupils only a few minutes to work independently, so there is time for steps 4-6).
3. Move around the class checking for understanding and misconceptions.
4. Ask the pupils to turn to a neighbour and discuss whether (a) and (b) are arithmetic patterns.

5. Ask 2 pupils to write the list of numbers for (a) and (b) on the board. (Answers: (a) 21, 24, 27, 30, 33, 36, 39; (b) 7, 14, 21, 28, 35, 42)
6. Ask pupils to share with the class whether they decided (a) and (b) are arithmetic patterns or not. (Answer: both (a) and (b) are both arithmetic patterns because the same number is added each time. The starting number does not matter.)

Closing *(2 minutes)*

1. Ask pupils to describe in their own words what an arithmetic pattern or arithmetic sequence is. Allow them to discuss with the class. (Example answers: it's a list of numbers with the same difference between each number; where the same number is added or subtracted each time)

Lesson Title: Rules in Number Patterns	**Theme:** Algebra	
Lesson Number: M-07-107	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes: By the end of the lesson pupils will be able to: 1. Identify the rule in a given arithmetic pattern. 2. Create basic arithmetic patterns given a rule.		**Teaching Aids** Number patterns		**Preparation** Write the number patterns, in the Opening, Introduction to the New Material, Guided Practice, and Independent Practice, on the board.

Opening *(3 minutes)*

1. Look at the following on the board: $20, 25, 30, 35, 40$
2. Ask pupils to identify the pattern.
3. Allow pupils to discuss with a partner.
4. Ask a pupil to say out the answer.
   (Answer: Add 5 to each preceding term, an arithmetic sequence that adds 5 to each term)
5. **Say:** Today, we will learn about rules to make arithmetic patterns, and make some arithmetic patterns of our own.

Introduction to the New **Material** *(14 minutes)*

1. Look at the following on the board: $2, 5, 8, 11, 14, 17, 20$
2. **Ask:** What is the pattern in this number sequence?
   (Answer: The pattern in the number sequence is to add 3 to the preceding number to get the next number).
3. **Say:** This sequence has a rule that it follows. The rule is to add 3 to each term. We call this 3 the 'common difference' because it is the difference between each of the numbers in the sequence.
4. Write another number pattern on the board: 13, 8, 3, -2, -7, -12
5. **Ask:** What is the common difference in this sequence? (Answer: -5)
6. **Say:** The common difference is a negative number, because it is subtracted from each term to get the next one.
7. **Say:** Now I want each of you to create a number pattern.
8. Write on the board: Write a number pattern from 1 to 13, with a common difference of 3
9. Allow pupils to work in their exercise books for 2 minutes. Ask one pupil to write his or her answer on the board. (Answer: 1, 4, 7, 10, 13)
10. Ask pupils to describe the rule this pattern follows in their own words.
    (Example answers: it counts by 3s, it has a common difference of 3)
11. **Say:** Now I want each of you to create a number pattern of your own. Write any number pattern with a common difference of 2.
12. Allow pupils to work in their exercise books for 2 minutes.
13. Ask 2-3 pupils to come to the board at once and write their number patterns. Ask all other pupils in the class to check their work. They may start at any number and count in 2s.
    (Example answers: 1, 3, 5, 7, or -8, -6, -4, -2, or 10, 12, 14, 16)

Guided Practice *(5 minutes)*

1. Look at the following on the board:
    a. Identify the rule in the pattern: 36, 29, 22, 15
    b. Write an arithmetic pattern with a common difference of 4.
2. Ask pupils to work in pairs. Allow pupils to discuss and share ideas.
3. Walk around the class checking for understanding and clearing misconceptions.
4. Ask a pupil to say the answer to (a) above. (Example answers: The rule is a common difference of -7, 7 is subtracted from each term).
5. Ask another pupil to write the answer to (b) above.
    (Example answers: 2, 6, 10, 14 or 1, 5, 9, 13 the pattern can start at any number)

Independent Practice *(10 minutes)*

1. Look at the following on the board:
    (a) Identify the rule in the pattern: 3, 12, 21, 30, 39, 48
    (b) Create an arithmetic pattern with a common difference of 15
2. Ask pupils to work independently.
3. Walk around checking for understanding and clearing misconceptions.
4. Ask a pupil to stand and say his or her answer to (a).
    (Example answers: The rule is to add 9 to each number; the common difference is 9)
5. Ask a pupil to write his or her answer to (b) on the board.
    (Example answer: 15, 30, 45, 60, 75)
6. **Say:** The pattern depends on the choice of the first term. Therefore, you can create as many patterns as possible.

Closing *(3 minutes)*

1. Ask pupils questions to review the topic. For example:
    a. What is an arithmetic pattern? (Example answer: it is a pattern where the same number is added or subtracted to each term to get the next number)
    b. What is the common difference in an arithmetic pattern? (It is the number by which each of the numbers in the sequence is different from the numbers before and after it)
    c. If an arithmetic pattern starts with 2 and has a common difference of 4, what is the second term? (Answer: 6, because 2+4=6) What is the third term?
        (Answer: 10, because 6+4=10)

Lesson Title: Completing Number Patterns	**Theme:** Algebra	
Lesson Number: M-07-108	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupil will be able to: 1. Provide the next terms of an arithmetic pattern. 2. Provide missing terms of an arithmetic pattern.		**Teaching Aids** Number patterns		**Preparation** Write the number patterns, in the Opening, Introduction to the New Material, Guided Practice, and Independent Practice, on the board.

Opening (*3 minutes*)

1. Look at the following on the board: 18, 21, 24, 27, 30
2. **Say:** identify the rule in this arithmetic pattern.
3. Ask a pupil to describe the pattern to the class. (Example answers: The rule is to add 3 to the preceding term to get the next term; there is a common difference of 3)
4. **Ask:** What do you think the next term of the pattern is?
5. Allow pupils to think for a moment before giving their answer and reason.
   (Answer: 33 is next because we add the common difference of 3 (30+3=33))
6. **Say:** The lesson today is completing number patterns and providing missing terms in a given sequence.

Introduction to the New **Material** *(15 minutes)*

1. **Say:** In completing a number pattern or finding the missing terms of arithmetic pattern, we need to know the rule of the given sequence.
2. Look at the following on the board: Find the next four terms in the arithmetic pattern 50, 48, 46…
3. **Ask:** Who can identify the rule in the arithmetic pattern above?
4. Allow pupils to discuss with their neighbour.
5. Ask a pupil to state the rule of the pattern.
   (Example answers: The rule is to subtract 2 from each preceding term to get the next term, it is a common factor of -2)
6. **Say:** So we will now follow the rule to have the next four terms.
7. **Ask:** What is the next term in the sequence? Why? (Answer: 44; it is found by subtracting 2 from 46, the preceding term)
8. Follow the same process and have pupils give the next 3 terms of the sequence. As they give the terms, write them on the board. (Answer: 50, 48, 46, **44, 42, 40, 38**)
9. Look at the following on the board: 6, 12, __, 24, 30, __, 42
10. **Say:** Now we will find the missing numbers in this sequence.
11. **Ask:** What is the rule for this pattern? (Answer: 6 is added to each number; there is a common difference of 6)
12. Ask pupils to work in pairs to find the two missing numbers.

13. Ask 2 different pairs to give their answers for each of the missing numbers and explain their reason. (Answers: The first one is 18, because 12+6=18; the second one is 36, because 30+6=36)

14. Write their answers on the board: 6, 12, <u>18</u>, 24, 30, <u>36</u>, 42

15. Look at the following on the board: 9, 6, __, 0, -3, __, -9, -12

16. **Ask:** What is the rule for this pattern? (Answer: 3 is subtracted from each number; there is a common difference of -3)

17. Ask pupils to work in pairs to find the two missing numbers.

18. Ask 2 different pairs to give their answers for each of the missing numbers and explain their reason. (Answers: The first one is 3, because 6-3=3; the second one is -6, because -3-3=-6)

19. Write their answers on the board: 9, 6, <u>3</u>, 0, -3, <u>-6</u>, -9, -12

Guided Practice *(5 minutes)*

1. Look at the following on the board:
   a. Write the next 4 terms of the arithmetic pattern: 1, 4, 7, __, __, __, __
   b. Find the missing terms: 35, 30, __, __, __, 10, 5, 0
2. Allow pupils to think and discuss.
3. Walk around checking for understanding and clear misconceptions.
4. Ask a pair to share their answer for (a) and explain. (Answer: 1, 4, 7, <u>10</u>, <u>13</u>, <u>16</u>, <u>19</u>; the common difference is 3)
5. Ask another pair to share their answer for (b) and explain. (Answer: 35, 30, <u>25</u>, <u>20</u>, <u>25</u>, 10, 5, 0; the common difference is -5)

Independent Practice *(10 minutes)*

1. Look at the following on the board:
   a. Find the first 3 terms: __, __, __, 48, 60, 72
   b. Find the missing terms: -3, -8, __, -18, -23, -28, __, -38
   c. Find the next 3 terms: 150, 300, 450, __, __, __
2. Ask pupils to work independently.
3. Walk around checking for understanding and clear misconceptions.
4. Allow pupils to turn around and discuss with neighbours.
5. Ask 3 different pupils to give their answers to the 3 problems. (Answers: (a) <u>12</u>, <u>24</u>, <u>36</u>, 48, 60, 72; (b) -3, -8, <u>-13</u>, -18, -23, -28, <u>-33</u>, -38; (c) 150, 300, 450, <u>600</u>, <u>750</u>, <u>900</u>)

Closing *(2 minutes)*

1. Ask pupils questions to review the topic. For example:
   a. When is the common difference of an arithmetic pattern negative? (Example answers: When the pattern counts down; when the difference is subtracted each time)

b. How can we find the missing terms in an arithmetic pattern? (Example answer: Find the common difference and add or subtract it to the term before or after the unknown term)

Lesson Title: Variables	**Theme:** Algebra	
Lesson Number: M-07-109	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to: 1. Identify variables as unknown values. 2. Identify the variable in a simple equation and find its value.		**Teaching Aids** None		**Preparation** None

Opening *(3 minutes)*

1. Write on the board: $y + 1 = 4$
2. Ask a pupil to identify the letter in the equation on the board. (Answer: y)
3. Ask another pupil to give the numbers in the same equation on the board. (Answer: $1, 4$)
4. **Say:** Today we will learn about variables.

Introduction to the New Material *(13 minutes)*

1. Remind pupils of the problem written on the board ($y + 1 = 4$).
2. **Say:** Any letter in an algebraic expression or equation is a variable. In this equation, y is the variable.
3. **Say:** A variable is an unknown value. It is a letter in place of a missing number. In algebra we are often asked to solve for variables. This means to find the number value for a variable.
4. **Say:** A number by itself in an equation is called a constant. Unlike a variable, a constant does not change. In the given equation, 1 and 4 are constants.
5. **Ask:** What is the value of y in the equation on the board?
6. Allow pupils to think for a moment. Allow them to share their ideas.
7. **Say:** The value is 3, because we know that $3 + 1 = 4$
    ➢ Pupils do not need to know how to balance or transpose equations yet. They use their own problem solving skills. They should think about the equation and realize that y must be equal to 3 because of the addition: $3 + 1 = 4$
8. Write on the board: $y = 3$
9. Write another problem on the board: $a - 6 = 7$
10. Ask a pupil to identify the variable in the equation (Answer: a)
11. **Ask:** What is the value of a?
12. Allow pupils to think for a moment. Allow them to share their ideas.
13. **Say:** The value is 13, because we know that $13 - 6 = 7$
14. Give more examples, one-by-one: $3 + x = 8$ $3 = 12 - z$
15. Ask pupils to say the value of each variable and give their reason. (Answers: $x = 5, z = 9$)

Guided Practice *(7 minutes)*

1. Ask pupils to work in pairs.
2. Write 2 problems on the board: (i) $x + 2 = 3$ (ii) $6 = y - 4$
3. Ask pupils to work in their exercise books.
4. Move around the class to check for understanding and correct misconceptions.
5. Ask 2 pupils from the back to go on the board and give the answers. (Answers: $x = 1$ and $x = 10$)

Independent Practice *(10 minutes)*

1. **Say:** Please write an equation of your own in your exercise book. Your equation should have a variable and 2 constants. It should use addition or subtraction.
   - ➢ Give pupils examples if they need help thinking of equations of their own. (Examples: $4 + a = 6, 6 = y - 3$)
2. **Say:** Now exchange exercise books with a partner. Find the answer to the equation written by your partner.
3. Allow pupils to solve the problem written by their partner. Walk around to clear misconceptions.
4. Ask pupils to check their work in pairs, to make sure their neighbour solved their problem correctly.
5. Ask one pair to give their problems and answers on the board if there is enough time.

Closing *(2 minutes)*

1. Write a problem on the board as an exit ticket: $1 + b = 2$.
2. Ask pupils to write the answers in their exercise books. (Answer: $b = 1$)
3. Check pupils' work quickly before leaving class. Make sure they understand the day's topic.

Lesson Title: Solving for a Variable	**Theme:** Algebra	
Lesson Number: M-07-110	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to find the value of a variable in simple algebraic equations involving addition and subtraction.		**Teaching Aids** None		**Preparation** None

Opening *(3 minutes)*

1. Write an algebraic equation on the board: $p + 4 = 7$
2. Ask a pupil to identify the variable. (Answer: p)
3. Ask another pupil to give the constants. (Answer: 4,7)
4. **Ask:** What is the value of p in the equation?
5. Allow pupils to think and share their answers. Guide them to understand that $p = 3$ because $3 + 4 = 7$
6. Write on the board: $p = 3$
7. **Say:** Today, we will learn about algebraic equations involving addition and subtraction.

Introduction to the New Material *(15 minutes)*

1. Remind pupils about the equation on the board: $p + 4 = 7$
2. **Say:** We know that p is 3 because when we put 3 into the equation instead of p, it is a correct math problem. We can also solve for p by using subtraction.
3. **Say:** To solve for a variable, we want to get the variable alone on one side of the equals sign. If we can move the 4, the p will be alone on the left side.
4. Write on the board: $p + 4 - 4 = 7 - 4$
5. **Say:** If we subtract 4 from both sides of the equals sign, it is still a true math equation.
6. Carry out the subtraction to get the answer: $p = 3$
7. Write another problem on the board: $n - 2 = 10$
8. **Ask:** What is the value of n?
9. Allow pupils to discuss and share their ideas with the class. (Example: the value of n must be 12 because $12 - 2 = 10$)
10. **Say:** The answer is $n = 12$. When we put 12 into the equation instead of n, the math is correct.
11. **Ask:** What if I want to solve this problem using addition or subtraction? What can I do?
12. Allow pupils to brainstorm. Guide them to see that adding 2 to both sides will get n alone on the left side, because $-2 + 2 = 0$.
13. Write on the board: $n - 2 + 2 = 10 + 2$
14. Carry out the addition to get the answer: $n = 12$
15. **Say:** To cancel a negative number, add that number to both sides of the equation. To cancel a positive number, subtract that number from both sides of the equation.
16. Write another problem on the board: $12 = y + 8$
17. **Ask:** What do you think we will do first to find the value of y?

18. Allow pupils to share their ideas. Guide them to understand that we subtract 8 from both sides.
19. Solve on the board:
$$12 - 8 = y + 8 - 8$$
$$4 = y$$
20. **Say:** This is the same as $y = 4$.
21. Write on the board: $x + 8 = 10 + 4$
22. Ask pupils to describe each step, and work the problem on the board:
$$x + 8 = 14$$
$$x + 8 - 8 = 14 - 8$$
$$x = 6$$

Guided Practice *(10 minutes)*

1. Ask pupils to work in pairs.
2. Write two problems on the board
    i. $5 = y - 8$ ii. $x + 9 = 15 + 4$
3. Ask pupils to solve the problems in their exercise books.
4. Walk around the class to check for understanding and correct misconceptions.
5. Ask a pupil from the front of the class and one from the back of the class to go on the board and give the two answers. They should each explain.
    i. $5 + 8 = y - 8 + 8$ ii. $x + 9 - 9 = 19 - 9$
         $13 = y$ $x = 10$

Independent Practice *(10 minutes)*

1. Ask pupils to work independently.
2. Write the following problems on the board.
    i. $y + 4 = 9$ ii. $27 - 9 = d$ iii. $8 + n = 23$
3. Ask pupils to do the work in their exercise books.
4. Ask three pupils to go on the board to solve the problems and explain.
    Answers:
    i. $y + 4 - 4 = 9 - 4$ ii. $27 - 9 = d$ iii. $8 - 8 + n = 23 - 8$
          $y = 5$ $d = 18$ $n = 15$

Closing *(3 minutes)*

1. Write a problem on the board as an exit ticket: $x + 2 = 4 - 1$
2. Ask pupils to write the answer in their exercise books.
3. Check pupils' work quickly before leaving class. Make sure they understand the topic for the day. (Answer: $x = 1$)
4. **Say:** In the next lesson we will be learning about coefficients, or numbers that are multiplied by variables.

Lesson Title: Coefficients	**Theme:** Algebra	
Lesson Number: M-07-111	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to identify the coefficient in an expression as a number multiplied by a variable.		**Teaching Aids** None		**Preparation** None

Opening *(3 minutes)*

1. Write on the board: $3 + 3 + 3 + 3 + 3 + 3$
2. Ask pupils to find another way to write this expression.
3. Ask a pupil to write their answer on the board. (Answer: $3 + 3 + 3 + 3 + 3 + 3 = 6 \times 3 = 18$).
4. **Say:** The topic today is coefficients.

Introduction to the New Material *(14 minutes)*

1. Write on the board: $a + a + a + a + a$
2. Ask pupils to find another way to write this expression.
3. Guide them to see that adding a variable is the same as adding a number. Adding a variable a five times is the same as multiplying it by 5.
4. Write on the board: $a + a + a + a + a = a \times 5 = 5a$
5. **Say:** When you see a number before a variable, it means the variable is multiplied by that number. Any number multiplied by a variable is called a **coefficient**. The coefficient is always written in front of the variable.
6. Write on the board: coefficient
7. Write on the board: $6a$
8. Ask pupils to explain what $6a$ means in their own words. (Example: the 6 shows that the variable a is being multiplied by 6)
9. Write on the board: x
10. **Say:** There is only one x; x by itself is the same as $1x$. In this case, the coefficient of x is 1
11. Write other examples on the board: (a) $7 \times z$ (b) $y + y + y + y + y + y$ (c) $9 \times u$
12. Do the examples one by one.
    (Answers: (a) $7Z$ and the coefficient is 7 (b) $6y$ and the coefficient is 6 (c) $9u$ and the coefficient is 9)

Guided Practice *(5 minutes)*

1. Write on the board: Simplify and identify the coefficient: $t + t + t + t$
2. Ask pupils to work in pairs.
3. Allows them to think and share ideas.
4. Walk around checking for understanding and clearing misconceptions.

5. Call on a pupil to write answer on board. (Answer: $t + t + t + t = t \times 4 = 4t$; the coefficient is 4)

Independent Practice *(10 minutes)*

1. Ask pupils to work independently.
2. Write and ask pupils to simplify and identify the coefficient (a) $9 \times t$ (b) $b + b + b + b + b$
3. Allow pupils to discuss with a partner sitting next to them.
4. Ask pupil to write the answer on the board for (a). (Answer: $9t$ the coefficient is 9).
5. Ask another pupil to write answer on the board for (b). (Answer: $5 \times b = 5b$ the coefficient is 5).

Closing *(3 minutes)*

1. Give pupils an exit ticket problem to solve before leaving.
2. Write on the board: Identify the coefficients and variables of: $2a + 6b + 4c$
3. Allow them to work with a partner.
4. Check their work briefly before leaving class. (Answer: the coefficients are 2, 6, and 4 the variables are a, b, and c)
5. **Say:** In the next lesson we will learn to solve for a variable in an algebraic expression when it has a coefficient.

Lesson Title: Solving for a Variable with a Coefficient	**Theme:** Algebra	
Lesson Number: M-07-112	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to find the value of a variable in simple algebraic equation involving multiplication.		**Teaching Aids** Questions		**Preparation** Write the questions, in the Opening, on the board.

Opening *(2 minutes)*

1. Write on the board: Simplify $t + t + t + t + t + t + t$
2. Ask pupils to rewrite this as a variable with a coefficient.
3. Call on a pupil to write answer on the board. (Answer: $7t$)
4. **Say:** 7 is the coefficient of the variable t.
5. **Say:** The topic today is solving for a variable in an equation with a coefficient.

Introduction to the New Material *(15 minutes)*

1. Write on the board: $2x = 6$
2. Ask a pupil to identify the coefficient of x. (Answer: 2)
3. Ask another pupil to explain what $2x$ means. (Answer: 2 is multiplied by an unknown variable x).
4. **Ask:** What number, when multiplied by 2, gives an answer of 6?
5. Allow pupils to discuss and arrive at the answer, 3.
6. Write on the board: $2 \times 3 = 6$
7. **Ask:** What is the value of x in the equation $2x = 6$? (Answer: 3)
8. Write on the board: $x = 3$
9. **Say:** We have solved $2x = 6$ and found that $x = 3$. We can also solve problems with coefficients by using division. Divide each term in the equation by the value of the coefficient.
10. **Say:** To cancel the 2 from $2x$, we can divide by 2. If we divide both sides of the equation by the same 2, it is still a true math equation.
11. Write on the board: $\frac{2x}{2} = \frac{6}{2}$
    $$x = 3$$
12. Write another problem on the board: $4y = 18 - 2$
13. **Say:** We will find the value of y in the equation.
14. **Say:** We need to simplify first. What can we do to simplify? (Answer: subtract the right-hand side of the equation; $18 - 2 = 16$)
15. Write on the board: $4y = 16$
16. **Ask:** What is the coefficient of the unknown variable? (Answer: 4)
17. Ask a pupil to explain what $4y$ means. (Answer: 4 is multiplied by an unknown variable y).
18. **Ask:** What is the value of y in the equation $4y = 16$?
19. Allow pupils to discuss. Guide them to understand that $y = 4$ because $4 \times 4 = 16$
20. Write on the board: $y = 4$

21. **Ask:** How can we solve this problem using division?
22. Allow pupils to discuss. Guide them to understand that we can divide both sides by 4 to get the y alone on the left side.
23. Write on the board: $\frac{4y}{4} = \frac{16}{4}$
$$y = 4$$
24. Solve another problem with the pupils: $4 + 5 = 3x$
25. Guide them to find the solution by first simplifying, then dividing both sides by 3:
$$9 = 3x$$
$$\frac{9}{3} = \frac{3x}{3}$$
$$x = 3$$

Guided Practice *(5 minutes)*

1. Ask pupils to work in pairs.
2. Write on the board: Find the value of t in the expression $5t = 20 + 5$
3. Allow pupils to share ideas and solve the problem in their exercise books. Move around checking for understanding and clearing misconceptions.
4. **Say:** Can someone from the back write his/her answer for us on the board. Please give an explanation.
   Answer:
$$5t = 20 + 5$$
$$5t = 25$$
$$\frac{5t}{5} = \frac{25}{5}$$
$$t = 5$$

Independent Practice *(10 minutes)*

1. Write on the board: Simplify and find the value of the variable in the expression
   a) $3 \times t = 9 - 3$ b) $2u = 10$
2. Ask pupils to work independently to solve the problems.
3. Walk around to check for understanding and clear misconceptions.
4. Ask pupils to discuss with a partner.
5. Call on two pupils to solve the problems on the board.
   Answers:

   a. $3 \times t = 9 - 3$ b. $2u = 10$
   $$3t = 6$$ $$\frac{2u}{2} = \frac{10}{2}$$
   $$\frac{3t}{3} = \frac{6}{3}$$ $$u = 5$$
   $$t = 2$$

Closing *(3 minutes)*

1. **Say:** Let's check our answers from independent practice by substituting them into the equations.

2. Guide pupils to check each answer by putting it in place of the variable in the equation:

$$3(2) = 9 - 3 \qquad\qquad 2(5) = 10$$
$$6 = 6 \ \checkmark \qquad\qquad\quad 10 = 10 \ \checkmark$$

3. Suggested homework: Find the value of the variables in the expressions: a) $7z = 21$
    b) $4t = 15 - 3$ c) $12y = 24$ $\qquad$ (Answers: a) $z = 3$ b) $t = 3$ c) $y = 2$)

Lesson Title: Like Terms	Theme: Algebra	
Lesson Number: M-07-113	Class/Level: JSS 1	Time: 35 minutes

	Learning Outcomes		Teaching Aids		Preparation
	By the end of the lesson pupils will be able to identify like terms as those with the same variable and power.		Questions		Write the first questions, in the Opening and Introduction to the New Material, on the board.

Opening *(2 minutes)*

1. Write on the board: $2c + 5d$
2. **Ask:** What are the terms in the expression?
3. Allow pupils to think and discuss.
4. Ask 1 pupil to come to the board and write the terms. ($2c$ and $5d$)
5. **Say:** The lesson today is to identify like terms.

Introduction to the New Material *(15 minutes)*

1. Look at this on the board:
   $$2\ Bananas - 5\ Bananas + 2\ Apples + 3\ Apples$$
2. **Ask:** What do you notice about the expression?
3. Allow them to think and share ideas. (For example, there are two types of fruit.)
4. **Say:** There are 2 types of terms in this expression: banana terms and apple terms. The two banana terms are *like terms*. The two apple terms are also *like terms*. Like terms are the same, and they can be combined together.
5. **Say:** Unlike terms are different and cannot be combined together. For example, 10 bananas and 3 apples are unlike terms.
6. **Say:** In maths, terms with the same variable and power are called like terms.
7. Write a list of terms on the board: $2x \quad 6 \quad 3y \quad 10y \quad 12 \quad z \quad 5x \quad 10z \quad y$
8. **Say:** This is a list of terms. There are some like terms among them. Like terms share the same variable. They do not need to share the same coefficient. Like terms also share the same power. For example, x and x^2 are *not* like terms. Today we are *not* discussing variables with powers, but this is important to remember. Any numbers without variables are also like terms.
9. Write another term on the board: $5y$
10. Ask pupils to identify the like terms of 5y in the list. Underline each like term as pupils say them. (Answer: $2x \quad 6 \quad \underline{3y} \quad \underline{10y} \quad 12 \quad z \quad 5x \quad 10z \quad \underline{y}$)
11. Clear any misconceptions. (For example, pupils might think that $5x$ and $5y$ are like terms. This is not true. Tell them that only the variable matters in like terms, not the coefficient.)
12. Write another term on the board: $6x$
13. Using the same list in step 10, ask pupils to identify the like terms for 6x. Tell the pupils to draw a box around the like terms in their exercise books. Give the pupils 1 minute to complete this question.
14. Ask for a volunteer to list the answers and draw a box around the term as it is named.
    (Answer: $\boxed{2x} \quad 6 \quad \underline{3y} \quad \underline{10y} \quad 12 \quad z \quad \boxed{5x} \quad 10z \quad \underline{y}$)

15. Follow the same process with $12z$. Ask pupils to draw a line above each like term.

    (Answer: $\boxed{2x}$ 6 $\underline{3y}$ $\underline{10y}$ 12 $\overline{z}$ $\boxed{5x}$ $\overline{10z}$ y)

16. **Ask:** What are the terms in the list that we have not found like terms for? (Answer: 6 and 12)

17. **Ask:** Are 6 and 12 like terms? (Answer: yes)

18. Ask pupils to call out some other like terms for 6 and 12

    (Answers can be any number without a variable, for example: 10, 3, 16)

19. Now write some expressions on the board. For example:

    a. $3a + 7b + 5a + 2b$ b. $8p + 6r + 7r + 2p$

20. **Ask:** Who can identify the like terms from the expressions on the board?

21. Give them a minute to discuss with a partner.

22. Ask pupils to give the like terms in a. (Answer: $3a$ and $5a$ $7b$ and $2b$)

23. Ask pupils to give the like terms in b. (Answer: $8p$ and $2p$ $6r$ and $7r$)

Guided Practice *(5 minutes)*

1. Ask pupils to work in pairs.

2. Write and ask pupils to identify the like terms from the expressions:

   a. $2p + 5 - 5p - 11$ b. $6m + 3n - 8m + 2n$

3. Allow them to think and share ideas.

4. Walk around to check for understanding and misconceptions.

5. Ask two pupils to come on the board and write the answers.

   (Answers: *a.* $2p$ and $-5p$ 5 and 11 *b.* $6m$ and $-8m$ $3n$ and $2n$)

Independent Practice *(10 minutes)*

1. **Say:** For this exercise you will first work independently, then you will work with a partner sitting next to you.

2. **Say:** Please write 2 expressions of your own in your exercise books. Each expression should have at least 2 different types of like terms.

3. Give pupils a few minutes to write their expressions.

4. Move around checking for understanding. Give a few example expressions on the board if pupils need help. (For example: $5a + 3b - 2a + 2b + 3$)

5. Ask pupils to exchange exercise books with a partner.

6. **Say:** Identify all of the like terms in the expressions written by your partner. Write them near the expression.

7. Ask one or two pairs to share their example expression and like terms on the board.

   (Example: $5a + 3b - 2a + 2b + 3$ like terms are $5a$ and $-2a$ $3b$ and $2b$)

Closing *(3 minutes)*

1. Write on the board: Identify the like terms. $6p - 5 - 6p + 3$

2. Tell pupils that they should complete it before leaving the class.

3. Check their work quickly before leaving class. Make sure they understand like terms.

(Answer: $6p$ and $-6p$ -5 and 3)

4. **Say:** Our next topic will be combining like terms.

Lesson Title: Combining Like Terms	**Theme:** Algebra	
Lesson Number: M-07-114	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to group and combine like terms in a given algebraic expression.		**Teaching Aids** Questions		**Preparation** Write the first questions, in the Opening and Introduction to the New Material, on the board.

Opening *(3 minutes)*

1. Read this on the board: $3a + 4 + 4a + 5$
2. **Say:** Identify the like terms in the expression.
3. Allow pupils to discuss and share ideas in pairs.
4. Ask pupils to share their answers with the class. Write the correct answer on the board.
   (Answer: $3a$ and $4a$ are like terms. 4 and 5 are like terms.)
5. **Say:** Today we will learn how to group and combine like terms.

Introduction to the New Material *(15 minutes)*

1. Read this on the board: Simplify 5 pens $+ 2$ rulers $+ 3$ pens $+ 4$ rulers $+ 5$ pencils
2. **Ask:** What are the like terms in the expression?
3. Allow pupils to discuss with a partner and share their knowledge. (For example, all the pens are like terms; the rulers are like terms; pencils are like terms.)
4. **Say:** Like terms in the expression can be combined.
5. **Ask:** What is '5 pens' combined with '3 pens'? (Answer: 8 pens)
6. **Ask:** What is '2 rulers' combined with '4 rulers'? (Answer: 6 rulers)
7. **Ask:** Does '5 pencils' have a like term? (Answer: No, it is the only term of the expression with pencils.)
8. Combine the like terms in the equation on the board:
   5 pens $+ 3$ pens $+ 2$ rulers $+ 4$ rulers $- 5$ pencils $=$ **8 pens** $+$ **6 rulers** $-$ **5 pencils**
9. **Say:** In math, we can collect like terms and add or subtract them. We can simplify an algebraic expression by collecting like terms together.
10. Write on the board: $2x + 3x$
11. Ask pupils what they think this will simplify to, and allow them to share their answers. (For example, they might think it simplifies to $5x$ (correct) or $6x$ (incorrect).)
12. **Say:** To combine like terms, add or subtract the coefficients. In this expression, we add the 2 and 3 together.
13. Write the answer on the board: $2x + 3x = (2 + 3)x = 5x$
14. Show pupils why this is true by expanding the multiplication of each variable and coefficient. Remind them that $2x = x + x$ and $3x = x + x + x$:
    $$2x + 3x = (x + x) + (x + x + x) = x + x + x + x + x = 5x$$
15. Write on the board: $8y - 2y$
16. Ask pupils what they think this will simplify to, and allow them to share their answers. (For example, they might think it simplifies to $6x$ (correct) or $4x$ (incorrect).)

17. Write the answer on the board: $8y - 2y = (8-2)y = 6y$
18. **Say:** To subtract like terms, simply subtract the coefficients.
19. **Say:** It is also possible to have negative values when you combine like terms.
20. Write on the board: $3b - 10b$
21. **Ask:** What do you think this will simplify to?
22. Allow pupils to think about it for a moment before sharing their answers. (For example, they might say $7b$ (incorrect) or $-7b$ (correct).)
23. Write on the board: $3b - 10b = (3-10)b = -7b$
24. **Say:** We simply subtract the coefficients, and apply what we already know about negative numbers. When we subtract 10 from 3, we get *negative* 7. This is the coefficient in our answer.

Guided Practice *(5 minutes)*

1. Write on the board: Combine the following like terms: $(a)\ 9x + 14x$ (b) $-4a + 7a$
2. Ask pupils to work in pairs. Allow them to share and discuss.
3. Walk around checking for understanding and misconceptions. (For example, pupils may need to review negative numbers. Remind them that $-4 + 7 = 3$)
4. Ask two pupils to write the answers on the board (Answers: $23x$, $3a$)

Independent Practice *(10 minutes)*

1. Write on the board: Combine the like terms:
   i) $-20x + 9x$ ii) $12a + 35a$ iii) $100s - 21s$ iv) $9y - 42y$
2. Ask pupils to work independently.
3. Move around checking for understanding and misconceptions.
4. Ask 4 different pupils to come write their answers on the board.
   (Answers: $-11x$, $47a$, $79s$, $-33y$)
5. Ask pupils to compare their own work with the answers on the board.

Closing *(2 minutes)*

1. Write on the board: Simplify $16e + e - 3e$
2. Ask pupils to complete the problem before you leave the class.
3. Walk around to check their work and see whether they understood today's topic.
4. Ask a pupil to give the answer and explain. (Answer: $16e + e - 3e = (16 + 1 - 3)e = 14e$)

Lesson Title: Simplifying Algebraic Expressions	**Theme:** Algebra	
Lesson Number: M-07-115	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson, pupils should be able to simplify simple algebraic expressions.		**Teaching Aids** Questions		**Preparation** Write the first question, in the Introduction to the New Material, on the board.

Opening *(3 minutes)*

1. **Ask:** Who can write on the board an expression containing like terms?
   (For example: $4x + 2 + x + 2$)
2. Ask other pupils to identify the like terms on the board. (Example answer: $4x$ and x, 2 and 2)
3. **Say:** The topic today is simplifying algebraic expressions. We will continue combining like terms.

Introduction to the New Material *(15 minutes)*

1. Read this on the board: Simplify: 5 cups + 8 spoons +3 spoons + 13 cups.
2. **Ask:** What are the like terms in the expression? (Answer: 5 cups+13 cups and 8 spoons+3 spoons).
3. Ask the pupils to add the like terms together (Answer: 18 cups + 11 spoons).
4. Write another expression on the board. Simplify $2a + 7 + 5a - 2$
5. Ask pupils to call out the like terms in the expression. (Answer: $2a$ and $5a$ 7 and 2)
6. Now simplify the problem on the board (remind pupils that they can change the order of terms in addition and subtraction problems):
   $2a + 7 + 5a + 2$
   $= 2a + 5a + 7 - 2$ ← collect like terms
   $= (2 + 5)a + 7 - 2$ ← add or subtract any coefficients
   $= 7a + 5$ ← combine like terms
7. **Say:** To simplify an algebraic expression, first collect any like terms together, then add them.
8. Write another example on the board: Simplify $5f - 4 - 10f + 7$
9. Ask a pupil to come to the board to collect the like terms and rewrite the expression:
   $5f - 10f + 7 - 3$
10. Ask another pupil to come to the board to combine like terms:
    $(5 - 10)f + 7 - 3$
    $= -5f + 3$
11. Write another problem on the board: Simplify $5a + 2 + 3b - a + 8$
12. Ask a pupil to call out the like terms in the expression. (Answer: $5a$ and $-a$ 2 and 8)
13. Ask a different pupil to come to the board to do each step:
    $5a + 2 + 3b - a + 8$
    $= 5a - a + 3b + 2 + 8$ ← collect like terms
    $= (5 - 1)a + 3b + 2 + 8$ ← add or subtract any coefficients
    $= 4a + 3b + 10$ ← combine like terms
14. Write another problem on the board: Simplify $4ab + 3a + 2ab - a$

15. Ask a pupil to call out the like terms in the expression. (Answer: $4ab$ and $2ab$ $3a$ and $-a$)
16. Clear any misconceptions. For example, make sure pupils understand that like terms can have 2 variables as long as they are the same (any terms with ab are like terms).
17. Ask a different pupil to come to the board to do each step:

$4ab + 3a + 2ab - a$
$= 4ab + 2ab + 3a - a$ ← collect like terms
$= (4 + 2)ab + (3 - 1)a$ ← add or subtract any coefficients
$= 6ab + 2a$ ← combine like terms

Guided Practice *(5minutes)*

1. Write on the board: Simplify $h + 7g - 4 - 2g + 4h - 6$
2. Ask pupils to work in pairs.
3. Allow pupils to discuss and share ideas.
4. Call on a pupil at the back of the class to write his or her answer on the board.

Answer: $7g - 2g + h + 4h - 6 - 4$ ← collect like terms
$= (7 - 2)g + (1 + 4)h - 6 - 4$ ← add or subtract coefficients
$= 5g + 5h - 10$ ← combine like terms

Independent Practice *(10 minutes)*

1. Ask pupils to work independently.
2. Write two problems on the board:
   Simplify: (a) $4ab + 3a + 7 - ab - 2a - 8$
              (b) $4f + 6 + f - 4$
3. Walk around the class checking for pupils understanding and misconceptions.
4. Ask two different pupils to write their solutions on the board:
   (a) $4ab - ab + 3a - 2a + 7 - 8$
        $= (4 - 1)ab + (3 - 2)a + 7 - 8$
        $= 3ab + a - 1$

   (b) $4f + f + 6 - 4$
        $= (4 + 1)f + 6 - 4$
        $= 5f + 2$

Closing *(2 minutes)*

1. Write a problem on the board as an exit ticket: Write 3 like terms for $5x$ and combine them into one term.
2. Check their answers briefly before leaving class and make sure they understand the topic.
   (Example answer: $3x$, $8x$, and x $3x + 8x + x = (3 + 8 + 1)x = 12x$)

Lesson Title: Multiplying Algebraic Expressions	**Theme:** Algebra	
Lesson Number: M-07-116	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to multiply a constant by an algebraic expression.		**Teaching Aids** None		**Preparation** None

Opening *(2 minutes)*

1. Write an expression on the board: $5x + 4 + 3x - 7$
2. Ask pupils to group like terms. (Answer: $5x + 3x + 4 - 7$)
3. Ask pupils to combine like terms. (Answer: $8x - 3$).
4. **Say:** Today we will learn how to multiply algebraic expressions with a constant.

Introduction to the New Material *(15 minutes)*

1. **Ask:** What is the product of 7 and x?
2. Allow pupils to share their ideas and ask one of them to write the answer on the board: $7 \times x = 7x$
3. **Say:** When multiplying a constant and a variable, we write the constant before the variable. The multiplication signs between constants and variables are usually omitted, or left out.
4. Write on the board: $4 \times a \times b \times c$
5. Ask if anyone can come to the board and rewrite this. (Answer: $4 \times a \times b \times c = 4abc$)
6. Write on the board: $2(4ab)$
7. **Ask:** Do you think we can rewrite this? How?
8. Allow pupils to share their answers. (For example, they might say to add the 2 and 4 (incorrect) or to multiply the 2 and 4 (correct))
9. **Say:** If you see a number or variable outside of a bracket, it means to multiply by what is inside the bracket. So we want to multiply 2 times $4ab$. We will multiply the two numbers together keep the same variables.
10. Write on the board: $2(4ab) = 2 \times 4ab = 8ab$
11. Write another example on the board: $3(8x)$
12. Ask pupils to think about it for a moment and write their answers in their exercise books. Ask one pupil to come to the board and write the answer. (Answer: $3(8x) = 24x$)
13. Write on the board: $2(3x + 5)$
14. **Say:** To multiply a constant by an expression with more than one term, multiply each term within the bracket by the quantity outside the bracket. Remove the bracket.
15. Write the answer on the board: $2(3x + 5) = 2 \times 3x + 2 \times 5 = 6x + 10$
16. Write another problem on the board: $-5(2a + 8)$
17. **Say:** When there is a negative sign on the number before a bracket, remember to multiply the *negative* number by each term inside the bracket.
18. Ask pupils to multiply the first term and call out the answer. (Answer: $-5 \times 2a = -10a$)
19. Ask pupils to multiply the second term and call out the answer. (Answer: $-5 \times 8 = -40$)

20. Write the answer on the board: $-5(2a + 8) = -10a - 40$

Guided Practice *(5 minutes)*

1. Write 2 problems on the board:
   (i) $\quad 4(5x - 2y)$ $\qquad$ (ii) $-2(4y - 2x)$
2. Ask pupils to work in pairs and write the solutions in their exercise books.
3. Move around to check for understanding and clear misconceptions.
4. Ask two different pairs to write their answers on the board.
   (Answers: (i) $4(5x - 2y) = 20x - 8y$; (ii) $-2(4y - 2x) = -8y + 4x$

Independent Practice *(10 minutes)*

1. Write another 3 problems on the board:
   (i) $\quad 8(3 + 5b)$
   (ii) $\quad -6(4x + 1)$
   (iii) $\quad 2(4a + 2b - 5)$
2. Ask pupils to work independently to solve the problems.
3. Walk around the class to check for understanding and clear misconceptions. For example, pupils might be confused by question (iii). Tell them to simply multiply the 2 by each of the 3 terms to get the answer.
4. Ask pupils to turn to their partners and compare answers for a minute.
5. Ask 3 different pupils to share their answers.
   (Answers: (i) $8(3 + 5b) = 24 + 40b$ (ii) $-6(4x + 1) = -24x -$ (iii) $2(4a + 2b - 5) = 8a + 4b - 10$)

Closing *(3 minutes)*

1. Write a problem on the board: $2(3x + 2y) + y$
2. **Say:** This looks like a challenge, but you know everything you need. This problem involves multiplication and combining like terms. BODMAS applies to expressions in algebra. Remember to do multiplication before addition.
3. Ask pupils to work in their exercise books.
4. Ask one pupil to come write their answer on the board.
   (Answer: $2(3x + 2y) + y = 6x + 4y + y = 6x + 5y$)
5. Tell pupils that the topic for the next lesson is dividing algebraic expressions. Dividing algebraic expressions is the opposite of the multiplication we did today.

Lesson Title: Dividing Algebraic Expressions	**Theme:** Algebra	
Lesson Number: M-07-117	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to divide algebraic expressions by a constant.		**Teaching Aids** None		**Preparation** None

Opening *(3 minutes)*

1. Write a problem on the board. $3y + 2(3x - y)$
2. Ask a pupils to first clear the bracket from the expression. (Answer: $3y + 6x - 2y$)
3. Ask pupils to add the like terms. (Answer: $6x + y$)
4. **Say:** today, we will learn how to divide algebraic expressions.

Introduction to the New Material *(13 minutes)*

1. **Say:** In the last class we learned how to multiply a constant by an algebraic expression. Today we will do the opposite. We will divide an algebraic expression by a constant.
2. Write a multiplication problem on the board: $2(3x)$
3. Ask a pupil to come write the answer: $2(3x) = 6x$
4. Now write the opposite (division) problem on the board: $6x \div 2$
5. Ask pupils to brainstorm for a moment and share ideas about the answer. (They may realise that the answer is $3x$ because they just solved the related multiplication problem.)
6. **Say:** When we divide an algebraic expression by a constant, we divide the coefficient by that constant. In this problem, divide 6 by 2
7. Write the answer on the board: $6x \div 2 = \frac{6}{2}x = 3x$
8. Write another problem on the board: $12xy \div 4$
9. Ask pupils to explain how to solve the problem. (Answer: divide the coefficient 12 by 4)
10. Write the answer on the board: $12xy \div 4 = \frac{12}{4}xy = 3xy$
11. Write a problem on the board with a negative number: $20y \div -5$
12. **Say:** We apply the rules for dividing negative numbers to algebraic expressions.
13. **Ask:** What do we get when we divide a positive number by a negative number? (Answer: a negative number)
14. **Ask:** What is positive 20 divided by negative 5? (Answer: -4)
15. Solve the problem on the board. (Answer: $20y \div -5 = -4y$)
16. Write another problem on the board: $-48ab \div 6$
17. **Ask:** What is a negative number divided by a positive number? (Answer: A negative number.)
18. Ask pupils to think about the problem for a moment, then call one of them to the board to solve the problem. (Answer: $-48ab \div 6 = -8ab$)
19. **Say:** Remember that you can always check the answer to a division problem by multiplying the quotient and divisor.
20. Check the last answer on the board using multiplication: $-8ab \times 6 = -48ab$

Guided Practice *(6 minutes)*

1. Ask pupils to work in pairs.
2. Write two different problems on the board. Simplify the following:
   - (i) $24xy \div 12$ (ii) $5ab \div 5$
3. Ask pupils to work in their exercise books.
4. Walk around the class to check for understanding and clear misconceptions.
5. Ask 2 pupils to go on the board and solve the problems. (Answers: (i) $24xy \div 12 = \frac{24}{12}xy = 2xy$

   (ii) $5ab \div 5 = \frac{5}{5}ab = ab$)

Independent Practice *(10 minutes)*

1. Write 3 problems on the board: (i) $14xy \div 7$ (ii) $2ab \div -2$ (iii) $-100z \div 25$
2. Ask pupils to work independently to solve the problems.
3. Walk around the class to check on pupils' work. For example, maybe they did not apply the rules for dividing negative numbers.
4. Call 3 pupils to stand and give their answers.
   (Answers: (i) $14xy \div 7 = 2xy$ (ii) $2ab \div -2 = -ab$ (iii) $-100z \div 25 = -4z$)

Closing *(3 minutes)*

1. Write a question on the board: $12a \div 2 + 4a$
2. **Say:** Work the problem in your exercise books. Remember to apply BODMAS. Do division before addition.
3. Allow pupils to share their answers.
4. Check pupils work before they exit. (Answer: $12a \div 2 + 4a = 6a + 4a = 10a$)
5. Inform pupils that the topic for the next lesson is factorisation. We will use the division we learned today to factorise expressions.

Lesson Title: Factorisation	**Theme:** Algebra	
Lesson Number: M-07-118	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to: 1. Identify common factors in an algebraic expression. 2. Divide common factors from an algebraic expression.		**Teaching Aids** None		**Preparation** None

Opening *(3 minutes)*

1. Write on the board: $2(2x + 3y)$
2. Ask a pupil from the back of the class to come on the board and simplify the expression.
   (Answer: $4x + 6y$)
3. Ask another pupil to give the number that divides both 4 and 6 in the simplified expression.
   (Answer: 2).
4. **Say:** Today, we will learn how to factorise an algebraic expression, which means that we divide common factors from it.

Introduction to the New Material *(13 minutes)*

1. Write a question on the board. $2x + 2y$
2. **Ask:** What is the common factor of $2x$ and $2y$? (Answer: 2)
   ➢ Remind pupils about the meaning of 'common factor' if needed. It is a factor that is shared by two numbers. 2 is a common factor of $2x$ and $2y$ because it divides both terms.
3. **Say:** Factorisation is the reverse of multiplication. It involves dividing. To factorise expressions such as the one written on the board, the first step is to find any common factor of the terms. We then divide each coefficient or constant by this common factor.
4. Ask pupils to divide each term of the given expression by the common factor, 2
   (Answer: $2x \div 2 = x$ and $2y \div 2 = y$)
5. **Say:** We write the common factor outside of brackets. Inside the brackets are the terms that we have after dividing by the common factor.
6. Write on the board: $2x + 2y = 2(x + y)$
7. Write another problem on the board: $5x - 10$
8. **Ask:** What is a common factor of $5x$ and -10?
   (Answer: 5, because $5x$ and -10 are both divisible by 5.)
9. **Ask:** What is $5x$ divided by 5? (Answer: x)
10. **Ask:** What is -10 divided by 5? (Answer: -2)
11. Write the answer on the board: $5x - 10 = 5(x - 2)$
12. Write on the board: $25y + 75x$
13. **Ask:** Are there any common factors?
14. Allow pupils to discuss and share their answers. They may come out with 5 as a common factor, which is true. Encourage them to see that the greatest common factor is 25

30

15. Factorise 25 from each term and write on the board: $25(y + 3x)$
16. **Say:** Some numbers have multiple common factors. You should factor the greatest common factor out of the algebraic expression.
17. Write another problem on the board: $8a + 3b$
18. **Ask:** What are the common factors? (Answer: $8a$ and $3b$ do not have any common factors.)
19. **Say:** If there are no common factors, we cannot factorise the expression.

Guided Practice *(7 minutes)*

1. Ask pupils to work in pairs.
2. Write 2 problems on the board. Factorise the following:
   (i) $5x - 15$ (ii) $3a + 9b$
3. Walk around the class to check pupils' work.
4. Guide pupils and clear any misconceptions.
5. Ask for volunteers to come to the board and write their answers.
   (Answers: (i) $5x - 15 = 5(x - 3)$ (ii) $3a + 9b = 3(a + 3b)$)
6. Allow pupils to compare their work with the correct answers written on the board.

Independent Practice *(10 minutes)*

1. Write 3 different problems on the board. Factorise the following:
   (i) $18x - 12y$ (ii) $16x - 24$ (iii) $7a - 14b + 21c$
2. Ask pupils to work independently to solve the problems on the board.
3. Walk around to check for understanding and clear misconceptions. (For example, in (iii) pupils may not understand that they should look for common factors of all 3 terms. Help them notice that 7 is a factor of the 3 terms and that they should factor it out of the expression.)
4. Ask pupils to turn to a partner and compare answers for 1 minute.
5. Ask 3 pupils to come to the board and write their answers.
   (Answers: $18x - 12y = 6(3x - 2y)$ (ii) $16x - 24 = 8(2x - 3)$ (iii) $7a - 14b + 21c = 7(a - 2b + 3c)$)

Closing *(2 minutes)*

1. Remind pupils of the two main steps needed to factorise an algebraic expression: Identify common factors and divide common factors.
2. Write a problem on the board as an exit ticket: Factorise $4 + 2xy$
3. Ask pupils to work in their exercise books.
4. Check pupils' work briefly before leaving the classroom. Make sure they understand today's topic. (Answer: $4 + 2xy = 2(2 + xy)$)

Lesson Title: Introduction to Linear Equations	**Theme:** Algebra	
Lesson Number: M-07-119	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to identify and solve linear equations in one variable that require a single step.		**Teaching Aids** None		**Preparation** None

Opening *(3 minutes)*

1. Write on the board: $x + 7 = 15$
2. Ask pupils to identify the unknown variable. (Answer**:** x)
3. **Ask:** What is the value of x?
4. Allow pupils to work for 1 minute, and then ask them to call out their answers. (Answer: $x = 8$)
5. **Say:** $x = 8$ because when we add 8 plus 7, it gives us 15.
6. **Say:** The lesson today is an introduction to linear equations.

Introduction to the New Material *(15 minutes)*

1. **Say:** $x + 7 = 15$ is an equation because it has an equals sign. An equation has two sides, separated by an equal sign (=). We already know how to solve for a variable in simple equations.
2. Write some more equations on the board: $2x = 8$, $\quad 3y + 1 = 10$, $\quad 10 = z + 2$
3. Ask pupils to give their observations about the equations on the board. (Example answers: they each have one variable; some of them have coefficients; none of the variables have a power greater than 1).
4. **Say:** These are all linear equations. Linear equations can have 1 variable or 2 variables. They do not have any power on the variable. For now, we will discuss linear equations with 1 variable. A graph can be drawn for any linear equation, and this graph is always a straight line. Being able to solve linear equations will help us graph lines.
5. **Say:** There are two ways to solve a linear equation: the balancing method and the transposition method. You already know the balancing method. Let's review.
6. Solve the equation below with pupils using the **balancing** method:
$$x - 3 = 8$$
$$x - 3 + 3 = 8 + 3 \qquad \leftarrow \text{Add 3 to both sides}$$
$$x = 11$$
7. **Say:** Remember that in balancing linear equations, you must take all the variables on one side of the equals sign and all the numbers on the other side.
8. **Say:** The transposition method is new, but it is similar.
9. Solve the equation with pupils using the **transposition** method:
$$x - 3 = 8$$
$$x = 8 + 3 \quad \leftarrow \text{Transpose 3 to the right side of the equation and change the sign}$$
$$x = 11$$

10. **Say:** When using the transposition method you transpose number terms from one side to the other and change the sign.
11. Write on the board: Solve $t + 4 = 7$ using both methods
12. **Say:** First we are going to use the balancing method to solve the equation.
13. **Ask:** What will be our first step? (Answer: Subtract 4 from both sides of the equation)
14. Solve on the board:

$t + 4 = 7$
$t + 4 - 4 = 7 - 4$
$t = 3$

15. **Say:** Now let us use the transposition method.
16. **Ask:** Can someone explain to the class the steps to follow? (Example answer: Move 4 to the right side of equation and change the sign)
17. Solve on the board using transposition:

$t + 4 = 7$

$t = 7 - 4$
$t = 3$

Guided Practice *(5 minutes)*

1. Write on the board: $3 + x = 6 + 2$
2. Ask pupils to work in pairs to solve the equation using both methods.
3. **Say:** Remember that sometimes we can simplify equations before solving them.
4. Walk around the class checking for understanding and misconceptions.
5. Solve the problems with the whole class and write the solutions on the board.

   Answer: $3 + x = 8$ $3 + x = 8$
   $x = 8 - 3$ ← transposition $3 + x - 3 = 8 - 3$ ← balancing
   $x = 5$ $x = 5$

Independent Practice *(10 minutes)*

1. Write on the board: (i) $8 = 4 + n$ (ii) $y - 6 = -12$
2. **Say:** Please work in pairs. One pupil from each pair should use the balancing method, and the other pupil should use the transposition method. After both pupils find the answers, compare your answers. They should be the same.
3. Walk around to check for understanding and clear misconceptions.
4. **Ask** a pair to solve the first problem on the board using both methods.

   Answer: Transposition: Balancing:
   $8 = 4 + n$ $8 = 4 + n$
   $8 - 4 = n$ $8 - 4 = 4 + n - 4$
   $n = 4$ $n = 4$

5. Call on another pair to solve the second problem on the board using both methods

   Answer: Transposition: Balancing:

   $$y - 6 = -12$$ $$y - 6 = -12$$
   $$y = -12 + 6$$ $$y - 6 + 6 = -12 + 6$$
   $$y = -6$$ $$y = -6$$

Closing *(2 minutes)*

1. Ask pupils to explain in their own words the difference between the two methods, transposition and balancing. Allow them to discuss.
2. **Say:** The next class is also on solving linear equations. We will learn more steps that we can use to solve for variables.

Lesson Title: Showing Linear Equation (Review)	**Theme:** Algebra	
Lesson Number: M-07-120	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to solve linear equations in one variable that require 2 steps.		**Teaching Aids** None		**Preparation** None

Opening *(3 minutes)*

1. Write on the board: Solve for x if $x + 3 = 7$
2. **Say:** Discuss the problem and solve in pairs.
3. Ask a pair from the back to solve the problem on the board.
   Answer:
   $$x + 3 = 7$$
   $$x = 7 - 3$$
   $$x = 4$$
4. **Say:** The lesson today is solving linear equations.

Introduction to the New Material *(15 minutes)*

1. Write on the board: Solve for x: $2x = 6$
2. **Say:** This is a linear equation in 1 variable. We have already learned how to solve simple equations like this. Let's review.
3. **Ask:** What will be our first step? (Answer: We divide both sides of the expressions by 2, the coefficient of x.)
4. Solve the problems together with pupils. Answer: $2x = 6$
   $$\frac{2x}{2} = \frac{6}{2}$$
   $$x = 3$$
5. **Say:** We can look at another example. Solve $2x + 3x = 20$
6. **Ask:** How can we combine like terms?
7. Allow pupils to think and discuss with a partner and share their ideas.
8. Ask a pupil to rewrite the equation on the board with the like terms combined: $5x = 20$
9. **Say:** Remember that when combining like terms, we add the coefficients of the like terms.
10. **Ask:** How will we solve for x now? (Answer: Divide both sides by the coefficient, 5)
11. Now solve the expression on the board:
    $$\frac{5x}{5} = \frac{20}{5}$$
    $$x = 4$$
12. Write on the board: Solve $2x + 5 = 13$
13. **Say:** This equation needs to be solved in 2 steps. We need to balance the equation by subtracting 5 (or use transposition). We also need to divide by the coefficient, 2.

14. **Say:** When balancing an equation, add or subtract the constant **before** dividing by the coefficient.
15. **Say:** Remember that what you do to one side, you must also do to the other side.
16. Solve the problem on the board and explain each step:

$$2x + 5 = 13$$
$$2x + 5 - 5 = 15 - 5 \quad \leftarrow \text{subtract 5 from both sides}$$
$$2x = 10$$
$$\frac{2x}{2} = \frac{10}{2} \quad \leftarrow \text{divide both sides by 2}$$
$$x = 5$$

17. Write on the board. Solve $6m + 11 = 25 - m$
18. **Ask:** What do you think we will do?
19. Allow pupils to think and discuss with a partner.
20. **Say:** Let us use the balancing method. We need to combine the like terms, and that means we should add or subtract them from both sides. Then, because there is a coefficient on m, we will need to divide to solve for m.
21. Solve on the board and explain each step:

$$6m + 11 = 25 - m$$
$$6m + 11 + m = 25 - m + m \leftarrow \text{Add } m \text{ to both sides (to cancel it from the right side)}$$
$$7m + 11 = 25$$
$$7m + 11 - 11 = 25 - 11 \leftarrow \text{Subtract 11 from both sides (to cancel it from the left side)}$$
$$7m = 14$$
$$\frac{7m}{7} = \frac{14}{7} \leftarrow \text{Divide both sides by 7 to get the } m \text{ alone}$$
$$m = 2$$

Guided Practice *(5 minutes)*

1. Write a question on the board: Solve $4 + 3x = 13$
2. Ask pupils to work in pairs to solve the equation.
3. Move around checking for understanding and helping the pupils.
4. **Say:** Think and share your knowledge with others.
5. Call on a pupil from a pair to solve the problem on the board.

Answer: $4 + 3x = 13$

$$3x = 13 - 4$$

$$3x = 9$$

$$\frac{3x}{3} = \frac{9}{3}$$
$$\boldsymbol{x = 3}$$

Independent Practice *(10 minutes)*

1. Write and ask pupils to simplify the following $a)\ 7m + 3 = 13 + 5m \quad b)\ 7p + 1 = 3p + 5$

2. Walk around checking for misconceptions and making corrections.
3. Ask two pupils to solve the problems on the board:

Answers:

(a) $7m + 3 = 13 + 5m$

   $7m + 3 - 5m = 13 + 5m - 5m$ ← Subtract $5m$ from both sides
   $2m + 3 = 13$
   $2m + 3 - 3 = 13 - 3$ ← Subtract 3 from both sides
   $2m = 10$
   $\frac{2m}{2} = \frac{10}{2}$ ← Divide both sides by 2
   $m = 5$

(b) $7p + 1 = 3p + 5$

   $7p - 3p + 1 = 3p - 3p + 5$ ← Subtract $3p$ from both sides
   $4p + 1 = 5$
   $4p + 1 - 1 = 5 - 1$ ← Subtract 1 from both sides
   $4p = 4$
   $\frac{4p}{4} = \frac{4}{4}$ ← Divide both sides by 4
   $p = 1$

Closing *(2 minutes)*

1. Ask questions to review today's topic. For example:
   - When there is a whole number coefficient on a variable, what operation do we need to do to cancel it? (Answer: Division)
   - When solving linear equations by the balancing method, which comes first – subtracting constants or dividing by coefficients? (Answer: Subtracting constants)
2. **Suggested homework:** Solve the linear equations: (a) $5p - 8 = 12$ (b) $60 = 2x + 10$
   (c) $9c + 24 = 105$ (Answers: (a) $p = 4$; (b) $x = 25$ (c) $c = 9$)

Lesson Title: Introduction to the Cartesian Plane	**Theme:** Algebra	
Lesson Number: M-07-121	**Class/Level:** JSS 1	**Time:**

	Learning Outcomes By the end of the lesson, pupils will be able to: 1. Draw the Cartesian plane. 2. Identify the x- and y-axes and label them with positive and negative values. 3. Identify that this x and y are often variables in linear equations, and the Cartesian plane is use to graph equations.		**Teaching Aids** Number lines		**Preparation** 1. Draw the number line, in the Opening, on the board. 2. Draw the Cartesian plane, in the Introduction to the New Material, on the board.

Opening *(5 minutes)*

1. Look at this number line on the board:

-5   -4   -3   -2   -1   0   1   2   3   4   5
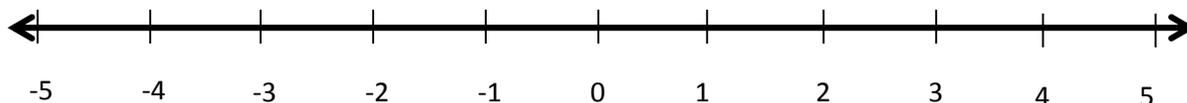
2. Compare the numbers on the number line and determine which number is higher in each pair.
   (a) -3, 2   (b) 0, -4

   Answers: (a) The larger number is 2, because 2 lies to the right of -3 on the number line.

   (b) The larger number is 0, because 0 lies to the right of -4 on the number line.

3. **Say:** Today, we will learn how to draw the Cartesian coordinate plane, identify and label its axes.

Introduction to the New Material *(12 minutes)*

1. Look at the Cartesian plane on the board →
2. **Say:** This is called the Cartesian coordinate plane. It is a system that consists of two number lines drawn at a right angle to one another. The two lines intersect at zero.
3. **Say:** A plane is any flat surface. The Cartesian plane helps us to describe where things are on a flat surface, like our paper or board.
4. **Say:** We will use the Cartesian plane later to draw (or graph) points, lines, and other shapes. It helps us to show where things are and how they look.
5. **Say:** Look at the small marks for each number. It is important that all of the marks on the axes are the same distance apart. This is the only way our drawing (or graphs) will be accurate.
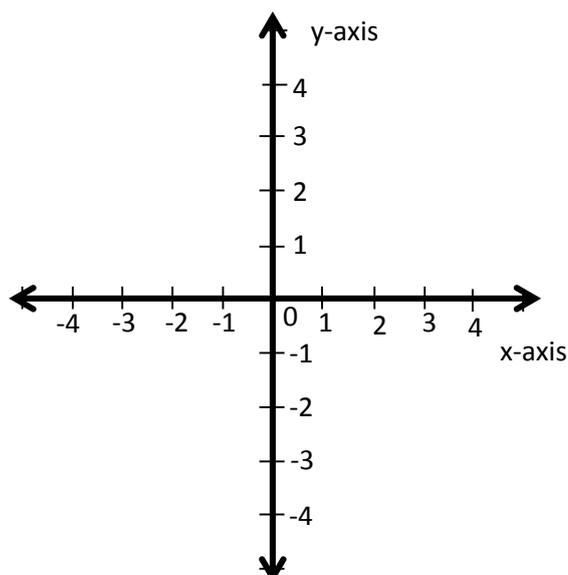
6. **Say:** The horizontal number line is called the 'x- axis' and the vertical number line is called the 'y– axis'.

7. **Say:** This x and y are the same x and y that we see as variables in equations. We can use the Cartesian plane to draw graphs of equations with x and y in them.

8. **Say:** On the x-axis, the positive numbers are to the right of zero, and the negative numbers are to the left of zero. On the y-axis, the positive numbers are above zero, and the negative numbers are below zero. The numbers go on forever on both the x- and y-axis, as with any number line.

9. Label the origin on the Cartesian plane (see below).

10. **Say:** The point at which the two axes intersect is called the 'origin'. The origin is at zero on the x-axis and zero on the y-axis.

11. Label the quadrants of the Cartesian plane (see below).

12. **Say:** The two number lines divide the plane into four regions called 'quadrants'. A quadrant is one of the four regions on a Cartesian plane.

13. **Say:** The top right of the coordinate is called the first quadrant. We find the second, third, and fourth quadrants by moving in an anti-clockwise direction from the first quadrant.
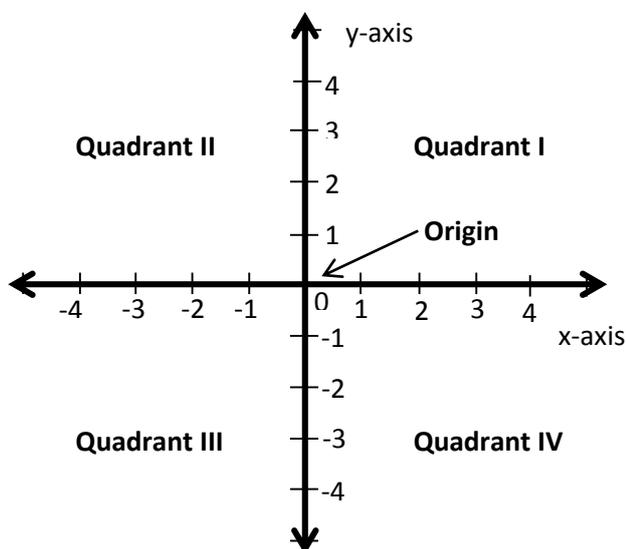
Guided Practice *(5 minutes)*

1. Ask pupils to work in pairs.
2. Write on the board: Draw in your exercise books:
    - (i)   The Cartesian coordinate plane from -6 to +6 on both axes.
    - (ii)   Label the x-axis and y-axis, and all of the numbers -6 to +6
3. Allow pupils to think and share ideas.
4. Move around the class, guiding and clear misconceptions.
5. Make sure that the pupils are showing same or similar distances apart in labelling the axes.
6. Ask a pair to come to the board and draw the x- and y-axes.
7. Call another pair to label the axes.

(Answer: see the graph below)

y-axis

6
5
4
3
2
1
0
-6 -5 -4 -3 -2 -1   1 2 3 4 5 6   x-axis
-1
-2
-3
-4
-5
-6
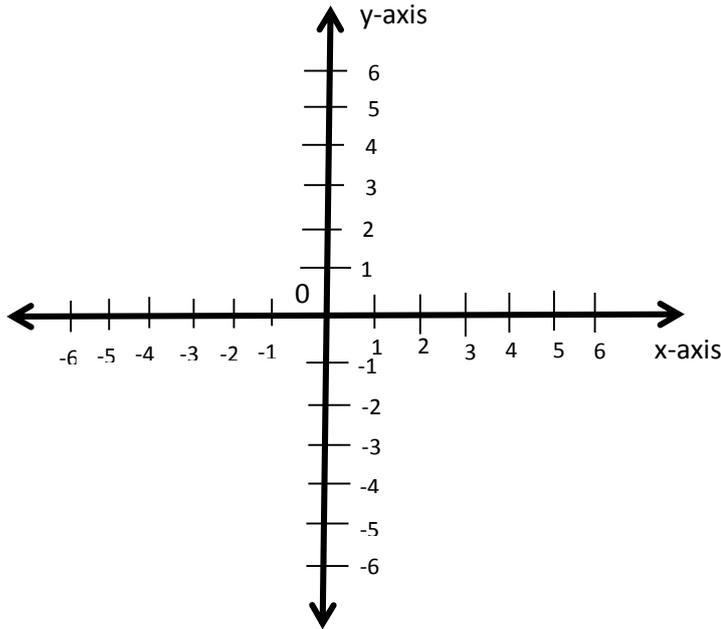
Independent Practice *(10 minutes)*

1. Write this on the board:
   (a) Draw a Cartesian plane.
   (b) Label the axes from -7 and +7.
   (c) Label the origin.
   (d) Label each quadrant.
2. Move around checking for understanding and clear misconceptions.
3. Ask pupils to exchange their books and make pair review.

y-axis

7
6
Quadrant II   5   Quadrant I
4
3
2   Origin
1
0
-7 -6 -5 -4 -3 -2 -1   1 2 3 4 5 6 7 x-axis
-1
-2
-3
Quadrant III   -4   Quadrant IV
-5
-6
-7
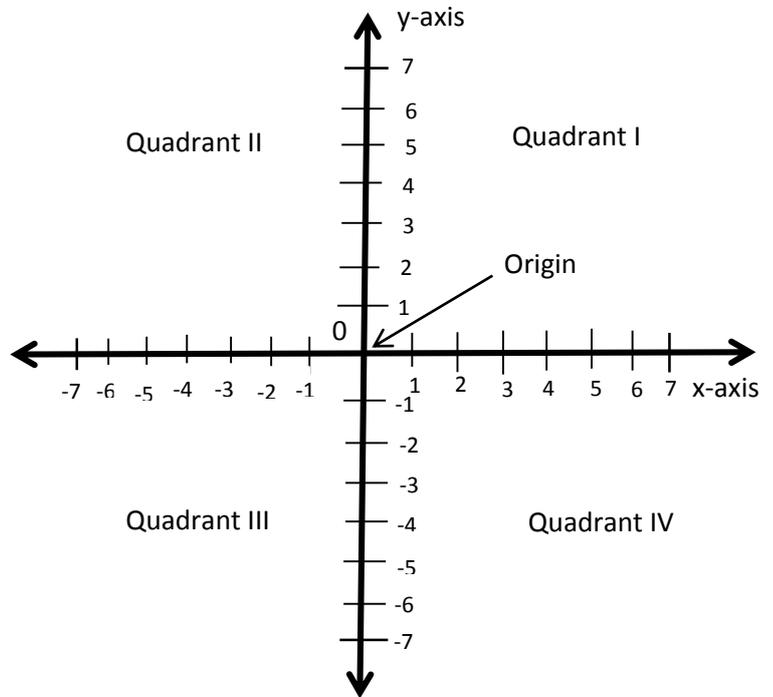
Closing *(2 minutes)*

1. Ask the following questions:
   a. Describe the term 'quadrant' in your own words. (Answer: Quadrant is use to call the four areas divided by the two axes in a Cartesian plane)
   b. What other name do we call the vertical axis? (Answer: The y-axis)
   c. What other name do we call the horizontal axis? (Answer: The x-axis)
   d. What is a coordinate plane used for? (Example answers: to graph or draw shapes, to graph equations)

Lesson Title: Identifying Points on the Cartesian Plane	Theme: Algebra	
Lesson Number: M-07-122	Class/Level: JSS 1	Time: 35 minutes

	Learning Outcomes		Teaching Aids		Preparation
	By the end of the lesson, pupils will be able to identify points in each quadrant of the Cartesian plane and write them in the form (x, y).		Rulers		1. Find enough rulers for each pair to use. 2. Draw the Cartesian plane, in the Introduction to the New Material, on the board.

Opening *(2 minutes)*

1. Ask pupils questions to review Cartesian plane. For example:
    a. What are the two axes of the Cartesian plane? (Answer: The x- and y-axes)
    b. What is the meeting point of the axes? (Answer: The origin O)
2. **Say:** Today, we will learn how to identify points in each quadrant and express them in coordinate form.

Introduction to the New Material *(15 minutes)*

1. Look at the Cartesian plane on the board. Ask pupils to do the same in their exercise books.
2. **Say:** Today I will show you some points on the Cartesian plane and how to identify them.
3. Plot the four points in the diagram below on the Cartesian plane on the board. (There is no need to teach pupils how to graph them at this point; simply plot them and move to the next step).
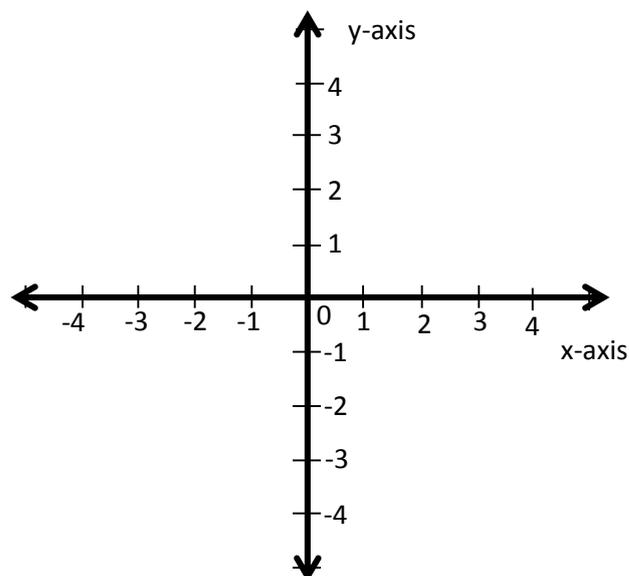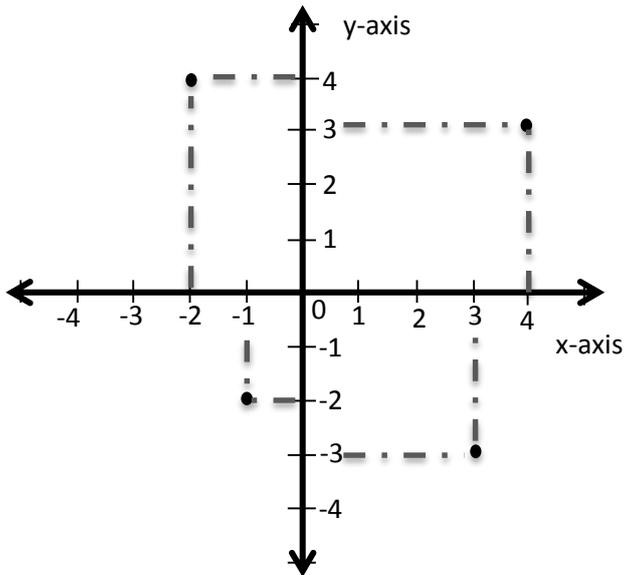
4. **Say:** Any point on the   Cartesian plane can be located by an 'ordered pair' of integers. These integers are called the 'coordinates' of the points. Each of the points shown here has coordinates that can be used to locate it.

5. Label the point (4, 3).

6. **Say:** These two numbers, 4 and 3, tell us where to locate this point.

7. Count 4 spaces on the x-axis and 3 spaces in the y-direction, ending at point (4, 3)

8. **Say:** The first number, 4, tells us where the point is on the x-axis. The second number, 3, tells us where the point is on the y-axis.

9. Write on the board: ordered pair: (x, y)

10. **Say:** This is what an ordered pair looks like. It has two numbers inside brackets and separated by a comma. The first number tells us how far to count on the x-axis. The second number tells us how far to count on the y-axis.

11. Write another ordered pair anywhere on the board: (-2, 4)

12. **Ask:** Which one of the points on this Cartesian plane matches this ordered pair?

13. Allow pupils to think for a moment before sharing their ideas with the class.

14. Ask pupils to come to the board and point to the point they think is (-2, 4)

15. Label the point (-2, 4) on the Cartesian plane.

16. **Say:** The first number is -2, so it tells us to count 2 spaces to the left, or in the negative direction, on the x-axis. The second number is positive 4, which tells us to count up, or in the positive direction, on the y-axis.

17. Follow the same process with the other two points. Allow pupils to think about them for a moment before sharing their ideas with the class.

18. Plot the following points on the same coordinate plane: (0, 0), (0, 2) and (-3, 0)

19. **Say:** The origin is at zero on the x- and y-axes, so we write its coordinates   as two zeros.
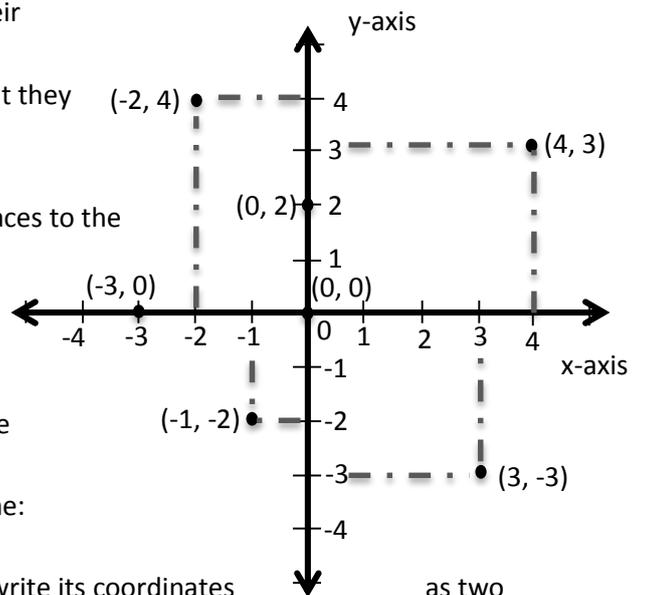
20. **Say:** Any point with zero for the x-value is on the y-axis. We cannot move left or right along the x-axis. Any point with zero for the y-value is on the x-axis. We cannot move left or right along the y-axis.
21. Allow pupils a moment to copy and label the four points on the Cartesian plane in their exercise books.

Guided Practice *(5 minutes)*

1. Ask pupils to work in pairs.
2. Draw the Cartesian plane below on the board, showing four points.
3. Ask pupils to identify the ordered pair for each point and write it in their exercise books.
4. Walk around the class assisting pupils and clear misconceptions.
5. Ask pupils randomly to read out the coordinates of the points.
    (Answers: P=(2,3) Q=(-2,3) R=(-3,-3) S=(3,-5))
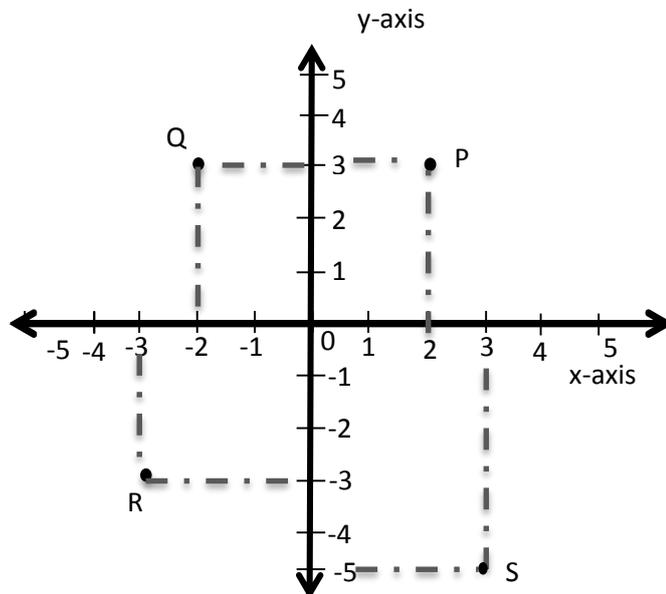
Independent Practice *(10 minutes)*

1. Draw a Cartesian plane showing the points A,B,C and D as shown below
2. Ask pupils to write down the coordinate of each point in their exercise books.

3. Call four pupils one at a time to come to the board and write the coordinate of the points.
      (Answers: A=(3, 1) B=(-4, 3) C=(-2,-3) D=(2,-4))
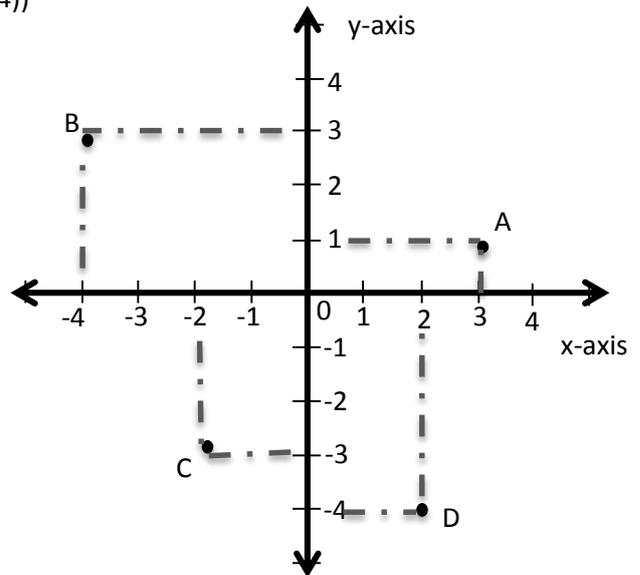
Closing *(3 minutes)*

1. Ask pupils questions to review. For example:
    a. What are the coordinates at the origin? (Answer: (0, 0))
    b. If x and y are both positive numbers, which quadrant is the point in? (Answer: Quadrant I)
    c. If x and y are both negative numbers, which quadrant is the point in? (Answer: Quadrant III)
    d. If x is positive and y is negative, which quadrant is the point in? (Answer: Quadrant IV)
    e. If x is negative and y is positive, which quadrant is the point in? (Answer: Quadrant II)
    f. What is the coordinates of the point of origin?   (Answer: 0,0).

Lesson Title: Plotting Points in the First Quadrant of the Cartesian Plane	**Theme:** Algebra	
Lesson Number: M-07-123	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson, pupils will be able to plot given points in the first quadrant of the Cartesian plane.		**Teaching Aids** Rulers		**Preparation** 1. Find enough rulers for each pair to use. 2. Write the instructions, in the Opening, on the board.

Opening *(4 minutes)*

1. Read the following on the board: Draw the Cartesian plane. Label the axes and each of the four quadrants.
2. Give pupils 2 min to draw the Cartesian plane in their exercise books.
3. Draw the Cartesian plane on the board while they are working and ask them to check their work.
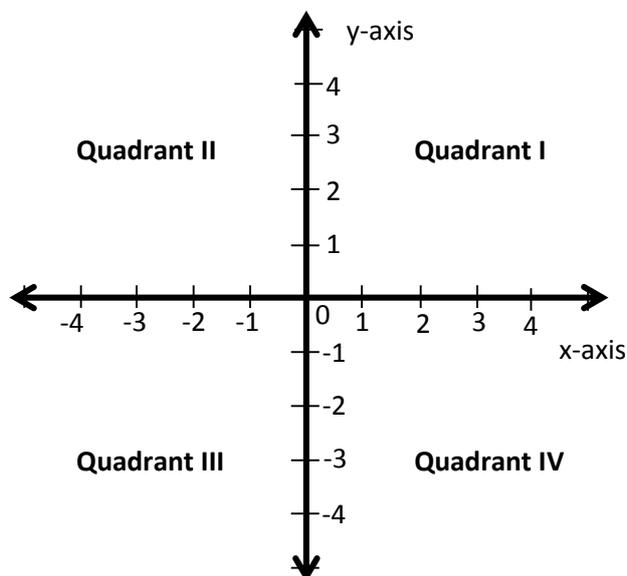
4. **Say:** Today we will learn how to plot given points in the first quadrant of the Cartesian plane.

Introduction to the New Material *(14 minutes)*

1. Erase the quadrant labels from the Cartesian plane on the board. You will use it to plot points.
2. Write on the board: A(2, 3), B(3, 1), C(4, 2)
3. **Say:** These are the coordinates for 3 points: A, B, and C. The letter before the bracket is the name of the point.
4. Remind pupils that the first quadrant contains only positive values for x and y.
5. **Say:** Let us plot point A first.
6. **Ask:** What is the x-value of point A? (Answer: 2)
7. **Ask:** What is the y-value of point A? (Answer: 3)

8. Show pupils how to count 2 spaces in the positive direction along the x-axis and 3 spaces in the positive direction along the y-axis.

9. **Say:** To find a point on the plane, make a vertical line from the x-value and a horizontal line from the y-value. These two lines intersect at the given point.

10. Use a ruler or any type of straight edge (for example, the side of a book or a straight piece of wood) to locate point A: Put your ruler at 2 on the x-axis, and draw a vertical line. Put your ruler at 3 on the y-axis and draw a horizontal line. Mark the point of intersection.

11. Label the point of intersection A.

12. Continue with the same process for point B (3, 1) and C (4, 2).

13. **Say:** We can use the same steps to plot any given points on the Cartesian plane.
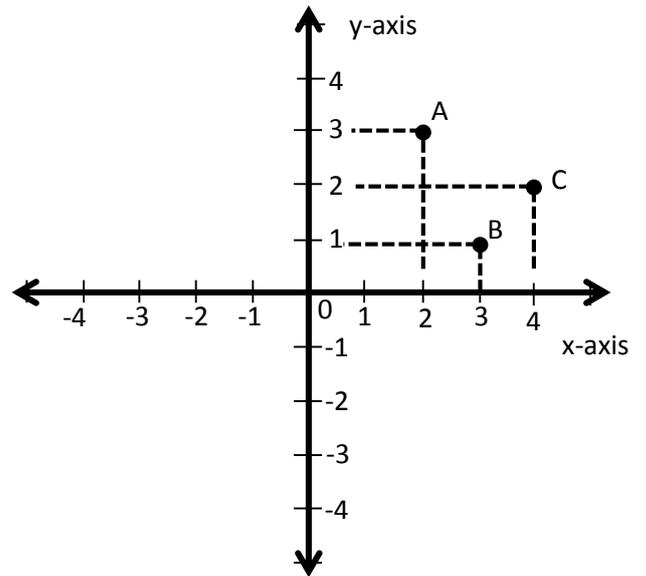
Guided Practice *(5 minutes)*

1. Write on the board: Draw the Cartesian plane with axes from -4 to +4. Use it to plot the following points: M (1,2) and N (3,4).

2. Ask pupils to work in pairs.

3. Move around, check for pupils understanding of the concept, clear any misconceptions. Make sure pupils are using a ruler or any other straight edge (for example, the side of a book or a piece of paper) to draw the lines.

4. Ask two pairs to each plot one of the two points. You can use the coordinate plan already on the board to save time. Answer →
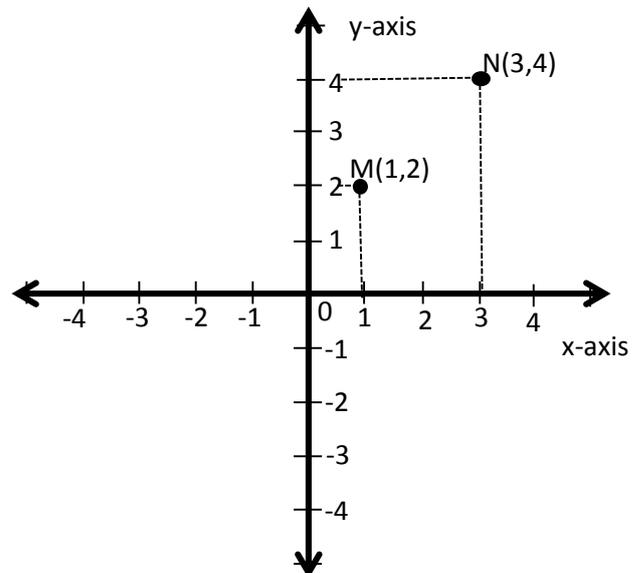
Independent Practice *(10 minutes)*

1. Write on the board:
    (a) Draw a Cartesian plane with axes from -5 to +5.
    (b) Use it to plot the points: Q (2,5), R (4, 3) and S (5,1).

2. Ask pupils to work independently.

3. Move around to check for understanding and clear misconceptions.

4. Ask a pupil to come to the board and draw the Cartesian plane.

5. Call 3 pupils one at a time to plot each point. (Answer: See the Cartesian plane below)
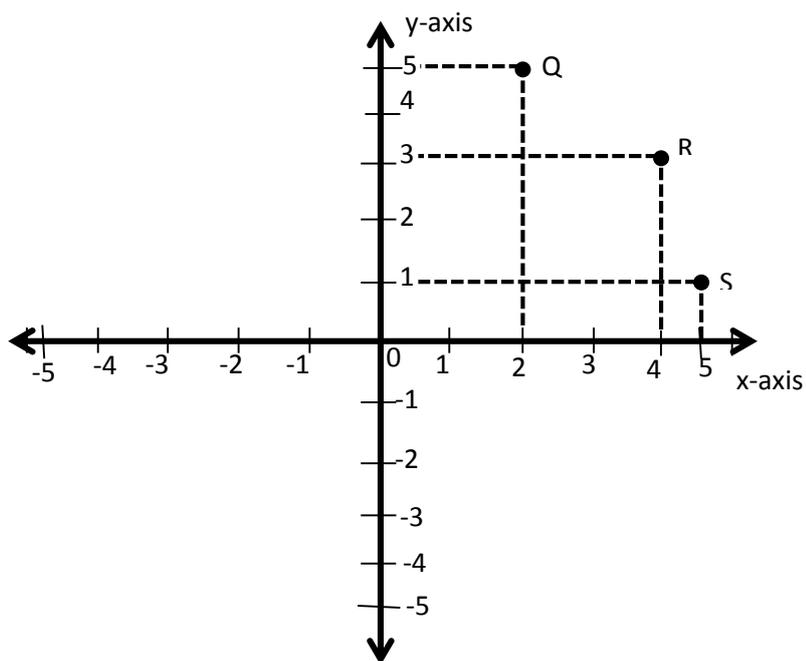
Closing *(2 minutes)*

1. Ask a pupil to explain in his/her own words the steps in plotting a point (for example, (4,5)).
   (Example answer: Put a ruler at 4 on the positive x-axis, move up to meet the positive 5 on the y-axis. Mark the point of intersection.)
2. Follow the same process for additional points in the first quadrant if time allows.

Lesson Title: Plotting Points in All Quadrants of the Cartesian Plane	**Theme:** Algebra	
Lesson Number: M-07-124	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson, pupils will be able to plot given points in any quadrant of the Cartesian plane.		**Teaching Aids** Rulers		**Preparation** 1. Find enough rulers for each pair to use. 2. Draw the Cartesian plane, in the Introduction to the New Material, on the board.

Opening *(2 minutes)*

1. Ask a few questions to review Cartesian plane:
    a. What is a quadrant? (Example answer: it is one of the four regions of a Cartesian plane, divided by the x and y axes)
    b. Where is the origin on a Cartesian plane? (Example answers: where the two axes intersect, where both axes equal zero)
    c. What is an ordered pair? (Example answer: the coordinates that tell us where to plot a point on the Cartesian plane, written as an x- and y-value in brackets)
2. **Say:** Today, we will learn how to plot given points in any quadrant of the Cartesian plane.

Introduction to the New Material *(13 minutes)*

1. Look at the Cartesian plane on the board with the quadrants labelled→
2. Ask pupils to draw it in their exercise books.
3. Ask questions to review the signs on x and y in each quadrant:
    o What are the signs on x and y in quadrant I? (Answer: both positive)
    o What are the signs on x and y in quadrant II? (Answer: x is negative, y is positive)
    o What are the signs on x and y in quadrant III? (Answer: both negative)
    o What are the signs on x and y in quadrant IV? (Answer: x is positive, y is negative)
4. Write on the board: Plot the points: P(-1, 1), Q(-2, -3) and R(3, 4), S(4,0), T (0,3)
5. **Say:** Now we will plot each of these points.
6. Ask pupils to look at point P.
7. **Say:** The x-coordinate for P is negative. Can anyone tell me which direction to move on the x-axis? (Answer: to the left)
8. **Say:** The y-coordinate for P is positive. Can anyone tell me which direction to move on the y-axis? (Answer: up)
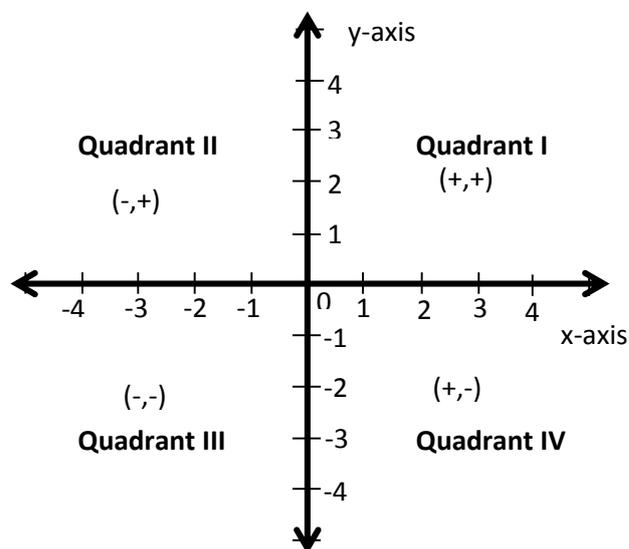
9. **Say:** The first number is -1, which shows that we count 1 space to the left or in the negative direction on the x-axis. The second number is +1, which shows that we count 1 space up in the positive direction on the y-axis.
10. Plot point P on the Cartesian plane on the board. Ask pupils to do the same in their exercise books.
11. Follow the same process to plot points Q and R. Involve the pupils by asking them to tell you the steps.
12. Ask pupils to observe point S on the board.
13. **Ask:** Where do you this point will lie?
14. Allow pupils to share their ideas. (Example answers: on the x-axis (correct), on the y-axis (incorrect), we can't plot this point (incorrect))
15. **Say:** Point S has a y-coordinate of zero. All points that lie exactly on the x-axis have y-coordinate zero. That is, the second number in the coordinate is zero.
16. Plot point S (4, 0).
17. **Say:** With x=4, I need to move it 4 units to the right. Having y=0 implies that we will not move up or down along the y-axis.
18. Ask pupils to look at point T and share their ideas about plotting it.
19. **Say:** Point T has an x-coordinate of zero. All points that lie exactly on the y-axis have x-coordinate zero. That is, the first number in the coordinate is zero.
20. **Say:** since x=0, this means that that there is no movement along the x-axis. However, y=3 implies that I need to move it 3 units in the upward direction.
21. Ask a pupil to plot point T (0, 3).
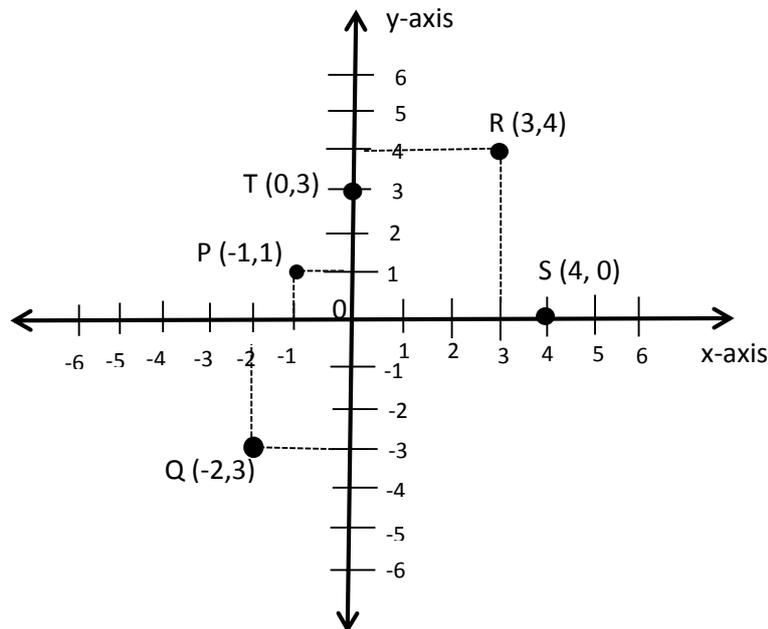
22. **Say:** Now you can plot any points on the coordinate plane. Just be sure to count in the correct direction.

Guided Practice *(7 minutes)*

1. Write on the board: Plot the points: A(4,2), B(0,-3), C(-3,-2) and D(-4,3).
2. Ask pupils to work in pairs.
3. Move around assisting pupils and clearing any misconceptions.
4. Ask 4 pairs to each come plot one of the points on the coordinate plane on the board.
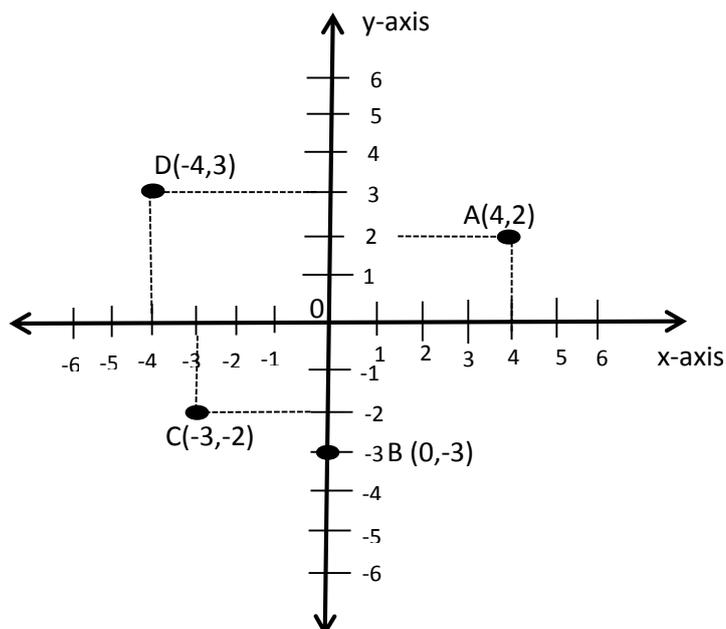
Independent Practice *(10 minutes)*

1. Write on the board: Draw a Cartesian plane with axes from -6 to 6. Plot the points: R(6,4) S(-3, 4), T(-5, 0), U(3, -2)
2. Ask pupils to do the work in their exercise books.
3. Move around, ensure that each pupil is doing the work in his/her exercise book.
4. Allow them to share answers with a partner.
5. Ask 4 pupils to come to the board and each plot a point.
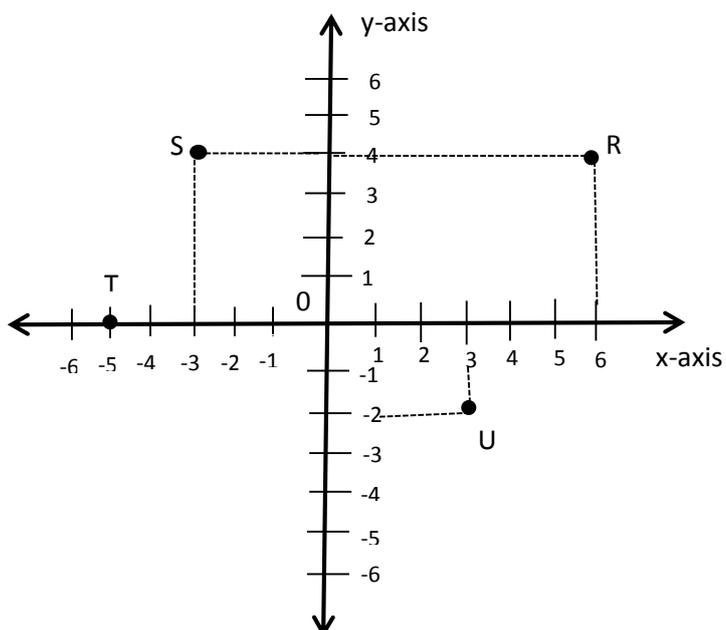
Closing *(3 minutes)*

1. Ask pupils review questions:
    (a) What are coordinates? (Example answers: An ordered pair, Points along the x and y-axes or sometimes called x values and y values).
    (b) What is a Cartesian plane? (Example answer: A flat surface or area or space where we can use coordinates to draw shapes, lines)

(c) What is the point called where the x and y axes intersect?
(Answer: the point of origin 0).

Lesson Title: Practice with the Cartesian Plane	**Theme:** Algebra	
Lesson Number: M-07-125	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson, pupils will be able to draw or identify only one given point on the Cartesian plane.		**Teaching Aids** 1. Ruler 2. Cartesian plane		**Preparation** 1. Find enough rulers for each pair to use. 2. Write the coordinates, in the Opening, on the board. 3. Draw the Cartesian plane, in the Introduction to the New Material, on the board.

Opening *(3 minutes)*

1. Look at these coordinates on the board: $E(-1, -2)$, $F(3, 4)$, $G(-4, 2)$, $H(5, -4)$
2. Ask pupils to identify the quadrant where each of the points will lie and write the answers in their exercise books.
3. Ask pupils randomly to give their answers. (Answers: Point E is in the 3rd quadrant, Point F is in the 1st quadrant, Point G is in the 2nd quadrant, Point H is in the 4th quadrant)
4. **Say:** Today we will do more of plotting and identifying points on the Cartesian plane.

Introduction to the New Material *(12 minutes)*

1. **Say:** Before plotting any point on the Cartesian plane, we must have an idea of where the point will lie.
2. **Say:** Therefore, we must identify the specific quadrant for a given coordinate before plotting the point.
3. Look at the Cartesian plane with axes from -5 to $+5$ on the board.
4. List these coordinates on the board: $Q(-2, 4)$, $R(4, 4)$, $S(4, -1)$, $T(-2, -1)$
5. Ask a pupil to identify the quadrant where point Q will lie. (Answer: 2nd quadrant)
6. Ask a pupil from the back seat to come to the board and plot point Q. (See diagram below)
7. **Say:** Can someone identify the area where point R will lie? (Answer: 1st quadrant)
8. Ask a pupil from the front seat to plot point R. (See diagram below)

9. Ask a pupil to identify the quadrants where points S and T will lie.
    (Answer: the 4th and 3rd quadrants respectively)
10. Call two pupils one at a time to plot points S and T.
11. **Say:** If we connect these points, we have a shape. What shape is it? (Answer: rectangle)
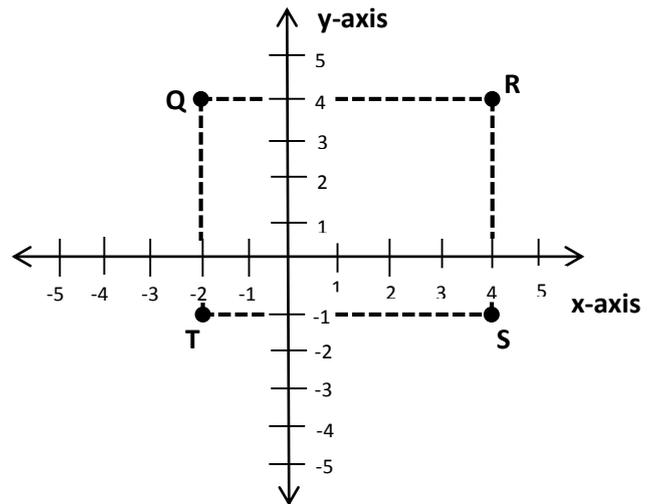
Guided Practice *(7 minutes)*

1. Put these points on the board: $M(-5, 4)$, $N(3, 2)$, $O(-3, -2)$, $P(2, -4)$, $Q(5, 0)$
2. Ask pupils to draw a Cartesian plane with axes from -6 to $+6$ in their exercise books.
3. **Say:** Label the axes. Take note of equal spacing in labelling each axis and plot the points.
4. Allow pupils to work in pairs.
5. Move round and make sure that each pupil participates in the pair work.
6. Call two pairs to come to the board one at a time and plot two points each using the Cartesian plane on the board.
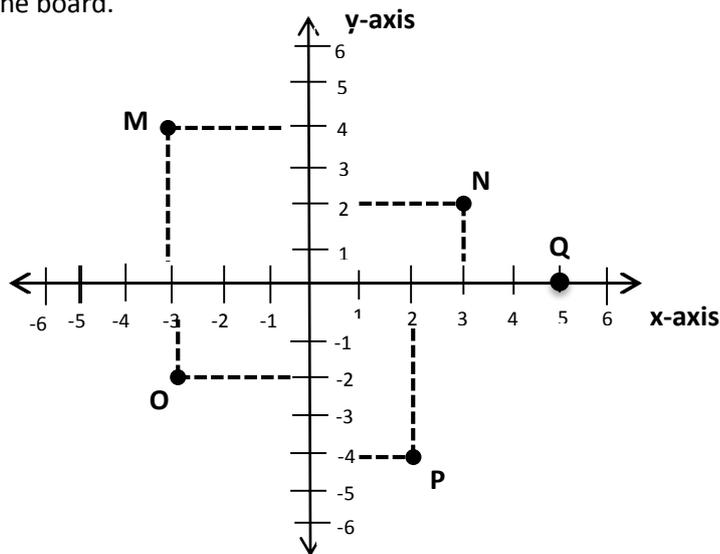
Independent Practice *(10 minutes)*

1. Draw a Cartesian plane with axes from -5 to $+5$ showing the points J, K, and L as shown →
2. Ask pupils to copy the coordinate plane in their exercise books.
3. Write on the board:
   a. Write the coordinates for J, K, and L
   b. Plot the points: $(-1, 2), (1, -2), (4, -5)$
4. **Say:** Do both a and b on the same coordinate plane.
5. Move round and check for any misconceptions and clarify it. Make sure they understand both of the tasks.
6. Assist pupils where necessary.
7. Do corrections together with pupils on the board.
   (Answers: (a) $J = (2, 5), K = (-4, 2), \ L = (-4, -3)$ (b) see diagram below)
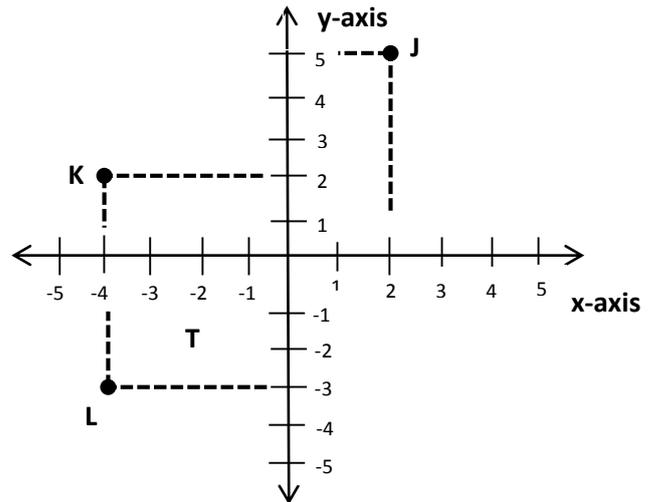
y-axis / x-axis diagram with points J, K, L, T

y-axis / x-axis diagram with points J, K, L, T and plotted points $-1, 2$; $(1, -2)$; $(4, -5)$
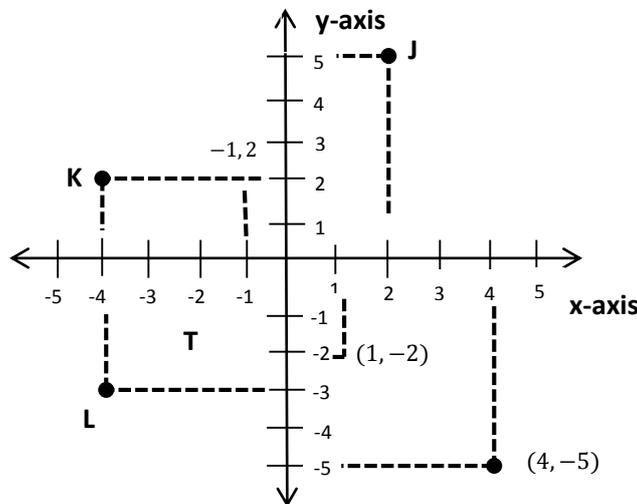
Closing *(3 minutes)*

1. Ask questions to discuss and review. For example:
   a. Ask a pupil to explain the word 'Coordinate' in his/her own words. (Example answer: A coordinate is a pair of numbers that describes the exact location of a point on a Cartesian plane. The first number is the x-value and the second number is the y-value)

b. Ask a pupil to describe how to plot a point when both numbers are negative. (Example answer: count in the left (negative) direction on the x-axis and in the downward (negative) direction on the y-axis.)

Lesson Title: Data Collection	Theme: Statistics	
Lesson Number: M-07-126	Class/Level: JSS 1	Time: 35 minutes

Learning Outcomes	Teaching Aids	Preparation
By the end of the lesson pupils will be able to collect data from class members and display it with tally marks and pictograms.	Questions	1. Write the questions, in Guided Practice and Independent Practice on the board.

Opening *(3 minutes)*

1. **Ask** pupils the following questions. Allow them to share their ideas before arriving at the answers. Write the answers on the board.
   a. How many tables are in your classroom? (use 'desks' if there are not tables).
   b. How many chairs are in your classroom? (use 'benches' if there are not chairs)
   c. How many male teachers teach at the school?
   d. How many female teachers teach at the school?
2. **Say:** Today we will learn how to collect and display data.

Introduction to the New Material *(12 minutes)*

1. **Say:** Data are any numerical facts, information, or measurement of something.
2. Explain to pupils the meaning of tally marks (strokes which represent the number of time a particular event or appears) They are grouped in fives: ‖‖
3. **Say:** Let's display our data with tally marks.
4. Write the tally marks for 'tables' (see answer below).
5. Ask pupils to draw the other tally marks for chairs and teachers.
   Answer:

   Tables - ‖‖ ‖‖ ‖‖ ‖‖   (18)   Chairs - ‖‖ ‖‖ ‖‖ ‖‖   (20)

   Males- ‖‖‖‖   (4)   Females - ‖‖ ‖   (6)

6. **Say:** Symbols or pictures can also be used to represent a certain number of items.
7. Draw the following pictures on the board (use desks and benches if your classroom does not have tables and chairs):

   For 2 female teachers   For 2 male teachers   for 2 tables   for 2 chairs

8. **Say:** these are the pictures that we will use to make a pictogram.
9. Draw the row for tables (see answer; draw the correct number for your own classroom).

10. Ask pupils to draw each of the other rows for chairs and teachers.

Answer:

Tables - (18)

Chairs (20)

Males - (4)
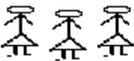
Females - (6)

11. Do correction where necessary.

Guided Practice *(8 minutes)*

1. Read the question on the board: 20 pupils are each asked to give the number of sisters they have. The data is collected as follows: Michael (4), Issa (4), Janet (5), Abass (3), Jane (1) Idrissa (2) and Fanta (1).
2. Ask pupils to work in pairs.
3. **Say:** Display the information with tally marks. Then, display the information with a pictogram, using one picture to represent one sister.
4. Draw a picture for one sister on the board:

5. Move around to check pupils understanding and clear misconceptions.
6. Ask a pupil from any group to come to the board and present their answer in tally marks.
   Example:

   Michael - //// **Issa** - //// **Janet** - ///// **Abass** - /// **Jane** - / **Idrissa** - // **Fanta** - /

7. Ask another pupil to come to the board and display the information in a pictogram.
   Example:

   Michael

   Issa

   Janet
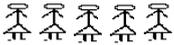
   Abass

   Jane

   Idrissa

Fanta

8. Do correction where necessary.

Independent Practice *(10 minutes)*

1. Read this question on the board:
   One pupil received the following marks on her examinations: Mathematics 14, English 10, Social Studies 13, French 19, Business Studies 8 and Integrated Science 11.
2. **Say:** Work independently. Create the correct number of tally marks to show her mark for each subject. Then, display the information on a pictogram using a rectangle to represent 2 marks.
3. Move around to check their work and clear misconceptions.
4. Ask 2 pupils to come to the board to present their answers. Check their answers.

Mathematics	English	Social Studies	French	Business Studies	Integrated Science
̸H́Ī ̸H́Ī ////	̸H́Ī ̸H́Ī	̸H́Ī ̸H́Ī ///	̸H́Ī ̸H́Ī ̸H́Ī ////	̸H́T́ ///	̸H́T́ ̸H́T́ /

For Pictogram:

Mathematics =
English =
Social Studies =
French =
Business studies =
Integrated Science =
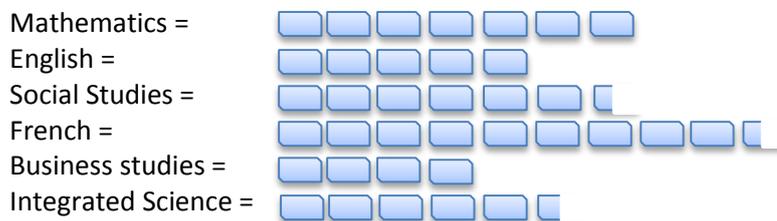
Closing *(2 minutes)*

1. **Ask:** What are data? (Answer: Data are any numerical fact or information which can be measure or given a numerical qualification)
2. **Ask:** What are tally marks? (Answer: Tally marks are strokes which represent the number of times a particular event occurs or appears)
3. **Say:** Please define pictogram. (Answer: symbols or pictures used to represent a certain number of items.

Lesson Title: Tables of Data	**Theme:** Statistics	
Lesson Number: M-07-127	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to organise and display collected data in a table.		Teaching Aids Tally table		Preparation 1. Draw the Subject table, in the Introduction to the New Material, on the board. 2. Write the questions, in Guided Practice and Independent Practice on the board.

Opening *(3 minutes)*

1. Ask pupils the following questions:
    a. How many male teachers are in our school? (Example: 20)
    b. How many female teachers are in our school? (Example: 19)
    c. How many pupils are in our school? (Example: 200)
    d. How many classrooms are in our school? (Example: 10)
2. Allow pupils to come out with figures.
3. **Say:** We have all this information about our school, which means we know much about our school.
4. **Say:** Today we will learn how to organise and display collected data in a table.

Introduction to the New Material *(12 minutes)*

1. **Say:** All those who think mathematics is their best subject, raise your hands up.
2. **Say:** Those who prefer English Language to be their best subject, can you raise your hands.
3. Do the same for Social Studies and Integrated Science.
4. **Say:** Now we will count how many people like each subject and write the numbers in a table on the board.

SUBJECT	TALLY MARKS	NUMBER OF PUPILS
Mathematics		
English Language		
Social Studies		
Integrated Studies		
Total		

5. Look at the empty table on the board →
6. **Say:** First we will make a tally mark for each pupil to show their best subject.
7. Draw a tally mark in the table for each pupil in your classroom. In a small class, ask pupils to come out to the board and put their own tally mark in the table. In a large class, ask them to raise their hands again and count them before you draw the correct number of tally marks.
    o Make sure pupils understand tally marks. They should be able to draw and count them.

8. Ask pupils to count the number of tally marks for each subject. Ask one pupil to come to the board and write the number of tally marks for each subject (in the 'number of pupils' column). Example table:

SUBJECT	TALLY MARKS	NUMBER OF PUPILS
Mathematics	Ж/ /	6
English Language	Ж/ Ж/	10
Social Studies	Ж/ Ж/ Ж/	15
Integrated Studies	Ж/ ////	9
Total	40	40

9. Show pupils how the numbers in each column sum to the total number of pupils in the class.
10. **Say:** The last row of a table is often used to give the total number.

Guided Practice *(8 minutes)*

1. Read the following on the board: The ages of 20 pupils were recorded as follows: 13, 9, 15, 17, 13, 9, 11, 9, 11, 15, 17, 15, 11, 9, 9, 11, 15, 11, 11, 11.
2. Draw an empty table on the board:

AGES	TALLY MARKS	NUMBER OF PUPILS
9		
11		
13		
15		
17		
Total		

3. Tell pupils to work in pairs.
4. **Say:** Organise the data on the board into the table.
5. Walk around the room to check as they work. Assist them as needed.
6. Ask a pupil from one group to fill the 'tally marks' column, and a pupil from another group to fill the 'number of pupils' column.

AGES	TALLY MARKS	NUMBER OF PUPILS
9	⊬⊬⊓	5
11	⊬⊬⊓ //	7
13	//	2
15	////	4
17	//	2
TOTAL	**20**	**20**

7. Check the table on

the board.
Answer:

Independent Practice *(10 minutes)*

1. Read this question on the board:
2. This is a list of the scores obtained by pupils in a mathematics test worth 30 possible points. Organise the data in a table: 12, 25, 30, 20, 15, 12, 25, 12, 20, 12, 25, 12, 15, 12, 15, 12, 15, 20, 30, 25, 15, 30, 20, 15, 25, 30, 12, 12, 15, 12, 30, 20, 15.
3. Ask pupils to solve the problem independently.
4. Walk around the classroom to make sure pupils understand the task and are working.
5. **Say:** Who can come to the board and present his/her answer?
6. Allow one pupil to draw the table on the board, while the other pupils check it.
7. Do correction where necessary.

   Answer:

SCORES	TALLY MARKS	NUMBER OF PUPILS
12	⊬⊬⊓ ⊬⊬⊓	10
15	⊬⊬⊓ ///	8
20	⊬⊬⊓	5

25	ℋℐℐ	5
30	ℒℋℐ	5
TOTAL	**33**	**33**

Closing *(2 minutes)*

1. **Ask:** What is the statistical term for a chart using symbols or pictures used to represent a certain number of items? (Answer: Pictogram).
2. **Ask:** What word can we use for any list of information or facts gathered for statistical purposes? (Answer: Data).
3. **Say:** In the next lesson you will learn how to make a bar chart from the data in a table.

Lesson Title: Creating Bar Charts	Theme: Statistics	
Lesson Number: M-07-128	Class/Level: JSS 1	Time: 35 minutes

	Learning Outcomes		Teaching Aids		Preparation
	By the end of the lesson pupils will be able to display collected data in a bar chart.		Tally table		1. Draw the table, in the Introduction to the New Material, on the board.

Opening *(2 minutes)*

1. Ask pupils open-ended questions.
2. Allow them to share their ideas before arriving at the answers.
   a. What did we learn yesterday? (Example: How to organise collected data in a table).
   b. What is the statistical term for information that we collect in numbers? (Data).
   c. How many column we treated in the table from our last lesson? (Three)
   d. What are some examples of the columns we had in our tables? (Examples: scores, tally marks, total number of pupils).
3. **Say:** Today we will learn how to display collected data in a bar chart.

Introduction to the New Material *(11 minutes)*

1. Look at the following on the board:
   The grades of pupils in an exam are: B, C, A, B, A, D, F, E, C, C, A, B, B, E, B.
2. Ask a pupil to come to the board and write all the grades in a list by alphabetic order.
   (Answer: A, A, A, B, B, B, B, B, C, C, C, D, E, E, F)
3. **Say:** The grades are in a list even though most of them appear more than once.
4. **Say:** We can put the result in a table. Another term for this type of table is 'frequency table.'
   Frequency here means the number of times a grade appears (or something happens).
5. Look at the table on the board:

Grade	Tally	Total
A		
B		
C		
D		
E		
F		
TOTAL		

6. Ask pupils to come to the board to help tally each letter grade. Ask different pupils to count the tally marks for each letter grade and write the total number for each in the third column. Ask another pupil to find the total number of all pupils (15) and write this number in the last row.
7. **Say:** The number of tally marks gives the total, which is what we call frequency. We are now going to put the frequency table into a bar chart.
8. **Say:** A bar chart has rectangular bars of equal width. The height of the bars are equal to the number of items beings represented.
9. Draw the empty bar chart on the board, label and show pupils the x-axis, y-axis, title, and labels:

Grade	Tally	Total
A	///	3
B	////	5
C	///	3
D	/	1
E	//	2
F	/	1
TOTAL		15

Pupils' Exam Grades
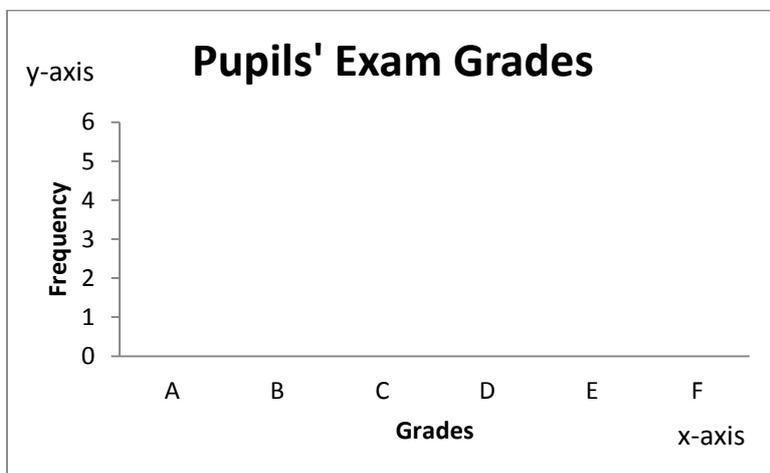
10. **Say:** Now we will draw a bar to show the number of pupils who received each grade. The bars are separated by equal gaps.
11. Draw the bar chart for pupils:

Pupils' Exam Grades
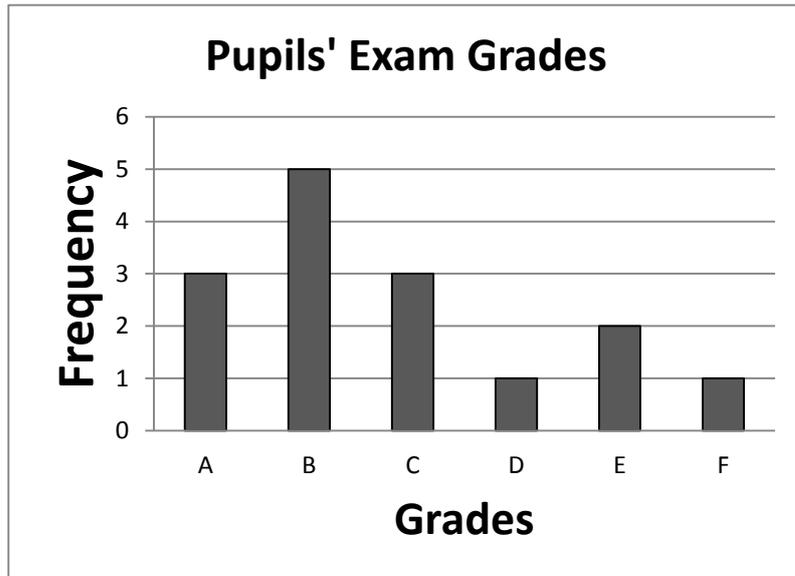
Guided Practice *(10 minutes)*

1. Write on the board: The following are the goals scored by a football team in one season: 3, 2, 0, 1, 5, 3, 2, 1, 2.
2. Ask pupils to sit in pairs.
3. **Say:** Organise and display the scores in a frequency table. Then draw a bar chart for the frequency table.
4. Move around the class to check pupils as they work. Clear any misconceptions. For example, draw the empty frequency table and bar chart if needed.
5. Ask a pupil to come to the board and present their answer.
   Answer:

Goals	Frequency
0	1
1	2
2	3
3	2
4	0
5	1
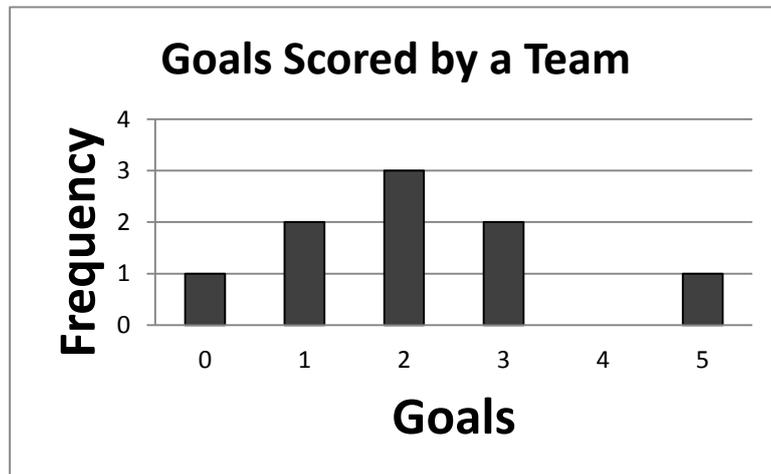
Independent Practice *(10 minutes)*

1. Write on the board: The following are sizes of shoes worn by 20 pupils: 7, 9, 6, 10, 8, 8, 9, 11, 8, 7, 9, 6, 8, 10, 9, 8, 7, 7, 8, 9.
2. Draw this table on the board →
3. **Say:** Copy and complete the table. Work independently to draw a bar chart showing the frequency of shoe size.
4. Move around the class to make sure pupils understand and are working.
5. Ask a pupil to stand and read out the values for the frequency column. Ask another pupil to present on the board his/her bar chart.

   Answer:

Size	Frequency
6	
7	
8	
9	
10	
11	

Size	Frequency
6	2
7	4
8	6
9	5
10	2
11	1
Total	**20**

Pupils' Shoe Size
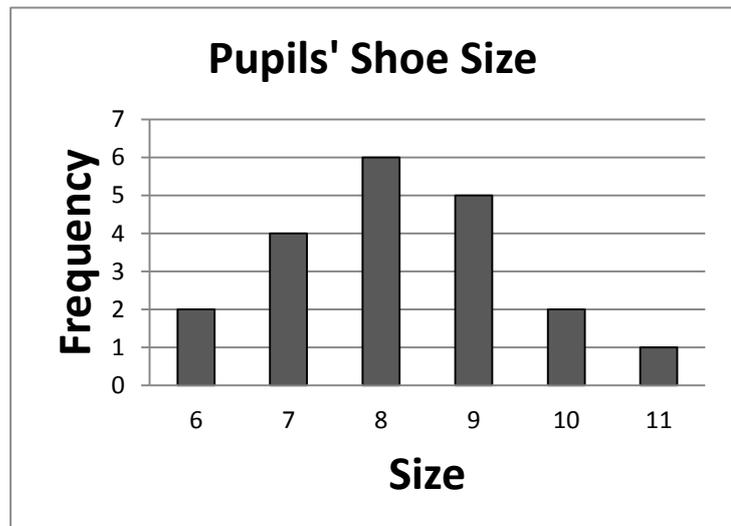
Closing *(2 minutes)*

1. Ask pupils to give the answers of the following questions in their own words:
   a. What is the meaning of frequency?
      (Example answer: The number of times an item or something appears or happens).
   b. What is a bar chart? (Example answer: A chart with rectangular bars of equal width that holds statistical information)
   c. What are the parts of a bar chart? (Example answers: x-axis, y-axis, title, labels and bars.)

Lesson Title: Interpret Bar Charts	**Theme:** Statistics	
Lesson Number: M-07-129	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to make comparisons and draw conclusions from bar charts.		**Teaching Aids** Tally table		**Preparation** Draw the tally table, in the Introduction to the New Material, on the board.

Opening *(3 minutes)*

1. **Ask:** In statistics, what do we call the number of times an item appears or something happens?
   (Answer: Frequency)
2. **Ask:** What is the name given to statistical information or data represented by bars?
   (Answer: Bar chart or graph.)
3. Ask pupils to describe 'bar chart' in their own words.
   (Example answers: Rectangular bars of equal width, the heights are equal to the number of items being represented. The bars have equal spaces between them.)
4. **Say:** Today, we are making comparisons and drawing conclusions from bar charts.

Introduction to the New Material *(12 minutes)*

1. Look at the table that shows a tally of types of vehicles that were wrecked in serious accident during one month on a busy road.

Vehicle	Car	Lorry	Bus	Taxi	others
Frequency	////	̶H̶1̶/ ////	/	//	//

2. Ask pupils to read the frequencies out loud as numbers instead of tallies. (Answer: Car 5, Lorry 9, Bus 1, Taxi 2 and others 2.).
3. Draw the x and y axes as in the bar chart below. Ask different pupils to come to the board and represent the data in a bar chart. (For example, ask 5 pupils to come draw each of the 5 bars)
   Answer:
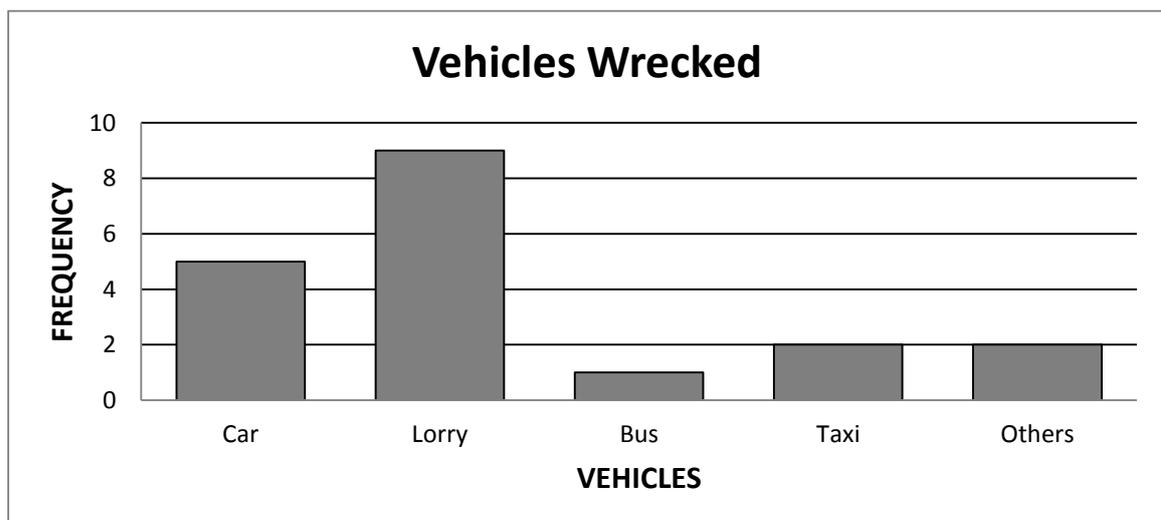
4. Ask questions to check for pupils' understanding of the bar chart. Discuss each answer:

o Which type of vehicle had the highest number of serious accidents? (Lorries have the highest number of occurrences, 9).

o How many vehicles were wrecked in total? (Answer: 19)

o Which vehicle had the lowest number of serious accidents? (Answer: Bus 1)

o Is it true that Cars and Lorries together had nearly three times as many serious accidents as all the other vehicles? (Answer: Yes: Cars and lorries had 14 accidents in total, there were only 5 accidents among all other vehicles.).

Guided Practice *(8 minutes)*

1. Write a question on the board:
   Aminata tossed a die 25 times. The frequency table below shows how many times she rolled each number between 1 and 6.

Number	1	2	3	4	5	6
Frequency	2	3	7	5	7	1

2. Ask pupils to work in pairs to draw a bar chart showing the frequency of the numbers in the table.

3. Ask one group to come to the board and present their bar chart.
   Answer*:*
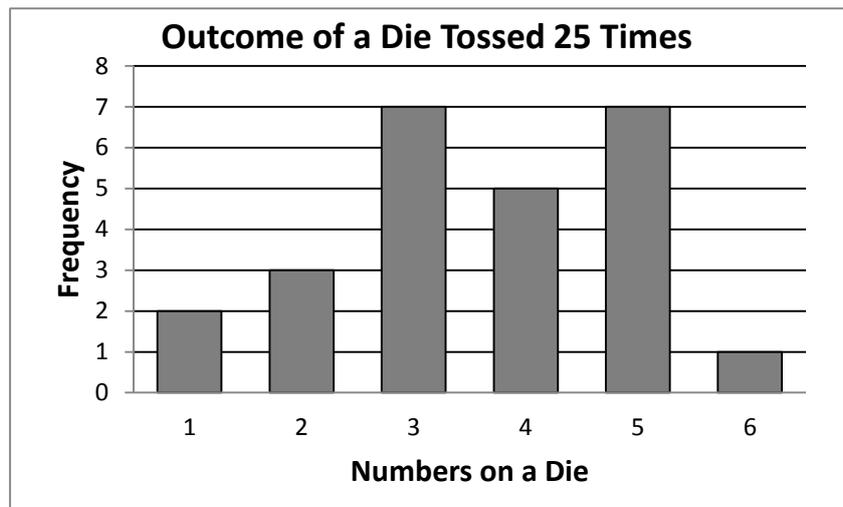
4. Do corrections where necessary.

Independent Practice *(10 minutes)*

1. **Say:** You will work independently to answer questions based on the bar chart you made in your groups.

2. Write questions on the board:
   a. Which number was rolled most often? (Answer: 3 and 5)
   b. Which number was rolled least often? (Answer: 6)
   c. How many more times did Aminata roll a 3 than a 1? (Answer: $7 - 2 = 5$ more times)
   d. How many fewer times did Aminata roll a 6 than a 5? (Answer: $7 - 1 = 6$ fewer times)

    e.   True or false: Aminata rolled exactly twice as many 4's than 2's. (Answer: False; she rolled five 4's and three 2's. Five is not twice three.)

3. Ask pupils to compare their answers with a partner if they finish early.
4. Read questions out loud and allow pupils to call out the answers. Do corrections and clear any misconceptions.

Closing *(2 minutes)*

1. **Ask:** What does the height of a bar represent?
2. Allow pupils to share their answers. (Example answers: the frequency, how much of something there is).
3. **Ask:** Why are bar charts useful? (Example answers: They help us compare the frequency of different events, or compare different amounts.)
4. **Suggested homework:** Ask pupils to draw a bar chart based on the data in a given table. For example: The following table shows the types of phones owned by 11 teachers in a school.

Phones	Nokia	Samsung	iPhone	Sony
Quantity	2	3	1	5

Lesson Title: Creating Line Graphs		**Theme:** Statistics	
Lesson Number: M-07-130		**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to display collected data in a line graph.		**Teaching Aids** Questions		**Preparation** Write the questions, in the Introduction to the New Material, Guided Practice, and Independent Practice, on the board.

Opening *(3 minutes)*

1. Write on the board: Graphs
    - ➢ Ask pupils if they can name some types of graphs.
    - ➢ Allow them to discuss and come out with their answers. (Example: bar graph, line graph, circle graph).
2. **Ask:** What is a graph?
3. Allow pupils to come with their definitions. (Example answer: A graph is a picture that shows information.)
4. **Say:** A graph can make information easy to understand without using words.
5. **Say:** Today, we are going to learn how to display collected data in a line graph.

Introduction to the New Material *(12 minutes)*

1. **Say:** To draw a line graph, you need a collection of data that has changed over time.
2. **Say:** A line graph is a graph that uses points connected by a line to show how something changes in value as time goes.
3. Read the question on the board: Mariama wants to know how much weight her dog Billy has gained from when he was a puppy to when he was fully grown.
   Here is the data she collected on her notepad:

Months	1	2	3	4	5	6	7	8	9
Weight in lbs.	10	15	20	25	30	35	40	45	50

4. **Say:** Together, we are going to display this data in a line graph.
5. Draw the lines for the x- and y-axis.
6. **Ask:** Which values should we put on the x-axis? (Answer: Months)
7. Ask another pupil which values should be on the y-axis? (Answer: Weight in lbs)
8. **Say:** Like other graphs, line graphs need two axes, one vertical (y-axis), and one horizontal (x-axis).
9. **Say:** The vertical axis represents the range of weight in pounds. The dog's lowest weight was 10 lbs. and his highest weight was 50 lbs. We will make our y-axis range from 0 to 60 lbs. to cover all of his weight.
10. **Say:** The horizontal axis represents the months when weight in pounds was calculated.

11. Plot the line graph on the board with the participation of pupils:

Billy's Weight
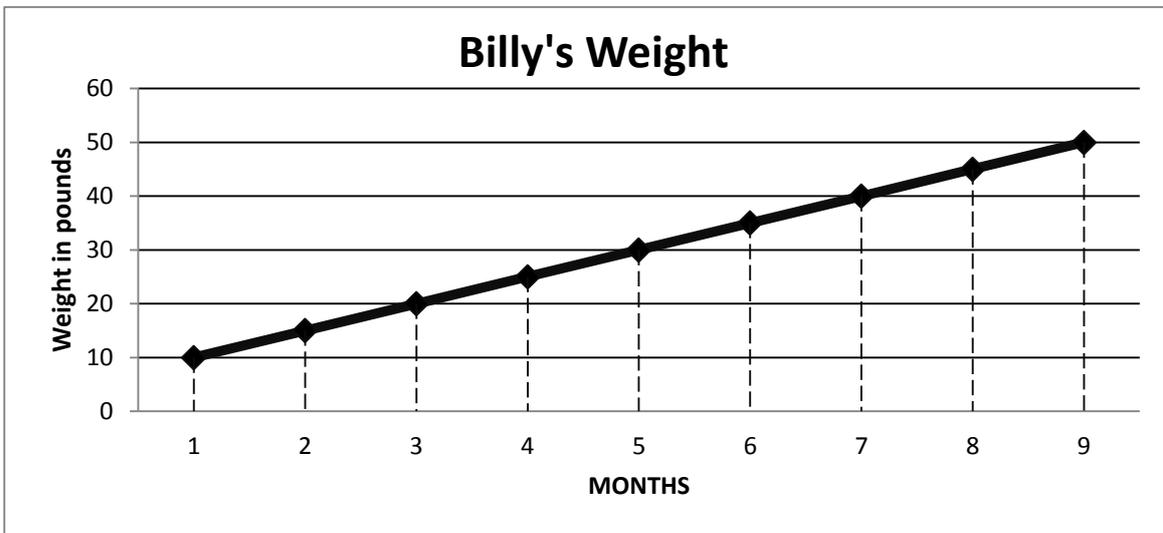
12. Clear any misconceptions. For example, you may need to explain why some of the points are plotted between the lines for weight. Explain that 15 lbs. is halfway between 10 and 20 lbs. That is why we plot the point for month 2 between the 10 line and 20 line.

Guided Practice *(8 minutes)*

1. Ask pupils to work in pairs.
2. Read the question on the board: When Muriel was born, her parents planted a tree in the back yard. Here is how tall the tree was in each of the next 8 years.

Year	2003	2004	2005	2006	2007	2008	2009	2010
Height in feet	2	3	5	7	10	12	15	18

3. **Say:** Work with your partner to display the data on a line graph.
4. Move around to check for understanding and clear misconceptions. If they find it difficult, draw the axes on the board and help them find a good scale (tell them they can count in 2s on the y-axis).

5. Ask a few different groups to come to the board. Give them each a different task on the same graph until it is complete. For example: draw the x and y-axis, label the axes, plot the points, and draw the line.

Height of the Tree

A line graph titled "Height of the Tree" with the y-axis labeled "Tree Lenght in Feet" ranging from 0 to 20, and the x-axis labeled "YEAR" showing years 2003 to 2010. Points plotted: 2003 = 2, 2004 = 3, 2005 = 5, 2006 = 7, 2007 = 10, 2008 = 12, 2009 = 15, 2010 = 18.
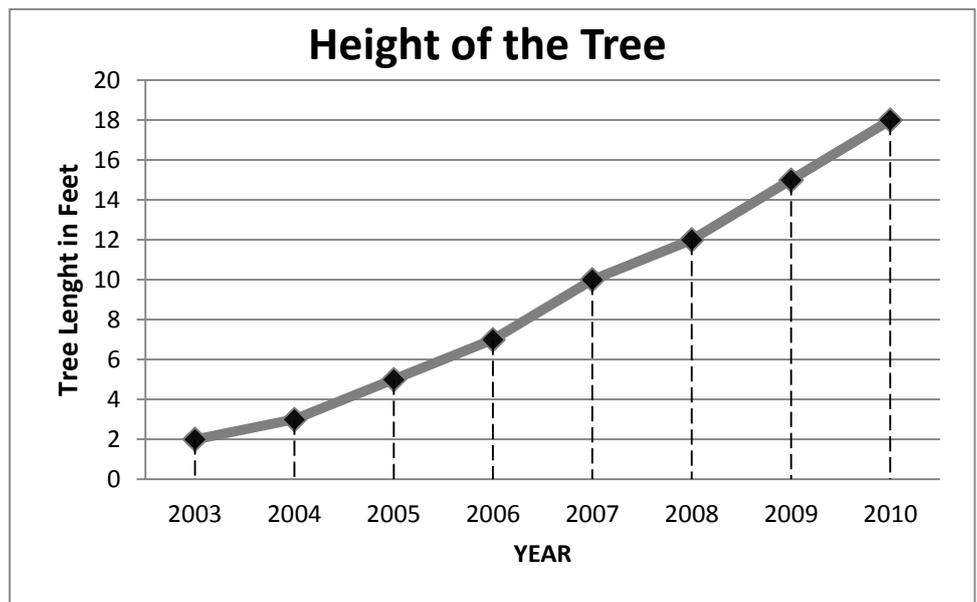
Independent Practice *(10 minutes)*

1. Read the question on the board:
   The table below shows daily temperatures for Freetown City, recorded for 6 days in degrees Celsius. Display the data in a line graph with a y-axis ranging from 24 to 33

Temperature in Freetown City

Day	1	2	3	4	5	6
Temperature (°C)	27	28	27	31	32	30

2. **Say:** Work independently to display the data on a line graph.
3. Tell pupils that they do not need to start the y-axis at 0. They can start it at any convenient number, as long as the number they start from is less than the lowest y-axis value to be plotted.
4. Move around to check pupils' understanding as they work.
5. **Say:** Turn to your neighbour and share for 2 minutes.

6. Ask 2 pupils to come to the board to present their answers (1 to draw the axis and scale and the other to plot and draw the line).

Answer:
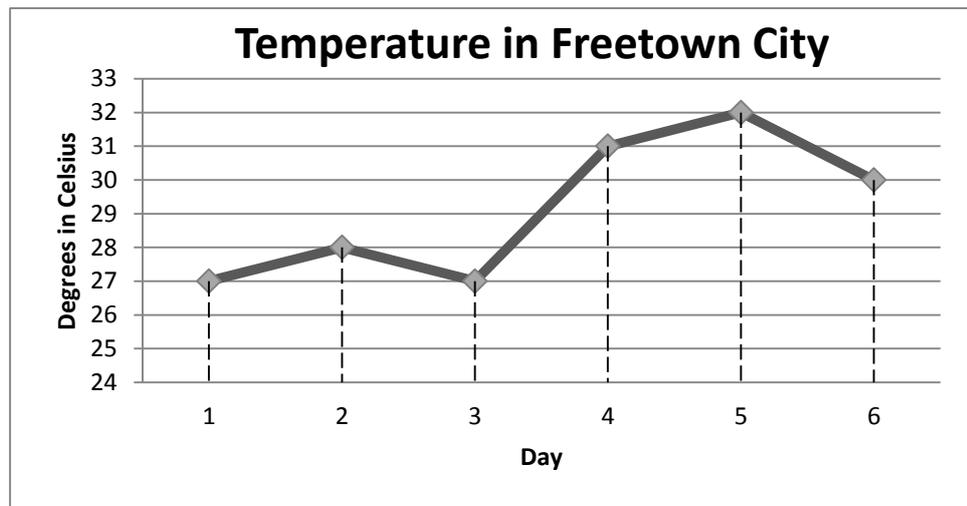
Closing *(2 minutes)*

1. **Ask:** What is a graph? (Example answer: A picture that shows information).
2. **Ask:** What is a line graph? (Example answer: A graph that uses points connected to lines to show how something changes over time).
3. Ask 2 pupils to each state 1 important purpose of line graphs (Example answers: (a) it makes information easy to understand without using words. (b) It allows a person to visually see how something changes).
4. **Ask:** Is a line graph the same as a bar graph? (Answer: 'No': Bar graph shows bars and line graph shows lines).

Lesson Title: Interpret Line Graphs		**Theme:** Statistics	
Lesson Number: M-07-131		**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to make comparisons and draw conclusions from line graphs.		**Teaching Aids** Line graph		**Preparation** Draw the line graph in the Introduction to New Material and Guided Practice, on the board.

Opening *(3 minutes)*

1. **Ask:** Pupils open-ended questions.
2. Allow them to share their ideas before arriving at the answers.
   a. What did we learn yesterday? (Display collected data in a line graph).
   b. How can we get information from a line graph? (Expected Answers: by observation, calculation, estimation)
3. **Say:** Today we will learn how to make comparisons and draw conclusions from a line graphs.

Introduction to the New Material *(10 minutes)*

1. Look at this line graph on the board:
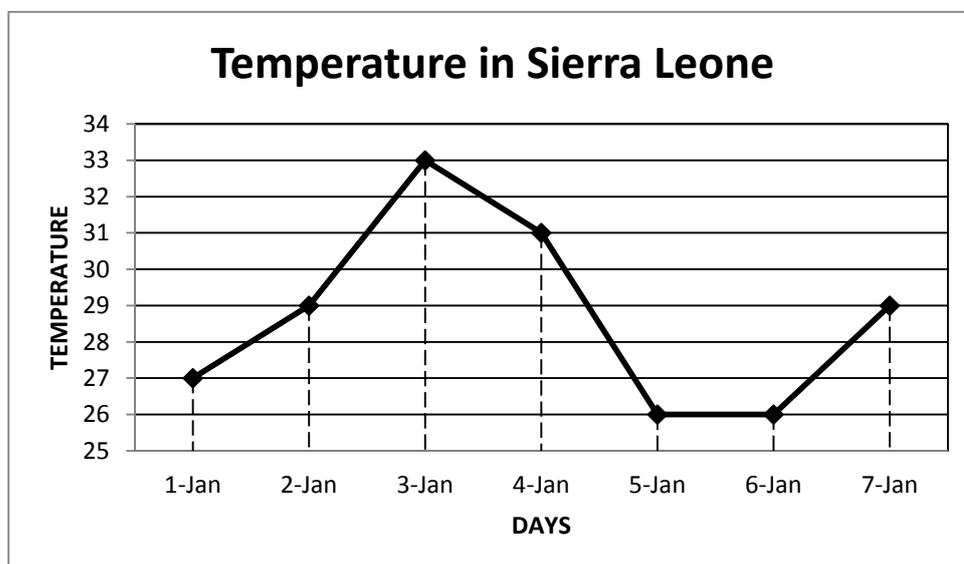
2. **Say:** Together we are going to use the line to answer questions. We can make a lot of observations about one line graph.
3. Ask pupils open-ended-questions, allow them to give their answers, and discuss:
   • What is being measured? (Answer: Daily Temperature from January 1st to 7th).
   • What is on the horizontal axis? (Answer: Days)

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- What is on the vertical axis? (Answer: Temperature).
- What was the highest temperature recorded? (Answer: 33°C)
- What was the lowest temperature recorded? (Answer: 26°C).
- What is the difference between the highest and lowest temperatures?
  (Answer: 33°C – 26°C = 7°C).
- On what day did the highest temperature occur? (Answer: January 3rd)
- Did any 2 days have the same temperature? Which days?
  (Answer: Yes; 5th and 6th January, 2nd and 7th of January)
- What was the temperature on the 5th January? (Answer: 26°C).

Guided Practice *(10 minutes)*

1. Look at this line graph below on the board:
2. **Say:** Each year, the forest rangers of Sierra Leone count the number of wild elephants in Gola National Park and put their findings in a line graph.
3. **Say:** Work with a partner. Use the line graph to answer the questions.
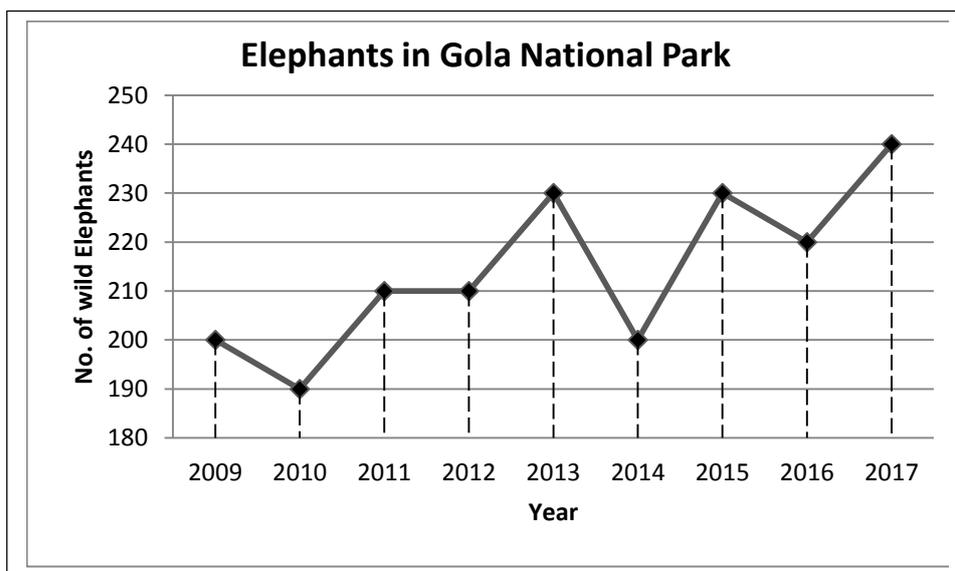
4. Write questions on the board for pupils to answer in their groups. Choose a number of questions that your pupils can complete in 10 minutes:
   - How many elephants were in Gola National Park in 2010? (Answer: 190 elephants)
   - How many elephants were counted in 2015? (Answer: 230 elephants)
   - How many more elephant were counted in 2014 than 2010? (Answer: 10 elephants)
   - In which year was the greatest number of elephants counted? (Answer: 2017)
   - What was the ratio of elephants in 2009 to that in 2012? (Answer: 20:21).
   - What is the difference in the elephant population between 2009 and 2013? (Answer: 30)
   - Which year had the lowest number of elephants? (Answer: 2010)
5. Walk around the class to check for understanding and clear misconceptions.
6. Ask a different group to present each answer on the board.

Independent Practice *(10 minutes)*

1. Draw the line graph below on the board.
2. **Say:** The line graph shows the sales of pens between 8 AM and 1 PM one day in a shop.

Pens Sold
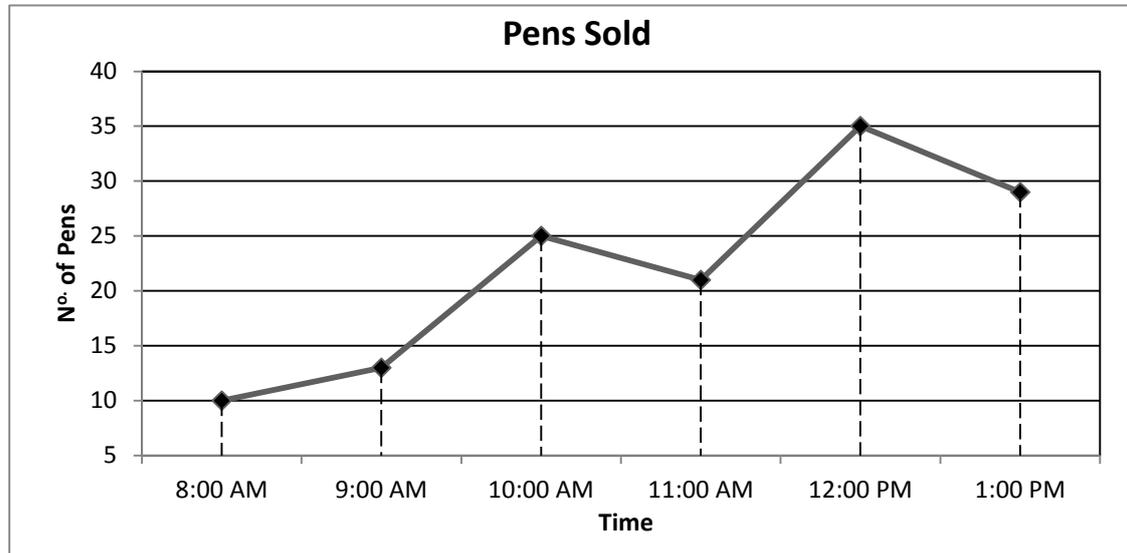
3. **Say:** Answer the questions independently.
4. Write questions on the board. Choose a number of questions that your pupils can complete in 10 minutes.
   - How many pens were sold at 1:00 PM? (Answer: 29)
   - How many more pens were sold at 12:00 PM than 8:00 AM? (Answer: 25)
   - What time had the highest sale? (Answer: 12:00 PM)
   - What was the difference in sales between 10:00 and 1:00? (Answer: 4)
   - How many pens were sold at 11:00? (Answer: 21)
   - What was the ratio in sale at 10:00 AM to that of 12:00 PM? (Answer: 5:7)
   - How many pens were sold in total from 8:00 AM to 1:00 PM? (Answer: 133)
5. Walk around the classroom to make sure pupils understand the task and are working.
6. Read the questions out loud and ask different pupils to share their answers. Discuss each answer.

Closing *(2 minutes)*

1. **Ask:** Why are line graphs useful?
   (Answer: Line graphs are useful in displaying data or information that changes continuously over time.)
2. **Ask:** When do we use bar graphs and line graphs?
   (Answer: Bar graphs are used to compare amounts while line graphs are used to show the change of something over time.)

Lesson Title: Pie Charts	**Theme:** Statistics	
Lesson Number: M-07-132	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to interpret information from a pie chart.		**Teaching Aids** 1. Pie charts 2. Questions		**Preparation** 1. Draw the pie charts, in the Introduction to the New Material, Guided Practice and Independent Practice, on the board. 2. Write the questions, in the Guided Practice, and Independent Practice, on the board.

Opening *(2 minutes)*

1. Ask questions to review the types of graphs learned so far (bar chart and line graph). Allow pupils to share their ideas and discuss:
   ➢ Why are bar charts useful? (Example answer: they help us to compare different quantities)
   ➢ Why are line graphs useful?
     (Example answer: they help us to see how a quantity changes over time)
2. **Say:** Today, we are learning how to interpret information from another type of chart, pie chart.

Introduction to the New Material *(13 minutes)*

1. **Ask:** What is a pie chart?
2. Allow pupils to come out with their definitions.
3. **Say:** A pie chart is a type of graph in which a circle is divided into sectors that each represents a portion of the whole.
4. **Say:** A pie chart is also known as circle chart.
5. Look at the pie chart below.
6. **Say:** This pie chart shows the percentage of blood types for a group of 200 pupils.

Blood Types of 200 Pupils
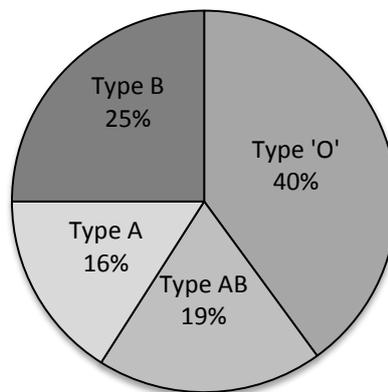
7. **Ask:** What does percentage (%) mean? (Answer: Percentage means out of 100)
8. **Say:** Let's add the percentages on this pie chart.
9. Write on the board: $25\% + 16\% + 19\% + 40\%$
10. Ask pupils to add the numbers in their exercise books. Then ask them to give the answer (100%).
11. **Say:** The percentages in a pie chart always add up to 100%. Remember that 100% is the same as one whole. A bigger percentage takes up more space in the pie chart. In this pie chart, a bigger piece means that more pupils have that blood type.
12. Ask pupils questions to check for understanding of the pie chart. Discuss each one and explain as needed.
    - Which blood group has the least percentage? (Answer: A)
    - Which blood group has the highest percentage? (Answer: O)
    - What percentage of pupils has blood type B? (Answer: 25%)
    - What percentage of pupils has blood type AB? (Answer: 19%)
13. **Ask:** How many pupils in this group of 200 have blood type AB?
14. **Say:** This question asks us how many, not what percentage. We will need to find the *number* of pupils out of the 200 that have blood type AB. That means we need to find 19% of 200 pupils.
15. Solve the problem on the board with pupils' participation. (Answer: $\frac{19}{100} \times 200 = 38$ pupils)
16. **Ask:** How many pupils in this group *do not* have blood type O?
17. **Ask:** What is the first thing we need to do to solve this problem?
18. Allow pupils to brainstorm. Guide them to understand that we first need to find the *percentage* of pupils who *do not* have blood type O.
19. **Say:** If the percentage of pupils who do have blood type O is 40%, then we need to subtract this number from 100%. This will tell us the percentage of pupils who do not have blood type O.
20. Write on the board: $100\% - 40\% = 60\%$
21. **Say:** 60% of pupils do not have blood type O.
22. Ask pupils to find 60% of the 200 pupils in their exercise books. **(**Answer: $\frac{60}{100} \times 200 = 120$ pupils)
23. Write the answer on the board and ask them to check their answers.

Guided Practice *(8 minutes)*

1. Look at the pie chart below and write on the board: On 1st October 2016, 300 vehicles travelled on Mango Road. This pie chart shows the types of vehicles in traffic that day.

Traffic on Mango Road

Buses 2%
Vans 20%
Motor Bikes 25%
Cars 53%
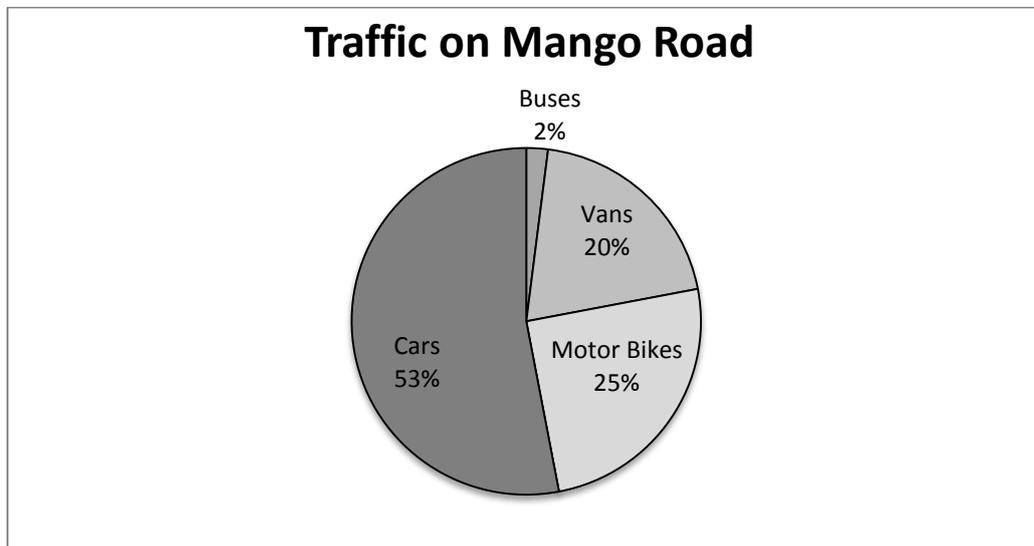
2. Ask pupils to work in pairs.
3. Read the questions on the board for them to answer. Write as many as they can complete in 8 minutes:
   - Which vehicles travelled on Mango Road at the lowest percentage that day? (Answer: Buses)
   - Which vehicles travelled on Mango Road at the highest percentage? (Answer: Cars)
   - What percentage of the vehicles were vans? (Answer: 20%)
   - How many of the vehicles were cars? (Answer: $\frac{53}{100} \times 300 = 159$)
   - How many of the vehicles were buses? (Answer: $\frac{2}{100} \times 300 = 6$)
4. Move around the classroom and check pupils as they work. Check that their answers are clearly written.
5. Make corrections where necessary.

Independent Practice *(10 minutes)*

1. Look at the pie chart below and write on the board: This pie chart shows the different types of transportation used by 800 pupils to come to school.

Transportation Used by Pupils
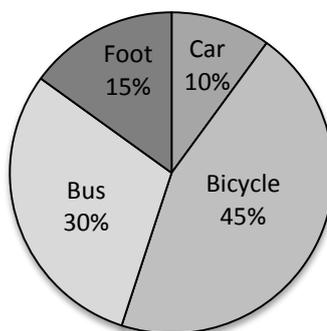
2. Ask pupils to work independently.
3. Write some questions on the board for them to answer. Write as many as they can complete in 10 minutes:
   - Which means of transportation does the highest percentage of pupils use? (Answer: Bicycle)
   - Which means of transportation does the lowest percentage of pupils use? (Answer: Car)
   - Find the different between the percentages of pupil that use bicycle and car. (Answer: $45 - 10 = 35\%$)
   - What percentage of pupils that do not walk to school? (Answer: $100 - 15 = 85\%$)
   - How many pupils come to school using bicycle? (Answer: $\frac{45}{100} \times 800 = 360$ pupils)
   - How many pupils do not walk to school? (Answer: $\frac{85}{100} \times 800 = 680$ pupils)
4. Move around the classroom to check for understanding.
5. Ask pupils to turn to their neighbour and compare their answers when they are finished.

Closing *(2 minutes)*

1. **Ask:** What is a pie chart? Why are they useful?
2. Allow pupils to share their ideas and discuss. (Example answer: A pie chart is a type of chart in which a circle is divided into sections; they help us compare parts of a whole.)

Lesson Title: Comparing Graphs and Charts	**Theme:** Statistics	
Lesson Number: M-07-133	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes		Teaching Aids		Preparation
	By the end of the lesson pupil will be able to: 1. Identify that bar charts and line graphs are used to compare different amounts and pie charts are used to compare parts of the whole. 2. Create an appropriate chart for a set of data.		1. Table 2. Questions		1. Draw the tables, in the Introduction to the New Material and Guided Practice, on the board. 2. Write the questions, in the Introduction to the New Material, on the board.

Opening *(3 minutes)*

1. Ask questions to review charts and graphs:
   - What is a bar chart?
   - (Answer: A chart with rectangular bars of equal width that interpret statistical information)
   - When do we use a bar chart? (Answer: when trying to compare different amounts)
   - What is a line graphs?
   - (Answer: they are used to display data or information that changes continuously over time)
   - What is a pie chart? (Answer: A pie chart is a type of graph in which a circle is divided into sectors that each represents a proportion of the whole).
   - When do we use a pie chart? (Answer: A pie chart is used to compare parts of the whole).
2. **Say:** Today we are going to learn how to create an appropriate chart for a set of data.

Introduction to the New Material *(12 minutes)*

1. **Say:** Bar chart and line graph are used to compare different amounts.
2. **Say:** Pie charts are used when you are trying to compare a whole. They do not show changes over time.
3. Read the question on the board: The table below shows the humidity level recorded in Freetown for 7 days. Construct a graph which best demonstrates the humidity level for each day.

HUMIDITY LEVELS IN FREETOWN	
Day	**Humidity Level (%)**
1	51
2	59
3	65
4	68
5	70
6	67
7	72

4. **Ask:** What is humidity?

5. Allow pupils to come out with their ideas. (Example: it tells us the amount of water vapour, or moisture, in the air)
6. **Ask:** What is the appropriate graph for this data?
7. Allow pupils to come out with their ideas. (Example: Bar chart, Pie chart and line graph).
8. **Say:** The table does not indicate any parts in relation to a whole, so a circle graph is *not* the right choice.
9. **Say:** We want to compare different values, and we can see that the data is changing over time. A line graph would be the best choice for displaying this data.
10. Together with pupils, draw the line graph on the board as shown below.

HUMIDITY LEVELS IN FREETOWN
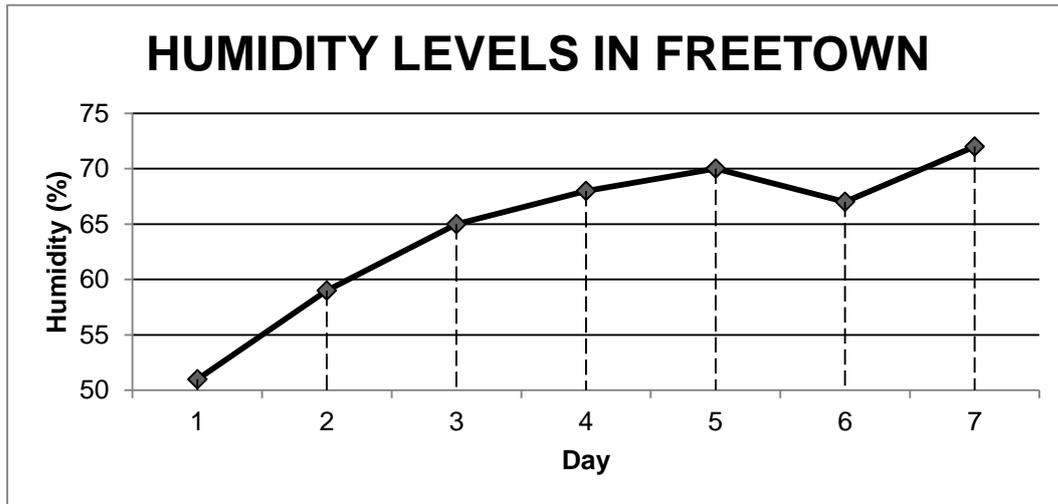
Guided Practice (8 minutes)

1. Look at this table on the board →
2. **Say:** This table shows subjects enrolled in by pupils in a class.
3. Ask pupils to work in pairs or with a partner.
4. **Say:** Draw the graph or chart that best shows the number of pupils enrolled in each subject.
5. Move around the classroom to check for understanding and clear misconceptions. If they have difficulty deciding which graph or chart to use, guide them to use a bar chart. Encourage them to count by 5's on the y-axis.

| SUBJECTS ENROLLED IN BY PUPILS ||
Subjects	Number of Pupils
Mathematics	32
Physical Education	18
Computer Studies	28
Home economics	15
Business management	10

6. Draw the empty graph on the board, and ask different pairs to come draw the 5 bars.

SUBJECTS ENROLLED IN BY PUPILS
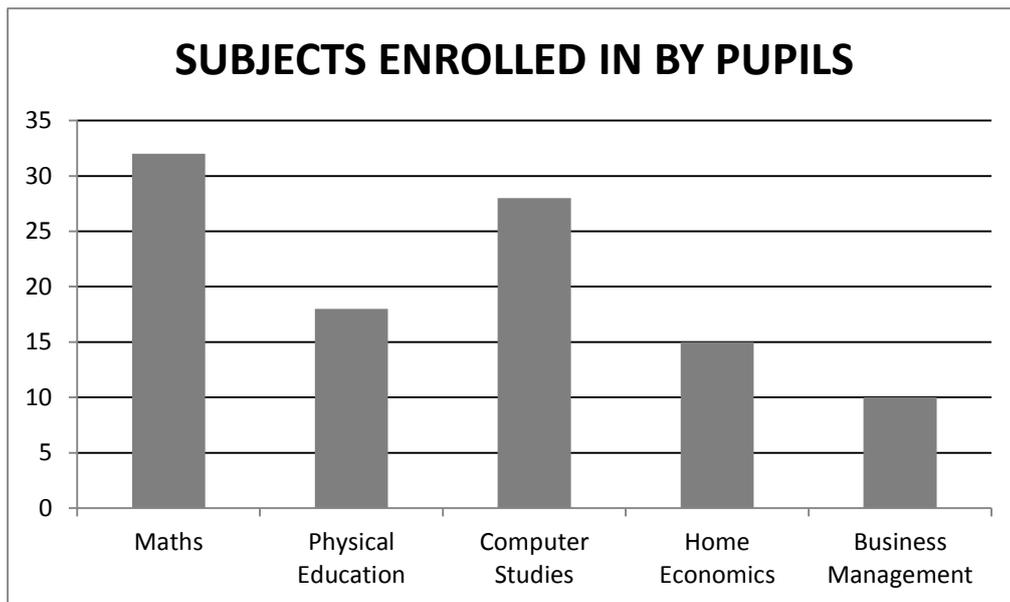
Independent Practice *(10 minutes)*

1. Write a question on the board: The table below shows the scores of 20 pupils in a Mathematics test marked over 50. Draw the graph or chart which best shows the marks scored by pupils.

Scores	25	30	35	40	45	50
No of pupils	2	1	3	5	7	2

2. Ask pupils to work independently to solve the problem.
3. Move around the classroom to check for understanding. For example, make sure pupils understand that bar chart is the best way to represent the data.
4. Ask pupils to turn to a neighbour and compare answers for a minute
5. Ask a pupil to come to the board and present their answer. Do corrections where necessary.

SCORES OF 20 PUPILS IN A MATHS TEST

A bar chart with the vertical axis labelled "Number of Pupils" ranging from 0 to 8, and the horizontal axis labelled "Scores" with values 25, 30, 35, 40, 45, 50.

- Score 25: 2 pupils
- Score 30: 1 pupil
- Score 35: 3 pupils
- Score 40: 5 pupils
- Score 45: 7 pupils
- Score 50: 2 pupils
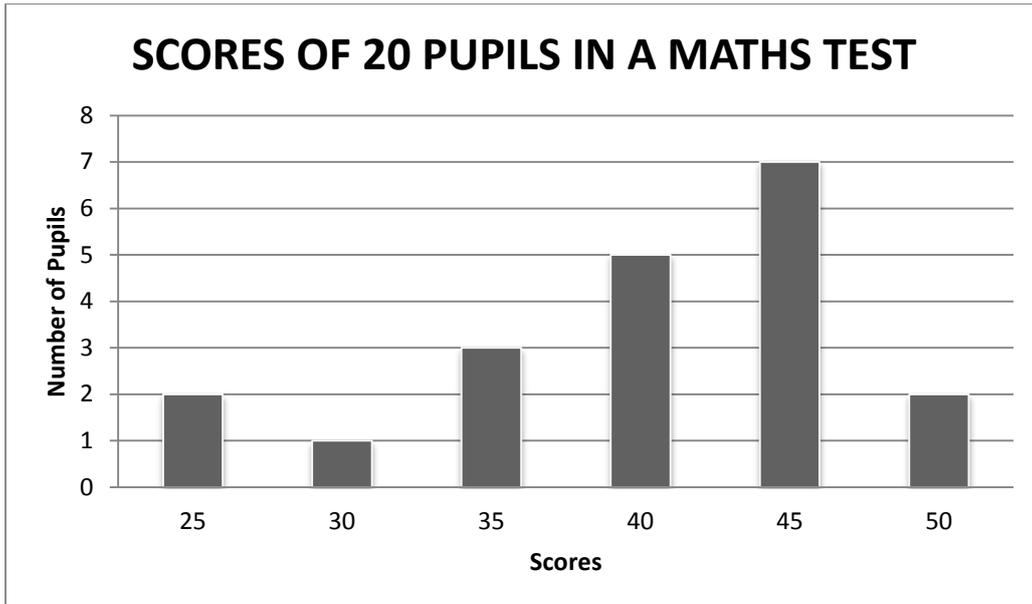
Closing *(2 minutes)*

1. Ask questions about the graph drawn in independent practice. Ask pupils to look at the bar chart and give the answers:
   a. Which score was achieved by the most pupils? (Answer: 45)
   b. How many pupils scored 35? (Answer: 3)
   c. Did more pupils score 40 or 45? (Answer: 45)
   d. How many more pupils scored 45 than 35? (Answer: 4)

Lesson Title: Community Survey Collecting Data	**Theme:** Statistics	
Lesson Number: M-07-134	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to collect information about the community and organise it in a table.		**Teaching Aids** 1. Information 2. Table		**Preparation** 1. Write the information, in the Introduction to the New Material, on the board. **2.** Draw the table, in the Introduction to the New Material, on the board.

Opening *(2 minutes)*

1. Ask open-ended questions:
   - ➢ What is a community? (Example answer: A group of people, living together, working together and sharing common things)
   - ➢ What is a survey? (Example answer: A way of collecting information that you hope represents the views of the whole community or group in which you are interested)
   - ➢ What is data collection? (Example answer: The process of gathering and measuring information on targeted variables in an established systematic fashion)
2. **Say:** Today, we are learning how to collect information about the community and organise it in a table.

Introduction to the New Material *(12 minutes)*

1. **Say:** A pupil in Diamond village collected information with a survey. There are only 4 houses in Diamond village, and she surveyed all of them to find out who lived there.
2. Look at the information on the board:
   - ➢ House A: 4 men, 3 women, 2 boys, 3 girls.
   - ➢ House B: 3 men, 2 women, 3 boys, 1 girl
   - ➢ House C: 2 men, 1 woman, 4 boys, 2 girls
   - ➢ House D: 4 men, 3 women, 5 boys, 3 girls
3. **Say:** We will help the pupil display this information in a table. That will make it easier to read.
4. **Ask:** What columns should we have in our table?
   (Example answers: House, men, women, boys, girls)

5. Look at the table (below) and ask pupils to draw the same table in their exercise books.
6. Ask pupils to come to the board and fill the table based on the survey data, as shown below. All pupils should do the same in their exercise books.

House	Men	Women	Boys	Girls
A	4	3	2	4
B	3	2	3	2
C	2	1	4	2
D	4	3	5	3

7. **Say:** We can make other tables with this information. Let's make a table that shows the total number of men, women, boys and girls living in Diamond village.
8. Draw the empty table on the right. Ask pupils to copy this table in their exercise books.
9. Ask pupils to fill the table in their exercise books by finding the total numbers of men, women, boys and girls in Diamond village.
10. Ask 4 pupils to come to the board and fill the table with a number from their table.

PEOPLE	NUMBER
Men	
Women	
Boys	
Girls	
Total	

PEOPLE	NUMBER
Men	13
Women	9
Boys	19
Girls	11
Total	52

Guided Practice *(9 minutes)*

1. **Say:** We will collect data from our class. This will be data on the different occupations of your parents. We all need to work together. I need a few people to be our leaders, and help us list the data on the board.
2. Select 4 pupils to lead the survey.
3. Share these duties among the 4 pupils: questioner, data entry clerk, tracker and supervisor.
4. **Say:** The questioner will ask each member of the class a question. The data entry clerk will write the responses on the board. The tracker will check the data. The supervisor will oversee the entire process and make sure everyone is active.

5. **Say:** The Questioner will ask each pupil the question: 'What work does your parent do?' Answer for only one of your parents. If you do not want to answer for your parents, choose someone else in the community who you respect, and tell what they do.
6. Write a few common jobs on the board in a vertical list.
   (Example: teacher, health worker, driver, farmer, tailor, petty trader, unemployed)
7. **Say:** The data entry clerk will write one tally mark for each of you.
8. Guide the data entry clerk to write each new occupation that pupils say on the board, and put a tally next to it. See the example list below.

Teacher	////////
Health worker	////////
Driver	////
Farmer	/////////
Tailor	///
Trader	////////

Independent Practice *(10 minutes)*

Unemployed	////

1. Ask the 4 pupils to go to their seats.
2. **Say:** Draw a table to represent the information on the board. You should work independently.
3. Walk around and check for understanding. (Note that pupils' tables may look different. Some might draw the table vertically, and others horizontally. Either way is fine.)
4. Ask a pupil to draw their table on the board.
5. An example is illustrated below :

Occupation	Teacher	Health Worker	Driver	Farmer	Tailor	Trader	Unemployed
No. of Parents	8	10	6	9	3	11	6

Closing *(2 minutes)*

1. **Ask:** Why is it important to collect data about our community? (Example answers: To know the needs of community, to evenly distribute resources in the community)
2. **Ask:** In the guided practice activity, we had a data clerk. What is the job of a data clerk? (Example answer: The person who takes record and manages the information gathered).

Lesson Title: Community Survey Displaying Data		**Theme:** Statistics	
Lesson Number: M-07-135		**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to create graphs and charts to display information about the community.		**Teaching Aids** Tables		**Preparation** 1. Draw the tables, in the Introduction to the New Material, Guided Practice and Independent Practice, on the board.

Opening *(2 minutes)*

1. Ask pupils open-ended questions.
2. Allow them to share their ideas before arriving at the answers.
   ➢ What did we learn in the last class?
      (Answer: How to collect information about the community and organise it in a table)
   ➢ What do you think are some other ways we can display data about our communities?
      (Example answers: By the use of bar chart, line graph and pie chart)
   ➢ What is the role of a supervisor in data collection? (Answer: A supervisor oversees the entire process of data entry)
3. **Say:** Today we are learning how to create graphs and charts to display information about the community.

Introduction to the New Material *(10 minutes)*

1. **Say:** In our last lesson, a pupil in diamond village collected information in her community. We organised the information in a table.
2. **Say:** Today we are going to create graphs and charts to display information about the community.
3. **Say:** Please look at the table of houses in diamond village again. Please tell me how many men, women, boys, and girls there are. (Answers: 13, 9, 19, 11)
4. Look at the table on the board (from yesterday):

People	**Number**
Adult male	13
Adult Female	9
Boys	19
Girls	11
Total	**52**

5. **Ask:** Which chart is most appropriate for the information above?
6. Allow pupils to come out with their views. (Example answers: Bar chart, line shape, pie chart)

7. Tell pupils that *bar chart* is the most appropriate chart for the information since it helps us make comparisons between different amounts.
8. Draw the empty bar chart on the board and ask four different pupils to come and draw each of the bars as shown below. All other pupils should do the same in their exercise books.

Number of People in Diamond Village
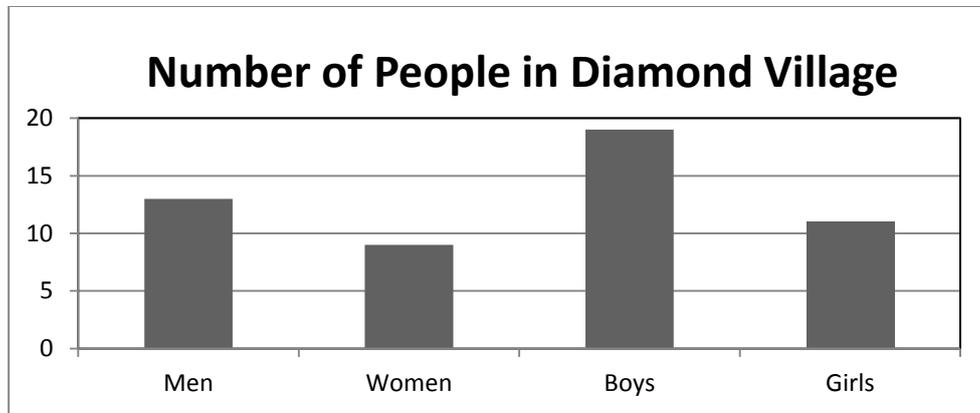
9. Ask questions and allow pupils to interpret the graph. For example:
   - Are there more males than females in the village? (Answer: Yes)
   - How many more boys than girls are there in the village? (Answer: 8)
   - What is the total number of adults in the village? (Answer: 22)

Guided Practice *(10 minutes)*

1. Look at the table on the board:
2. **Say:** Diamond village is a farming community. This is a table that shows the amount of rice produced by Diamond village in different years. Construct a graph that is most appropriate for the table.
3. Tell pupils to work in pairs.
4. Walk around the class to check for understanding and clear misconceptions. If they have difficulty deciding which chart to use, guide them to use a line graph. Encourage them to count in 2s on the y-axis scale.
5. Draw the empty chart on the board, and ask 7 pairs to each come plot one of the points.
6. Make corrections where necessary.

Rice Produced by Diamond Village	
Year	Tons
2010	8
2011	10
2012	6
2013	9
2014	6
2015	5
2016	11

Rice Produced by Diamond Village
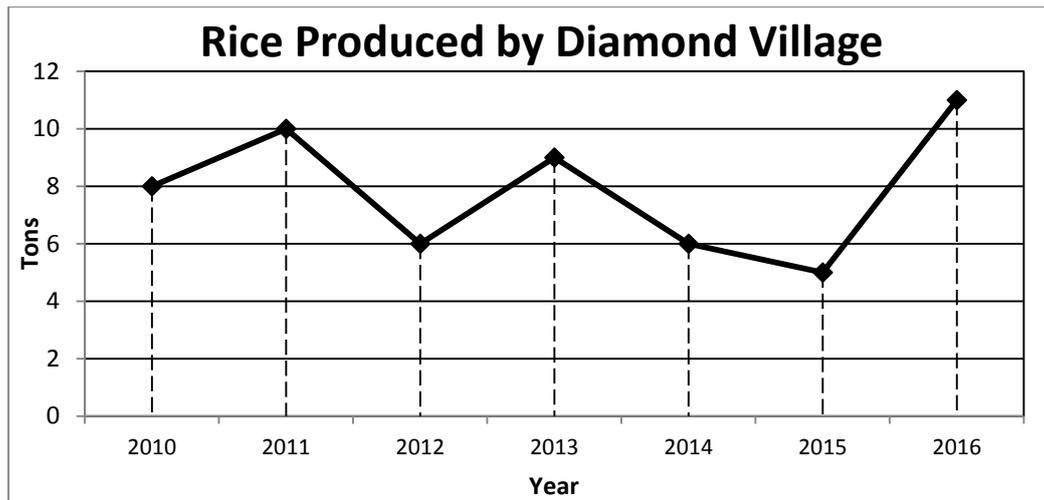
Independent Practice *(10 minutes)*

1. Look at the table on the board.
2. **Say:** A pupil did a survey to find out what the needs are in her community. She asked people what they think is needed most and used their responses to fill this table.
3. **Say:** Construct a chart that is most appropriate for this information.
4. Walk around the class to check for understanding and clear misconceptions. If they have difficulty deciding which chart to use, guide them to use a bar chart. Encourage them to count in 5s on the y-axis scale.
5. Ask pupils to turn to their neighbour and compare answer for 1 minute.
6. Draw the empty chart on the board, and ask 6 pupils to each come draw a bar.
7. Make corrections where necessary.

Needs of My Community	
Needs	**Number of people**
Health Centre	44
School	11
Community Centre	15
Clean water	30
Good Road Facility	25
Market	10

Needs of My Community

A bar chart titled "Needs of My Community" with the y-axis labeled "Number of People" (scale 0 to 50 in increments of 5) and the x-axis labeled "Needs". The bars show:
- Health Centre: 44
- Schools: 11
- Community Centre: 15
- Clean Water: 30
- Good Road Facility: 25
- Market: 10
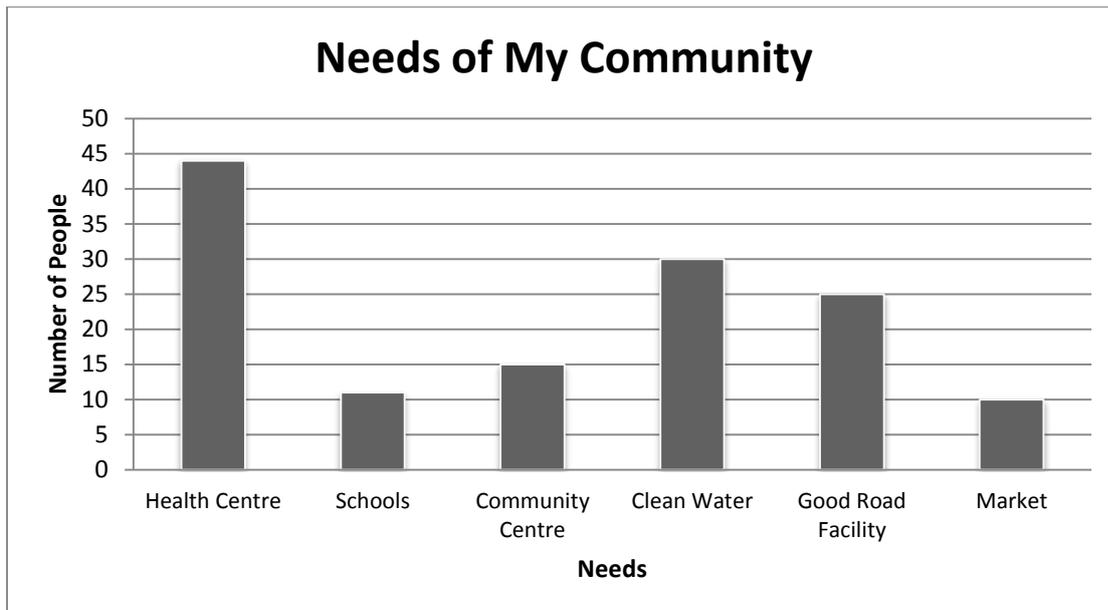
Closing *(3 minutes)*

1. Ask questions to review graphs and check for understanding. For example:
   a. How do graphs help in statistical analysis?
      (Example answer: Graphs help us examine trends and make comparisons by visual displaying data)
   b. When are bar chart used? (Answer: Bar charts are used to compare amounts)
   c. When are pie charts used? (Answer: Pie charts are used to compare the parts of a whole)
   d. When are line graphs used? (Answer: Line graphs are used to display data or information that changes continuously over time).
   e. Why do we use table in statistics? (Answer: Tables are used to organise exact amount of data and to display numerical information)

Lesson Title: Mean and Median	**Theme:** Statistics	
Lesson Number: M-07-136	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to: 1. Calculate the mean and median of a list of data generated by the class. 2. Interpret mean and median.		**Teaching Aids** Questions		**Preparation** Write the questions in the Introduction to the New Material, on the board.

Opening *(3 minutes)*

1. Write these numbers on the board: 1, 2, 3, 4, 5
2. Ask pupils to look at the numbers on the board.
3. Ask a pupil to come and add the numbers on the board. Ask all other pupils to complete the task in their exercise books. (Answer: $1 + 2 + 3 + 4 + 5 = 15$).
4. Ask a pupil to say how many numbers were added together to get 15. (Answer: 5)
5. Ask another pupil to say which number is in the middle of the five numbers. (Answer: 3)
6. **Say:** Today we will calculate mean and median. These are numbers that help us understand where the middle is in a group of numbers.

Introduction to the New Material *(15 minutes)*

1. Read the questions on the board: The Bangura family has 5 children ages 9, 12, 6, 15, and 13.
    (i)   What is the age of the middle child?
    (ii)   What is the mean of the children's ages?
2. **Say:** To find the age of the middle child we first arrange the numbers in order of size. The number in the middle is called the *median*.
3. Ask one pupil to arrange the numbers in order of size on the board. Ask all other pupils to complete the task in their exercise books. (Answer: 6, 9, 12, 13, 15).
4. **Ask:** What is the middle number? (Answer: 12)
5. **Say:** The age of the middle child is 12 years. This is the median of this data.
6. **Say:** Now look at problem 2. The *mean* is another number that tells us where the middle of the data is. It is also commonly known as 'average'. Most of the time it is not equal to the median, but it is often close to it.
7. **Say:** To find the mean of a set of data, add the numbers together and divide the total by the number of items. The quotient is the mean.
8. Write on the board: $6 + 9 + 12 + 13 + 15$
9. **Say:** Please add the numbers in your exercise books.
10. Ask one pupil to write the sum on the board. (Answer: $6 + 9 + 12 + 13 + 15 = 55$)
11. **Say:** Now we will divide the sum, 55, by the number of items, 5.
12. Write on the board: $55 \div 5$
13. Ask a pupil to give the answer. (Answer: $55 \div 5 = 11$)
14. **Say:** 11 years is the mean age of the 5 Bangura children. Recall that the median was 12 years. These are two different ways of finding the approximate middle of their ages.

15. Ask 6 pupils from the class to write the ages of their mothers in a list on the board. (Example: 35, 30, 40, 30, 36, 45)
16. **Say:** We will find the median and mean of these mothers' ages.
17. Ask one pupil to arrange the numbers in order of size on the board. Ask all other pupils to complete the task in their exercise books. (Example answer: 30, 30, 35, 36, 40, 45)
18. **Ask:** What is the middle number?
    (Answer: There is no middle number; 35 and 36 are both in the middle)
19. **Say:** When we have an even number of items, there is no single middle number. We look at the two middle numbers and find their mean. We add the two numbers and divide by 2.
20. Add the two middle mothers' ages and divide by 2 on the board.
    (Example: $35 + 36 = 71$ $71 \div 2 = 35.5$)
21. **Say:** When there is an even number of items, the mean will always be between the two numbers in the middle. (In this example, 35.5 is between 35 and 36).
22. **Say:** The median age of the mothers of these 6 pupils is **35.5** years old.
    (Insert the number from your calculations instead of 35.5)
23. **Say:** Now we will calculate the mean by adding the numbers and dividing by 6, the total number of mothers.
24. Add the ages on the board: $30 + 30 + 35 + 36 + 40 + 45 = 216$
25. Divide this number by the 6 mothers: $216 \div 6 = 36$
26. **Say:** The median age of the mothers is 35.5 and the mean age is 36

Guided Practice *(5 minutes)*

1. Ask pupils to work in pairs.
2. **Say:** You will make a list of numbers with your partner. I want you to write down the ages of all of the siblings of all of your partner, including yourself. If anyone does not have siblings, write the ages of their two best friends.
3. Tell pupils that they should each write the list in their own exercise book. All members of one group should have the same list. (For example: Ages of siblings = 3, 15, 20, 17, 9, 2, 4, 19, 17)

Independent Practice *(10 minutes)*

1. Ask pupils to work independently to find the mean and median of the list that they wrote down in guided practice.
2. Walk around to check for understanding and clear misconceptions. Pupils who have difficulty solving the problem may work with a partner.
3. Ask pupils to compare their answers with their partner. They should have the same answers because they used the same list of numbers.
4. Ask one group to present their answers on the board, if there is enough time. Allow all of the other groups to check the answer. (Example, from example list in guided practice:
   Mean: $2 + 3 + 4 + 9 + 15 + 17 + 17 + 19 + 20 = 106 \rightarrow 106 \div 9 = 11.8$ Median: 15)

Closing *(2 minutes)*

1. Ask pupils questions. Allow pupils to share their ideas and discuss. For example:
    a. What information can we get from the median and mean? (Example answer: They both tell us the approximate middle of a set of data.)
    b. How do you calculate the median of an even number of items? (Example answer: Find the two numbers in the middle; add them together and divide by 2.)

Lesson Title: Mode and Range	**Theme:** Statistics	
Lesson Number: M-07-137	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to: 1. Find the mode and range of a list of data generated by the class. 2. Interpret mode and range.		**Teaching Aids** 1. Table 2. Questions		**Preparation** 1. Draw the table, in the Independent Practice, on the board. 2. Write the questions, in the Independent Practice, on the board.

Opening *(3 minutes)*

1. Write on the board: 2, 1, 7, 5, 6, 8, 6, 9, 6, 9
2. Ask pupils to arrange the numbers in order from lowest to highest in their exercise books.
3. Call on pupils to answer questions:
    a. What is the lowest number? (Answer: 1)
    b. What is the highest number? (Answer: 9)
    c. Which number appears more often than the others? (Answer: 6)
4. **Say:** Today, we will learn about two more statistical calculations, called mode and range.

Introduction to the New Material *(12 minutes)*

1. **Say:** In the previous class we calculated the mean and median of a list of numbers. Today we will do the same thing for mode and range. Let's find the mode and range of the list of numbers on the board.
2. Refer pupils to the same list of numbers from the opening.
3. **Say:** The range is the difference between the highest and lowest numbers. It tells us how spread apart our numbers are. To find the range, subtract the lowest number from the highest number.
4. **Ask:** For the numbers on the board, what numbers will we subtract to find the range? (Answer: $9 - 1$)
5. Write on the board: Range $= 9 - 1 = 8$
6. **Say:** The range of these numbers is 8
7. **Say:** The mode is the number that appears most often in a list. You told me that 6 appears most often in this list. Therefore, 6 is the mode for this data.
8. Write on the board: Mode $= 6$
9. Ask 10 pupils from the class to come write their ages on the board.
    (For example: 12, 12, 13, 12, 13, 15, 11, 14, 12, 13)
    • *Ensure that the 10 pupils are not all the same age.*
10. Ask pupils to write these in order from lowest to highest in their exercise books. (Example: 11, 12, 12, 12, 12, 13, 13, 13, 14, 15)
11. **Ask:** What is the lowest age of these 10 pupils? (Example answer: 11)
12. **Ask:** What is the highest age of these 10 pupils? (Example answer: 15)

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13. **Ask:** What is the range of the ages of these pupils? Explain. (Example answer: the range is 4 years because we subtract $15 - 11 = 4$)
14. **Ask:** What is the mode of the ages of these pupils? Explain. (Example answer: the mode is 12, because more pupils are 12 years old than any other age.)
    - *If there is no mode or two modes for the list on the board, skip to step 15.*
15. **Say:** If a number is not repeated in a list, then that list of numbers does not have a mode. There can also be two or more modes. If two different numbers are repeated the same number of times, they are both called the mode.

Guided Practice *(8 minutes)*

1. Ask pupils to work in pairs.
2. **Say:** You will make a list of numbers with your partner. Please stay sitting and interview the classmates sitting near you to gather data. Interview the classmates in front of you, behind you, to your left, and to your right.
3. **Say:** Ask your classmates this question: 'What is your favourite number between 0 and 10?' Write their favourite numbers down in one list. Make your list as long as you can in 2 minutes.
4. Give the pupils 2 minutes to turn and find the favourite numbers of their neighbouring classmates.
5. **Say:** Now, you will write the numbers in order from lowest to highest. Find the range and mode.
6. Walk around to check for understanding and clear misconceptions.
7. Ask one group to write their list, mode, and range on the board as an example. (Example: 1, 1, 1, 3, 4, 6, 7, 7, 8, 9 range= $9 - 1 = 8$ mode= 1)

Independent Practice *(10 minutes)*

1. Look at the table, and read the questions on the board. Ask pupils to copy it in their exercise books:
    a. What are the mode and range of the 6 classmates' ages?
    b. What are the mode and range of the 6 best friends' ages?

Classmate	Age	Best friend's age
1.		
2.		
3.		
4.		
5.		
6.		

2. **Say:** I want you to interview 6 pupils sitting near you and fill the table with their information. Write their name, age, and best friend's age in the table. Then use this information to answer the questions on the board.
3. Ask pupils to work independently to solve the problem on the board.
4. Move around to check for understanding and clear misconceptions.

5. Ask pupils to turn to their partner and compare answers for 1 minute.
6. While they are comparing, ask one pupil to fill the table on the board and write their answers on the board as an example. (Example answers: (a) Mode= 12 and 13; Range= $13 - 12 = 1$; (b) Mode= 13; Range= $15 - 11 = 4$)

Classmate	Age	Best friend's age
1. Michael	12	13
2. Hawa	13	11
3. Juliet	12	12
4. Nathaniel	13	13
5. Issa	13	15
6. Aminata	12	13

Closing *(2 minutes)*

1. Ask questions to review mean, median, mode, and range. Allow pupils to respond and discuss. For example:
    a. Can someone tell me how to calculate mean?
       (Example: Add a list of numbers together and divide by the number of items)
    b. Can someone tell me how to calculate mode?
       (Example: Find the number that appears most often in a list)

Lesson Title: Statistical Calculations from a List of Data	**Theme:** Statistics		
Lesson Number: M-07-138	**Class/Level:** JSS 1		**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to calculate the mean, median, mode and range of data from a list.		**Teaching Aids** Questions		**Preparation** 1. Write the questions, in the Opening, Guided Practice and the Independent Practice, on the board.

Opening *(3 minutes)*

1. Read this question on the board:
   The ages of 10 college students are: 18, 24, 20, 35, 19, 23, 29, 23, 19, and 20
2. Ask a pupil to come to the board and arrange the ages from youngest to oldest. Ask all other pupils to complete the task in their exercise books.
   (Answer: 18, 19, 19, 20, 20, 23, 23, 24, 29, 35)
3. **Say:** In the past two classes we learned four different statistical calculations: mean, median, mode, and range. Today, we will practise calculating all of them together on a list of data.

Introduction to the New Material *(10 minutes)*

1. **Say:** Let's calculate the mean, median, mode, and range of the numbers on the board.
2. **Ask:** Can someone tell me how to calculate the mean? (Answer**:** Add the numbers together and divide by the number of items [10]).
3. Ask pupils to find the sum of the numbers in their exercise books. Ask one pupil to give his or her answer. (Answer: 230)
4. **Ask:** What is 230 divided by 10? (Answer**:** 23)
   ➢ Review division by 10 as needed.
5. **Say:** The mean age of the college students is 23 years.
6. Ask pupils how they interpret this information, and allow them to share their ideas. (For Example answers: 23 years is the average age, or it is approximately in the middle of the ages of the 10 college students)
7. **Say:** Now we will find the median.
8. **Ask:** What are the 2 middle numbers? (Answer**:** 20 and 23).
9. **Say:** Please find the median in your exercise books.
10. Ask one pupil to write the answer on the board while the others work. (Answer:$\frac{20+23}{2} = \frac{43}{2} = 21.5$)
11. Ask pupils how they interpret this information, and allow them to share their ideas. (For Example answers: 21.5 also tell us the approximate middle of the ages of the 10 college students. Half of the pupils are younger than 21.5 and half of them are older.)
12. **Say:** Now we will find the mode.
13. **Ask:** Which number is in the list appears most often? (Answer: 19, 20, and 23 are all in the list once).

14. **Say:** This list of data has 3 modes. They are 19, 20, and 23.
15. **Ask:** How can we calculate the range of the data? (Answer**:** subtract the youngest age from the oldest age)
16. Ask a pupil to calculate the range on the board. Ask all other pupils to calculate the range in their exercise books. (Answer: $35 - 18 = 17$)
17. **Say:** The range in ages of the 10 students is 17 years.
18. Write the 4 statistical values together on the board in summary:

    Mean $=$ 23   Median $=$ 21.5   Mode$=$ 19, 20, 23   Range$=$ 17

Guided Practice *(7 minutes)*

1. Read this on the board:

   The ages of a group of cousins is: 13, 18, 13, 14, 13, 16, 14, 21, and 13. Find the mean, median, mode, and range of their ages.
2. Allow pupils to work in pairs.
3. Move around to check for understanding and correct misconceptions.
4. Ask 4 different pairs to come to the board and write the answers for the 4 calculations (Answers: Mean $= \frac{13+18+13+14+13+16+14+21+13}{9} = \frac{135}{9} = 15$; Median $= 14$ Mode $= 13$ Range $21 - 13 = 8$)
5. Ask all other pupils to check their answers with those on the board.

Independent Practice *(10 minutes)*

1. Ask pupils to work independently.
2. Read the following on the board:

   Find the mean, median, mode and range from the list of numbers: 8, 9, 10, 10, 10, 11, 11, 11, 12, and 13.
3. Move around to check for understanding and clear misconceptions.
4. After several minutes, ask pupils to turn to their pair and compare answers for 1 minute.
5. Ask 4 different pupils to come to the board and give the answers. (Answer**s:** Mean $= \frac{8+9+10+10+10+11+11+11+12+13}{10} = \frac{105}{10} = 10.5$; Median $= \frac{10+11}{2} = \frac{21}{2} = 10.5$; Mode $= 10, 11$; Range $= 13 - 8 = 5$)
6. Ask all other pupils to check their answers with those on the board.

Closing *(2 minutes)*

1. Ask pupils questions about the topic to review. For example:
   a. How can we find the range of a list of numbers?
   b. (Answer: Subtract the least number from the greatest number)
   c. How can we interpret the mean of a list of numbers?
   d. (Example answers: it is approximately in the middle, it is the average)

Lesson Title: Statistical Calculations from a Bar Chart	Theme: Statistics	
Lesson Number: M-07-139	Class/Level: JSS 1	Time: 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to calculate the mean, median, mode and range of data from a bar chart.		Teaching Aids Charts		Preparation Draw the bar charts, in the Opening and Guided Practice, on the board.

Opening *(5 minutes)*

1. Look at the bar chart below on the board:

Distribution of rainfall in Kabala for each day in a week
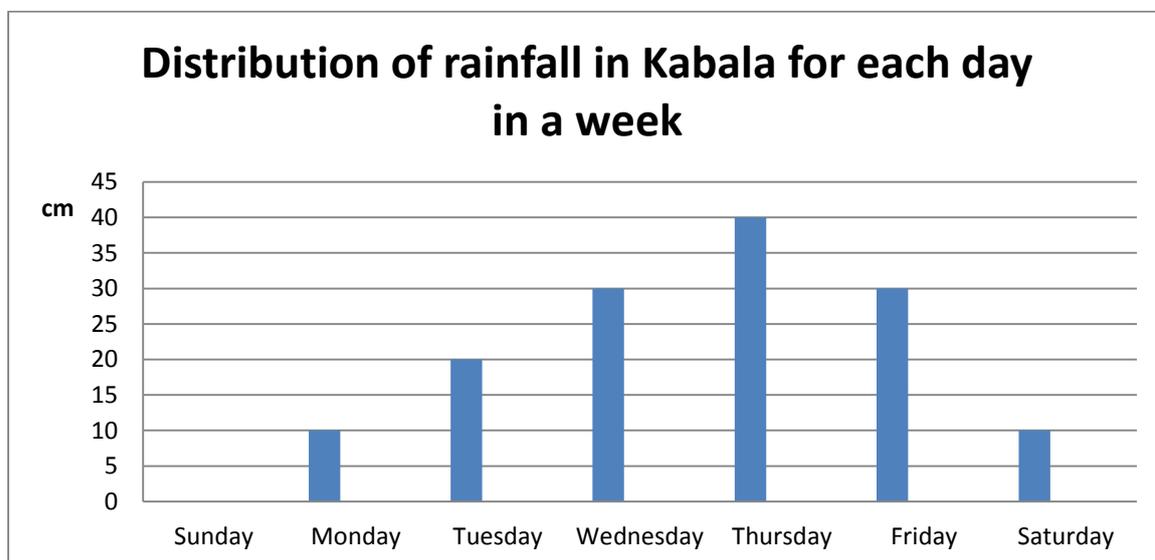
2. **Say:** This chart shows the distribution of rainfall in centimetres in Kabala for each day in a week.
3. Ask pupils to look and observe the bar chart on the board.
4. Ask questions to review how to interpret bar charts:
   a. Which day had the most rainfall? (Answer: Thursday)
   b. Which day had the least rainfall? (Answer: Sunday, on Sunday it did not rain)
5. **Say:** Today, we will learn how to compute mean, median, mode and range of data from the bar chart.

Introduction to the New Material *(11 minutes)*

1. **Say:** Let's find the mean, median, mode, and range of the amount of rain that fell during these 7 days.
2. **Ask:** How can we find the mean amount of daily rainfall based on this chart?
3. Allow pupils to share their ideas.

4. **Say:** We simply add together the amounts of rain that fell each day, and divide by 7, the total number of days.
5. Ask pupils to tell you the amount of rain that fell each day, and write the amounts on the board: $0 + 10 + 20 + 30 + 40 + 30 + 10$
6. Ask pupils to find the sum of the numbers in their exercise books and give the answer. (Answer: 140)
7. Ask pupils to divide 140 by 7 to find the mean. (Answer: Mean $= 140 \div 7 = 20$ cm)
8. Ask pupils to interpret the mean.
   (Example answer: It rained an average of 20 cm per day during this week)
9. **Ask:** How can we find the median of the daily rainfall? (Answer: write the numbers from the heights of the bars in a list and find the one in the middle)
10. Ask one pupils to write the numbers in order on the board. Ask all other pupils to complete the task in their exercise books. (Answer: 0, 10, 10, 20, 30, 30, 40)
11. **Ask:** What is the median? (Answer: 20 cm)
12. **Ask:** How can we find the mode of the daily rainfall? (Example answers: it is given by the numbers from the list that are equal, or the bars in the chart that are the same height)
13. **Ask:** What is the mode of the daily rainfall? (Answer: there are two modes: 10 cm and 30 cm)
14. **Ask:** How can we find the range of the daily rainfall? (Answer: subtract the least amount of daily rainfall from the greatest amount of daily rainfall)
15. Ask one pupil to come to the board and find the range. Ask all other pupils to complete the task in their exercise books. (Answer: $40 - 0 = 40$ cm)

Guided Practice *(7 minutes)*

1. Ask pupils to work in pairs.
2. Look at the bar chart on the board:
   The bar chart shows the favourite games of some teenagers in a certain community. Use this chart to answer the following questions.
   a. How many teenagers were involved in this survey?
   b. What is the mean number of teenagers that like each sport?

Favourite Games
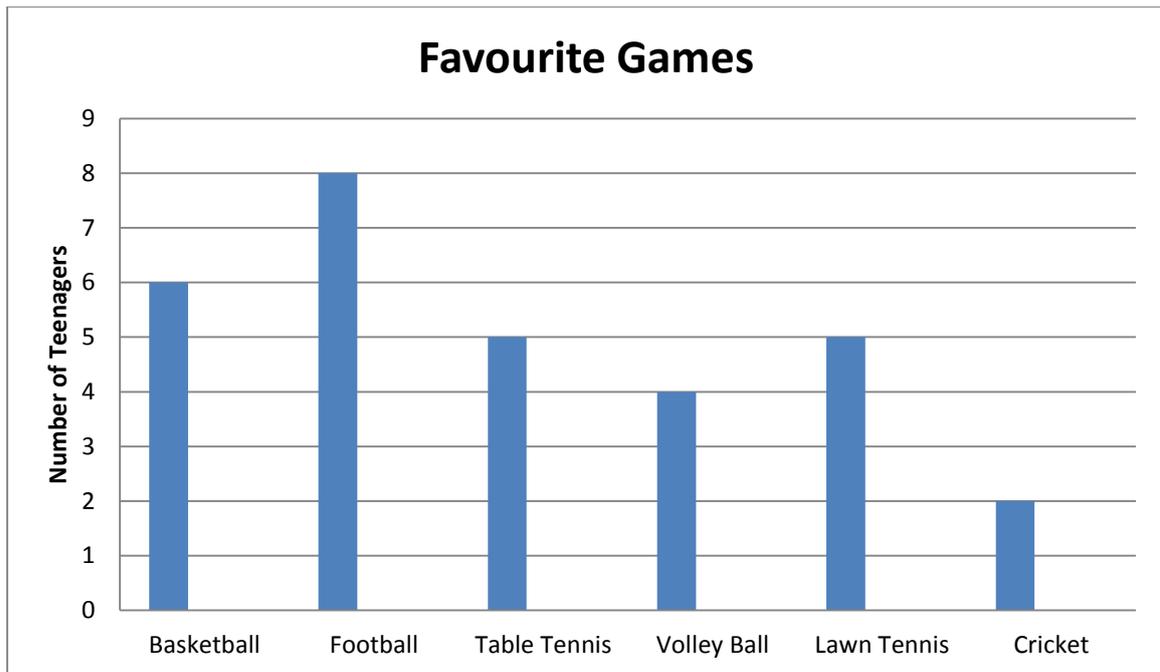
3. Allow pupils to copy the chart and work in their exercise books.
4. Move around to check pupils work for understanding and clear misconceptions.
5. Ask 2 pairs to come to the board and solve the problems.

(Answers: (a) Teenagers involved $= 6 + 8 + 5 + 4 + 5 + 2 = 30$ (b) mean $= \frac{30}{6} = 5$ (divide the number of teenagers by the number of sports))

Independent Practice *(10 minutes)*

1. Ask pupils to work independently in their books.
2. **Say:** You will continue working with the same graph that shows favourite sports of teenagers in the community.
3. Write on the board:
    a. What is the median number of teenagers that like each sport?
    b. What is the mode?
    c. What is the range?
4. Move around to check for understanding and clear misconceptions.
5. Ask pupils to turn to a classmate sitting next to them and compare answers for 1 minute.
6. Ask 3 pupils to come to the board and solve the problems. (Answers**:** (a) To find the median, list the numbers in order: 2, 4, 5, 5, 6, 8. Median $= \frac{5+5}{2} = \frac{10}{2} = 5$ (b) Mode $= 5$ because the bars for table tennis and lawn tennis are the same height (c) Range $= 8 - 2 = 6$)

Closing *(2 minutes)*

1. Ask questions about the bar chart used in guided and independent practice to review. For example:

a. Which sport is most well-liked by teenagers? How do you know? (Answer: Football, it has the tallest bar)
b. Which sport is the least well-liked by teenagers? How do you know? (Answer: Cricket, it has the shortest bar)
c. Compare the mean, median, and mode of the numbers from this chart.
    i. What do you notice? (Example answer: They are all 5)
    ii. How do you interpret this? (Example answer: the average or centre of the numbers is around 5, mean, median, and mode are all measures of the middle or centre of the data, so it's not unusual for them to be equal)

Lesson Title: Statistics Story Problems	**Theme:** Statistics	
Lesson Number: M-07-140	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to solve story problems involving mean, median, mode and range.		**Teaching Aids** Story problem		**Preparation** Write the story problem, in the Introduction to the New Material, Guided Practice and Independent Practice, on the board.

Opening *(3 minutes)*

1. Write this on the board: 10, 8, 5, 12, 5
2. Ask a pupil to write the numbers from smallest to greatest on the board. Ask all other pupils to do the task in their exercise books. (Answer: 5, 5, 8, 10, 12)
3. **Ask:** What is the median? Why? (Answer: 8, because it's in the middle)
4. **Ask:** What is the mode? Why? (Answer: 5, because it appears more than the other numbers)
5. Ask a pupil to find the range on the board. Ask all other pupils to do the task in their exercise books. (Answer: Range $= 12 - 5 = 7$)
6. **Say:** Today we will learn how to solve story problems involving mean, median, mode and range.

Introduction to the New Material *(12 minutes)*

1. Read the story problem on the board:
   A scientist did a butterfly count, and recorded the number of butterflies she observed each week. During 8 weeks, she recorded: 13, 20, 15, 14, 16, 20, 10, and 20. Find the mean, median, mode and range.
2. **Ask:** How can we calculate the mean number of butterflies she observed in a week?
   (Answer: Find the total number of butterflies and divide by 8, the number of weeks)
3. Ask pupils to calculate the total number of butterflies she counted during the 8 weeks in their exercise books. Ask them to give the answers. (Answer: 128)
4. Ask them to calculate the mean number of butterflies counted and give the answer.
   (Answer: Mean $= \frac{128}{8} = 16$)
5. **Ask:** How can we find the median number of butterflies? (Answer: Write the numbers in order and find the number in the middle, or find the mean of the two numbers in the middle)
6. Ask one pupil to arrange the numbers in order of size on the board. Ask all other pupils to do the task in their exercise books. (Answer: 10, 13, 14, 15, 16, 20, 20, 20)
7. Ask a pupil to come to the board and calculate the median number. Ask all other pupils to do the task in their exercise books. (Answer: Median $= \frac{15+16}{2} = \frac{31}{2} = 15.5$)
8. **Ask:** How can we find the mode number of butterflies? (Answer: it is the number that appears the most)
9. Ask a pupil to identity the mode in the numbers. (Answer: 20)
10. Ask a pupil to explain how to calculate the range of the numbers.
    (Answer: Identify the highest and the lowest numbers and find their difference)

11. **Ask:** What will be the range in the numbers of butterflies observed? (Answer: 20 – 13 = 7)

Guided Practice *(8 minutes)*

1. Read the story problem on the board:
   A restaurant owner tallied the number of plates of rice ordered in her restaurant for the last 10 days: 21, 22, 21, 20, 18, 21, 25, 23, 20, 19
2. Find the (a) mean (b) median (c) mode and (d) range of the numbers
3. Ask pupils to work in pairs.
4. Walk around and check for understanding and clarify any misconception.
5. Ask 2 pairs to write the answers for (a) and (b) on the board.
   (Answer: (a) Mean= $\frac{210}{10} = 21$; Median = $\frac{21+21}{2}$ = $\frac{42}{2}$ = 21)
6. Ask another 2 pairs to give the answers for (c) and (d) verbally.
   (Answer: Mode = 21. Range = 25 – 18 = 7)
7. **Ask:** How many plates of rice does the owner sell each day, on average?
   (Answer: She sells 21 plates on average)

Independent Practice *(10 minutes)*

1. Read the problem on the board:
   One day a distributor was supplied with crates of soft drinks as follows:
   Sprite 15 crates, Coke 20 crates, Mega cola 10 crates, Vimto 5 crates, Apple Sidra 20 crates, Fanta 25 crates, Maltina 10 crates.
   Calculate the mean, median, mode, and range of the information.
2. Ask pupils to work individually and solve the problem in their exercise books.
3. Walk around and check on pupils work and clear any misconception.
4. Allow pupils to discuss their answers with the next pupil.
5. Do corrections together with pupils on the board. (Answers: Mean= $\frac{105}{7}$ = 15 Median = 15 Mode = 10 and 20 Range = 25 – 5 = 20)

Closing *(2 minutes)*

1. **Say:** The mean, median and mode are basic measures of *central tendency*. They tell us where the centre of the data tends to be, or where the centre is approximately.
2. **Say:** You have learned about central tendency for 5 lessons.
3. **Ask:** Why is it useful to understand measures of central tendency such as mean, median, and mode?
4. Allow pupils to share their answers and discuss. (For example: Helps to interpret data, Makes tables and graphs easier to understand, Helps in further statistical analysis, Helps make meaningful comparisons).

Lesson Title: Introduction to Probability	**Theme:** Probability	
Lesson Number: M-07-141	**Class/Level:** JSS 1	**Time:** 35 minutes

Learning Outcomes By the end of the lesson pupil will be able to: 1. Identify that probability describes the chance of something happening. 2. Discuss the probability of an event happening in words.	**Teaching Aids** None	**Preparation** None

Opening *(3 minutes)*

1. Ask pupils open-ended questions to discuss. Allow them to give their own answers and discuss.
   a. How likely is it that it will rain tomorrow?
      (Example answers: it will probably rain tomorrow, it will probably not rain tomorrow)
   b. How likely is it that the sun will set this evening?
      (Example answers: it will definitely happen, it will certainly happen)
   c. How likely is it that a person's first-born child is a daughter?
      (Example answers: It's possible, it might happen)
2. **Say:** Today, we will learn that probability describes the chance of something happening. We will discuss the probability of different events happening.

Introduction to the New Material *(12 minutes)*

1. **Say:** Consider the question about rain. There are two possible outcomes for tomorrow: It will rain, or it will not rain.
2. **Ask:** In the rainy season, what are the chances that it would rain on any given day?
3. Allow pupils to share their answers and discuss as a class.
   (Example answers: It is likely to rain; It rains most days; It would probably rain)
4. **Ask:** In the dry season, what are the chances that it would rain on any given day?
5. Allow pupils to share their answers and discuss as a class.
   (Example answers: It is unlikely that it would rain; It doesn't rain often; It probably wouldn't rain)
6. Write on the board: Impossible, unlikely, likely, certain
7. **Say:** These are some words we use to talk about the chances of something happening. Impossible means that something will not happen. Unlikely means that it probably won't happen, and likely means that it probably will happen. Certain means that it will definitely happen.
8. **Ask:** What are some other words we use to talk about the possibility of something happening in our everyday lives?
9. Allow pupils to give their answers and write them on the board. (Example answers: possibly, probably, maybe, might, definite)
10. Ask pupils questions and encourage them to talk about probability in everyday language (they do not need to use numbers or math language yet). For example:

> **Ask:** If today is Monday, what is the probability that tomorrow will be Tuesday?
> (Example answers: it is certain, it definitely will be)
> **Ask:** What is the possibility of having one Sunday in every week?
> (Example answers: Certain, Each week has a Sunday)
> **Ask:** What is the probability that you will meet a friend on the road going home today?
> (Example answers: Probably will, It's possible, I might meet a friend)
> **Ask:** What is the possibility that next year is 2015?
> (Example answers: Impossible, it can't be 2015 next year because it's in the past**)**

11. **Say:** In math, we can study the possibility of something happening. We call this *probability*. In probability, we use numbers and math language to show the chances of something happening.

Guided Practice *(8 minutes)*

1. Write on the board: Impossible, unlikely, likely, certain
2. Ask pupils to work in pairs.
3. **Say:** Write the numbers 1 through 6 in your exercise books. I will ask you 6 questions, and you should work with your partner to decide which of these four words on the board is the best answer for each question. Write down your answer next to the number of the question.
4. Ask the following questions:
   1) What is the probability that you will grow another nose?
   2) What is the probability that it will rain in the second week of August?
   3) What is the probability that April will be a cold month?
   4) What is the probability of a cat being able to drive a car?
   5) What is the probability that a father is older than his son?
   6) What is the probability of curing a disease without taking a drug?
5. After reading the questions and allowing pairs to decide their own answers, ask pupils to share their answers and discuss as a class.
6. Encourage pupils to discuss when they disagree. For example, some pupils might think it's impossible to cure a disease without drugs, and other pupils might think it's unlikely. Either answer is okay. The discussion about probability is important.
   (Expected answers: (1) impossible (2) likely (3) unlikely (4) impossible (5) certain (6) unlikely)

Independent Practice *(10 minutes)*

1. Write a statement on the board: The sun rises at 10 o'clock in the night.
2. **Ask:** Is this statement impossible, unlikely, likely, or certain?
3. Allow pupils to discuss and give the answer.
   (Answer: impossible; the sun rises in the morning, not at night.)
4. Write on the board: Write 4 statements. One should be an impossible statement, one unlikely, one likely, and one certain.
5. Walk around and check that pupils are writing statements correctly. Clear any misconceptions.
6. Ask pupils to exchange exercise books with a partner to check their statements. Pupils should discuss each of the statements with their partner.

7. Ask 4 pupils to each read a statement to the class, one statement of each type. For example:

      Impossible: Fish can walk on land.

      Unlikely: It will rain too much in December.

      Likely: It will be hot in March.

      Certain: The sun will rise tomorrow morning.

Closing *(2 minutes)*

1. Ask pupils to give examples of events that are *likely* to happen.
   (Example answers: we will all sleep tonight; we will understand probability well)
2. Ask pupils to give examples of events that are *unlikely* to happen.
   (Example answers: the president of Sierra Leone will come to our class tomorrow, we will forget how to write)

Lesson Title: Probability Experiments	**Theme:** Probability	
Lesson Number: M-07-142	**Class/Level:** JSS 1	**Time:** 35 minutes

Learning Outcomes By the end of the lesson pupils will be able to: 1. Conduct simple probability experiments. 2. Use probability terms such as 'experiment,' 'outcome' and 'event'.	**Teaching Aids** 5 small pieces of paper	**Preparation** Write the number 1, 2, 3, 4, 5 on the pieces of paper.

Opening *(3 minutes)*

1. Ask pupils the following questions for brainstorming. Allow them to discuss.
    a. What is probability? (Example answer: Probability is the chance that something will happen or how likely it is that it will happen).
    b. Can anyone tell me a statement of something that is *certain*? (Example answers: The school day will finish today. The sun will set in the evening.)
    c. Can anyone tell me a statement of something that is *likely*? (Example answers: I will talk to my family when I go home. I will pass my next math test.)
2. **Say:** Today, we will learn how we use experiments to understand probability in mathematics.

Introduction to the New Material *(11 minutes)*

1. **Ask:** What is an experiment?
2. Allow pupils to bring out their ideas. (Example answers: It's when we try something to understand how it works, Scientists do experiments to understand new ideas.)
3. **Say:** In probability, an experiment is a situation involving chance. An experiment leads to results called outcomes.
4. **Say:** For example, I can toss a coin as an experiment. There is a chance that the coin will land on heads, and a chance that it will land on tails. This is an experiment involving chance.
5. **Ask:** What is an outcome when we talk about experiments?
6. Allow pupils to bring out their ideas.
7. **Say:** An outcome is a single result of an experiment. It is something that could possibly happen.
8. **Ask:** If I toss a coin, what are the possible outcomes?
9. Allow pupils to discuss and call out the possible outcomes. (Answers: Head or Tail)
10. Take the small pieces of paper marked 1 to 5. Show them to the pupils and tell them that they are numbered 1 to 5.
11. Fold the pieces of paper and put them in a pile on the table.
12. **Say:** I will now conduct an experiment. I will close my eyes and randomly select one piece of paper from these 5 pieces.
13. **Ask:** What are the possible outcomes of my experiment?
14. Allow pupils to bring out their ideas.
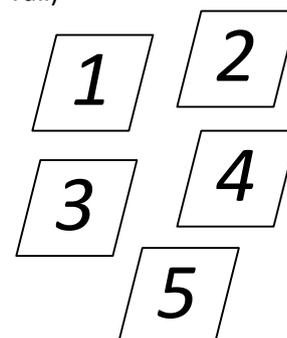
15. **Say:** There are 5 possible outcomes. I could select a 1, 2, 3, 4, or 5. Those are the only possible outcomes for my experiment of selecting a piece of paper.
16. Write on the board: Outcomes:
17. Do the experiment a few times. Select a piece of paper from the pile, and write the number you chose on the board. Place the paper back in the pile each time before doing the experiment again. (Example on the board: Outcomes: 3, 1, 1, 2, 5)
18. **Say:** Another word we use in probability is 'event'.
19. **Ask:** What is the meaning of event in our everyday' lives?
20. Allow pupils to share their ideas. (Example answers: Events are things that happen, often at certain times. A party or football match can be called an event.)
21. **Say:** In probability, the outcomes of an experiment can also be called events. Events can involve one outcome or more than one outcome. One event of our experiment is selecting a paper with a 3 on it. Selecting the 3 is an event.
22. **Say:** Events can also involve more than 1 outcome. For example, selecting a paper with an even number is an event. We could select 2 or 4. They are two different outcomes, but they are both even numbers, so in this case we can describe this as an event.
23. **Say:** Before we can do calculations with probability, we must understand experiments. It is important to learn the correct words for talking about probability.

Guided Practice *(9 minutes)*

1. Write on the board:
   > Experiment: Selecting pieces of paper
   > Outcomes:
2. Ask pupils to work in pairs.
3. **Say:** I want you to make your own experiment. Tear 10 small pieces of paper, from one page of your exercise book or any other sheet. I want you to write on them. You can write letters, numbers, or words. All 10 pieces of paper should be different.
4. **Say:** After you make your papers, I want you to conduct the experiment with your group. Fold the pieces of paper and put them in a pile. Everyone should take turns to randomly choose a piece of paper. Write down the outcomes of your experiment in a list.
5. Walk around to check for understanding. Make sure each pupil is involved in the experiment. Make sure pupils are writing the list of outcomes correctly. (Example outcomes: depending on what pupils wrote on their papers: 1, 7, 2, 9, or B, F, E, D, A, or Bird, Cow, Dog, Cat)
6. Ask a group to stand and explain their experiment to the class. Ask them to give the outcomes of their experiment. (Example: In our experiment, we wrote letters on the 10 pieces of paper. The outcomes of our experiment were B, F, E, D, A.)

Independent Practice *(10 minutes)*

1. **Say:** I am going to write down some experiments and outcomes on the board. I will not tell you what type they are. I want you to choose whether each is an experiment or outcome.
2. Do an example first. Write on the board: 1) Tossing a coin
3. **Ask:** Is this an experiment or outcome? (Answer: experiment)

4. Write the answer on the board after the statement: 1) Tossing a coin - *Experiment*
5. **Say:** I want you to do the same thing in your exercise books.
6. Continue the list on the board (do as many as you can with the time remaining):
    1) Tossing a coin - *Experiment*
    2) A coin landing on heads
    3) Randomly choosing any pen from a cup of 10 different coloured pens
    4) Rolling a die
    5) Choosing a red pen from a cup
    6) Choosing a football jersey at random from a box of different team jerseys
    7) A die landing on 3
    8) Choosing a Manchester United jersey from a box
7. Call 7 different pupils to call out the answers. (Answers: (2) Outcome (3) Experiment (4) Experiment (5) Outcome (6) Experiment (7) Outcome (8) Outcome)
8. Make corrections and discuss where necessary.

Closing *(2 minutes)*

1. Ask pupils the following questions and allow them to explain in their own words:
    a. What is an experiment? (Example answer: A situation involving chance or probability that leads to results, or outcomes).
    b. What is an outcome? (Example answer: It is a single result of an experiment)
    c. What is an event? (Example answer: It is one or more outcomes of an experiment)

Lesson Title: Certain and Uncertain Probability	**Theme:** Probability	
Lesson Number: M-07-143	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of this lesson, pupils will be able to identify that a probability of 1 means that an event is certain, and a probability of 0 means that an event is impossible.		**Teaching Aids** 1. 5 small pieces of paper 2. Questions 3. Statements		**Preparation** Write the number 1, 2, 3, 4, 5 on the pieces of paper. 2. Write the questions, in the Guided Practice and Independent Practice, on the board. 3. Write the statements in the on in the Introduction to New Material, on the board.

Opening *(3 minutes)*

1. Show pupils the pieces of paper numbered 1 to 5, and put them in a pile on a desk.
2. Conduct a quick experiment to review. Ask a few pupils to come to the front and randomly select pieces of paper from the pile.
3. Write the outcomes of the experiment on the board. (Example: Outcomes: 4, 2, 2, 5, 1, 3)
4. **Say:** Today we will talk about certain and impossible events in probability.

Introduction to the New Material *(15 minutes)*

1. **Say:** The papers in this pile are labelled 1 to 5. What are the chances that I will randomly select a 6?
2. Allow pupils to share answers and discuss. (Answer: It is impossible, we can't select 6 because it's not on any of the papers.)
3. **Say:** If the statement is impossible, the probability is 0
4. Write on the board: Probability of drawing 6 = 0
5. **Ask:** What are the chances that I will randomly select a number less than 6?
6. Allow pupils to share answers and discuss. (Answer: It is certain, the number selected will definitely be less than 6 because all numbers 1 to 5 are less than 6)
7. Write on the board: Probability of drawing a number less than 6 = 1
8. **Say:** If an event is impossible, then it definitely won't happen and the probability of it happening is 0. If an event is certain, then it will definitely happen and the probability of it happening is 1.
9. **Say:** We have also discussed likely and unlikely events. Those events might happen, or they might not. If there is a chance of them happening, the probability is between 0 and 1. That is, it is a fraction, or part of a whole.
10. **Say:** For today we will discuss certain and impossible events.
11. Read these additional statements on the board:
    a. Probability of drawing a negative number =
    b. Probability of drawing a positive number =
    c. Probability of drawing a number less than 100 =
    d. Probability of drawing 7 =
12. **Say:** These are also probability statements about my pile of numbers 1 to 5.

13. **Ask:** What is the probability of each of these events happening? Is it zero or one?
14. Allow pupils to think and discuss the events with neighbours.
15. Read each statement and ask pupils to share their ideas. Write the correct answer after each one. (Answers: a. 0 b. 1 c. 1 d. 0)
16. Read the practical questions below and ask pupils to give the probability as 1 or 0:
    - What is the probability that the sun will set this evening? (1)
    - What is the probability that you will grow another nose? (0)
    - What is the probability that next year is 2013? (0)
    - What is the probability that we will leave the school today? (1)

Guided Practice *(5 minutes)*

1. Ask pupils to work in pairs.
2. Read this on the board:
   There are 10 pieces of paper in a bag. They are all numbered 9. I randomly select one of them.
   (a) What is the probability of selecting 9? (b) What is the probability of selecting 8?
3. Allow pupils to discuss and share ideas.
4. Walk around checking for understanding and clearing misconceptions.
5. Ask each question and allow pupils to share their ideas with the class and discuss. (Answers: (a) The probability is 1 and the event is certain, because all papers are labelled 9 (b) The probability is 0 and the event is impossible, because there are no papers labelled 8.)

Independent Practice *(10 minutes)*

1. Read these on the board: What is the probability of the following?
   a. A cat giving birth to puppies.
   b. Next year being 2015.
   c. A 14-year-old turning 15 on her next birthday.
   d. A 14-year-old turning 13 on her next birthday.
   e. February coming after January.
2. Ask pupils to write the probability of each statement as 0 or 1.
3. Move around checking for understanding and clear misconceptions.
4. If they finish, ask pupils to turn and discuss with a partner.
5. Call on pupils to give the answers to each question and explain. (Answers: (a) 0, Impossible because cats give birth to kittens (b) 0, impossible because 2015 has passed (c) 1, Certain because 15 comes after 14 (d) 0, impossible because we can't get younger (e) 1, Certain because February is after January in the calendar)

Closing *(2 minutes)*

1. Ask pupils the following questions and allow them to explain in their own words:
   a. What does it mean if probability is 0? (Answer: It means the event is impossible)

      b.   What does it mean if probability is 1? (Answer: It means the event is certain to happen)

2.   If there is more time, ask pupils to give their own examples of impossible and certain statements.

Lesson Title: Likely and Unlikely Events	**Theme:** Probability	
Lesson Number: M-07-144	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to compare how likely different events are and rank them from unlikely to likely.		**Teaching Aids** 5 small pieces of paper		**Preparation** 1. Write the number 1, 2, 3, 4, 5 on the pieces of paper. 2. Write the questions, in the Guided Practice and Independent Practice, on the board.

Opening *(3 minutes)*

1. Ask questions to review certain and impossible events:
    a. What is the probability that I will draw a number greater than 10 from a pile of papers labelled 1 to 5? (Answer: 0)
    b. What is the probability that I will draw a number less than 10 from a pile of papers labelled 1 to 5? (Answer: 1)
    c. What is the probability that it will rain next year during rainy season? (Answer: 1)
    d. What is the probability that a snake has legs? (Answer: 0)
2. **Say:** Today we will continue to discuss probability. The topic today is likely or unlikely events.

Introduction to the New **Material** *(13 minutes)*

1. **Ask:** What does it mean if an event is *likely* to happen?
2. Allow pupils to think and discuss. (For example: A likely event has a greater chance of occurring, it will probably happen but we are not certain that it will happen.)
3. **Ask:** What does it mean if an event is *unlikely* to happen?
4. Allow pupils to think and discuss. (For example: An unlikely event is an event that is not sure of occurring; it is not impossible but it will probably not happen)
5. Write on the board: (a) A cat to chase a mouse (b) A cat to chase a dog
6. **Ask:** which of the event is likely and unlikely?
7. Allow pupils to think and share ideas in pairs.
8. Get responses from the pupils and guide them with the answer by saying: (a) is a likely event and (b) is an unlikely event.
9. Place the pieces of paper numbered 1 to 5 in a pile on a desk.
10. **Say:** I will draw a piece of paper from this pile. Is it likely that I will draw 1?
11. Allow pupils to share their ideas.
    (Example: It is unlikely to draw a 1 the first try, because there are 5 different numbers)
12. **Ask:** Is it likely that I will draw a number between 2 and 5?
13. Allow pupils to share their ideas. (Example: It is likely to draw a number between 2 and 5, because 4 of the numbers are between 2 and 5 [2, 3, 4, and 5])

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14. **Say:** If I choose a number randomly from this pile, it is more likely that it will be between 2 and 5. I might choose a 1, but it is less likely than choosing any number between 2 and 5.
15. Draw some papers from the pile one at a time (replace them after you draw them). Write the outcomes on the board. (For example: Outcomes: 2, 4, 1, 3, 5, 1)
16. **Say:** It is possible to draw a 1. If we keep drawing numbers from the pile, it will happen sometimes. However, it is more likely that we will get a number between 2 and 5.
17. Read the situations below out loud. Allow pupils to respond and discuss their ideas.
    a. There are 6 girls and 2 boys standing in a group.
        i. If I randomly select one, is it likely that I will select a girl? (Answer: Yes, likely)
        ii. If I randomly select one, is it likely that I will select a boy? (Answer: No, unlikely)
    b. I have 2 red pens and 10 blue pens in a cup at my house. I will randomly select a pen to mark exams. Is it likely that I will select a red pen? (Answer: No, unlikely)
    c. I have eight 10,000 Leone bills and one 2,000 Leone bill in my wallet. I will randomly select one and give it to my son. Is it likely that I will give him 10,000 Leones? (Answer: Yes, likely)

Guided Practice *(7 minutes)*

1. Read the following on the board:
   There are 10 pens in a cup. 3 of them are black and 7 of them are green. I will randomly select one. Rank the following events from most likely (or certain) to least likely (or impossible):
       a. I will select a green pen.
       b. I will select a red pen.
       c. I will select a black pen.
       d. The pen I select will be either black or green.
2. Ask pupils to work in pairs to list statements a, b, c, and d in the correct order. Allow them to discuss.
3. Walk around checking for understanding and clear misconceptions.
4. Ask and allow different pairs to respond:
   - Which event was most likely or certain? (Answer: d. there are only black or green pens, so if I select one it will definitely be black or green)
   - Which even is next most likely? (Answer: a. There are more green pens, so I am likely to select a green one)
   - Which event is next most likely? (Answer: c. I might select a black pen, but it is less likely than selecting a green pen because there are fewer of them)
   - Which event is least likely or impossible? (Answer: b.; I cannot select a red pen because there aren't any)

Independent Practice *(10 minutes)*

1. Read the following on the board:

There are 25 football jerseys in a box. 8 of them are yellow, 2 are orange, and the rest are black. I will randomly select one to wear. Rank the following events from most likely (or certain) to least likely (or impossible):

a. I will select a yellow jersey
b. I will select a green jersey
c. I will select an orange jersey
d. I will select a black jersey
e. I will select a jersey that is yellow, orange, or black.

2. Ask pupils to work individually to list statements a, b, c, d, and e in the correct order.
3. If they finish, ask them to compare answers and discuss with a partner.
4. Ask different pupils to give the answers in order from mostly likely to least likely and explain. (Answers: e, d, a, c, b)

Closing (2 *minutes)*

1. Ask pupils the following questions and allow them to explain in their own words:
   a. What is a likely event? (Example answer: An event that will probably occur, but it is not certain)
   b. What is an unlikely event? (Example answer: An even that will probably not occur, but it is not impossible)
2. If there is more time, ask pupils to give their own examples of likely and unlikely statements.

Lesson Title: The Language of Probability		**Theme:** Probability	
Lesson Number: M-07-145		**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to use probability vocabulary in everyday statements.		**Teaching Aids** Questions		**Preparation** Write the questions, in the Guided Practice and Independent Practice, on the board.

Opening *(2 minutes)*

1. Write on the board:
    Impossible   Unlikely   Likely   Certain
2. Call on pupils to give one example of each type of probability statement. (Example answers: Impossible: The sun will fall from the sky, Unlikely: it will start raining 10 minutes from now, Likely: I will see my mother when I go home; Certain: The sun will rise tomorrow.)
3. **Say:** We now understand probability very well. Today we will practise discussing and writing about probability.

Introduction to the New Material *(10 minutes)*

1. **Say:** We often use probability language to explain things in our everyday lives. Let's discuss some examples.
2. **Ask:** What is the probability that you will see a cat when going home from school?
3. Allow pupils to discuss and share their reasons. (Example answers: It is certain that I will see a cat because I always do, It is likely that I will see a cat because I often do, It is unlikely that I will see a cat because I rarely do)
4. **Ask:** What is the probability that you will pass the next maths test?
5. Allow pupils to discuss and share their reasons. (Example answers: It is likely that I will pass because I study hard; It is unlikely that I will pass because I do not study)
6. **Say:** Now let's consider an experiment. We often make small and large decisions in our lives. Sometimes we do this at random, and leave the outcome to chance. We can discuss the probability of different outcomes happening.
7. **Ask:** I want to randomly choose a pupil. If I choose a pupil from the front row, what is the probability that I will choose a girl?
8. Allow pupils to think for a moment and share their answers. (Example answers: certain, likely, unlikely, impossible)
9. Ask a pupil to count the number of pupils in the front row, and write it on the board (Example: 10)
10. Ask another pupil to count the number of girls in the front row. (Example: 6)
11. **Ask:** Are there more girls or boys in the front row? (Example answer: girls)
12. **Say:** Remember that if I choose one pupil at random, I am more likely to choose one from among the bigger group than the smaller group.
13. **Ask:** Am I more likely to choose a girl or boy?

(Example answer: girl because there are more girls)

14. **Ask:** So, what is the probability that I will choose a girl? (Example answer: it is likely)

Guided Practice *(10 minutes)*

1. Ask pupils to work in pairs.
2. **Say:** I want you to discuss an experiment in your pairs. First, list each of the family members in your two families on a piece of paper. Write down the names and ages of all of your parents and siblings.
3. **Say:** In this experiment, you will randomly select one person from among your two families to win a prize.
4. Read the following on the board:

   You will choose a family member at random. Discuss and write down the probability of the following:
   a. Is it more likely that you will choose an adult or a child?
   b. Is it more likely that you will chose a male or a female?
   c. Is it more likely that you will choose someone over 40 years old or under 40 years old?
   d. Is it more likely that you will choose a member of one pupil's family than the other?
5. Move around to check for pupils understanding and clear misconceptions.
6. Read each question out loud, and ask a pair of pupils to share their answer and reason. Example answers (answers change by pair and depend on the pupils' families):
   a. It is more likely to choose a child because there are more children than adults in our families.
   b. It is more likely that we will choose a female because there are more females than males in our families.
   c. It is more likely that we will choose someone under 40 years old because most members of our families are under 40.
   d. It is more likely that we will choose someone from Bendu's family, because Bendu's family is bigger than Juliet's family.

Independent Practice *(10 minutes)*

1. **Say:** I want you to continue working in pairs. I want each pupil in the class to independently write 2 probability questions. You will answer the probability questions written by your partner.
2. Write on the board: If I randomly choose ـــــ is it more likely that it will be ـــــ or ـــــ?
3. **Say:** I want your questions to look like this. I will start with examples.
4. Say or write examples so pupils understand:
   a. If I randomly choose <u>a pupil from the class</u>, is it more likely that it will be <u>a boy</u> or <u>a girl</u>?
   b. If I randomly choose <u>a day of the week to clean my house</u>, is it more likely that it will be <u>during the week</u> or <u>weekend</u>?
5. Ask pupils to work independently to write the 2 questions.
6. Walk around to check for understanding and make sure pupils are writing clear questions.

7. Ask pupils to exchange exercise books with their partners and answer the questions written by their partner. (Example answers to the questions in step 4: (a) It is more likely to be a girl because there are more girls in the class (it depends on your own class); (b) It is more likely to be during the week because there are more days during the week than weekend)

Closing *(2 minutes)*

1. Ask a few pairs to stand and give a question and answer that they wrote during the independent practice. Allow the class to discuss each of their answers.
2. **Say:** We now understand probability very well and can discuss the chances of something happening. In the next class, we will use numbers to talk about probability.

Lesson Title: Expressing Probability as a Fraction	**Theme:** Probability	
Lesson Number: M-07-146	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupils will be able to express the probability of an event happening as a fraction.		**Teaching Aids** 1. 5 small pieces of paper 2. Probability line 3. Question		**Preparation** 1. Write the number 1, 2, 3, 4, 5 on the pieces of paper. 2. Draw the probability line, in the Introduction to the New Material, on the board. 3. Write the probability question, in the Independent Practice, on the board.

Opening *(2 minutes)*

1. Do a problem to review fractions.
2. Write the question on the board: 3 sisters receive 3000 Leones for their lunch money and share it evenly. What fraction did each sister get?
3. Allow pupils to think and share ideas.
4. Ask a pupil to go board and write the answer. (Answer: $\frac{1000}{3000} = \frac{1}{3}$)
5. **Say:** Today we will learn how to express the probability of an event happening as a fraction.

Introduction to the New Material *(13 minutes)*

1. Show pupils the 5 pieces of paper labelled 1 to 5, and put them in a pile on a desk.
2. **Ask:** If I choose one paper from this pile, what is the probability that it will have a 3 on it?
3. Allow pupils to share their ideas. (Example answer: it is unlikely)
4. **Say:** Today we will learn how to answer this type of question with numbers. Remember that in probability, 0 is impossible and 1 is certain. That means that all other likely and unlikely events are expressed with fractions between 0 and 1.
5. Write on the board: $probability = \frac{the\ number\ of\ ways\ an\ event\ can\ occur}{total\ number\ of\ possible\ outcomes}$
6. Remind pupils of the question: If I choose one paper from this pile, what is the probability that it will be a 3?
7. **Say:** To find the numerator, we need to decide how many ways it could possibly happen that we draw a 3.
8. **Ask:** How many papers in this pile have 3 on them? (Answer: 1 paper)
9. **Say:** There is 1 possible way this event can outcome.
10. **Ask:** How many total possible outcomes are there in this pile? That is, how many different pieces of paper do we have? (Answer: 5)
11. Write on the board: $probability\ of\ choosing\ 3 = \frac{1}{5}$
12. **Say:** The fraction $\frac{1}{5}$ represents the probability of choosing a 3. We can say 'there is a one-in-five chance of choosing 3'.
13. Write on the board: There is a one-in-five chance of choosing 3.
14. Ask 2 boys and 3 girls to come stand in front of the class.

15. **Say:** I want to choose a pupil at random from this group of 5 pupils.
16. **Ask:** What is the probability that I will choose a girl?
17. Allow pupils to share their ideas. (Example answers: it is likely)
18. **Say:** Let's find the fraction together as a class.
19. **Ask:** What is the total number of ways I can choose a girl? (Answer: 3 ways because there are 3 different girls)
20. **Ask:** What is the total number of possible outcomes in this experiment? (Answer 5 possible outcomes because there are 5 pupils)
21. Write on the board: $probability\ of\ choosing\ a\ girl = \frac{3}{5}$
22. **Ask:** What is the probability of choosing a boy from the group?
23. Ask pupils to think about it and write their answers in their exercise books.
24. Ask pupils to share their answers with the class and discuss.

    (Answer: $probability\ of\ choosing\ a\ boy = \frac{2}{5}$)
25. Look on the board:

26. **Say:** This diagram helps us to compare likely and unlikely events. The bigger a fraction is, the more likely the event is to occur. The smaller the fraction, the less likely.

Guided Practice *(7 minutes)*

1. Ask pupils to work in pairs.
2. Write on the board:

    Mary will choose a letter at random from the 26 letters in the alphabet. What is the probability that she will choose: (i) E   (ii) Z   (iii) a vowel
3. Allow pupils to discuss and exchange ideas.
4. Move around to check for pupils understanding and clear misconceptions. For example, in (iii) they might need to be reminded of the 5 vowels.
5. Ask 3 different pairs to give the 3 answers and explain. (Answers: (i) $\frac{1}{26}$ because E only appears in the alphabet once and there are 26 possible letters to choose from; (ii) $\frac{1}{26}$ because Z also occurs only once; (iii) $\frac{5}{26}$ because there are 5 vowels in the alphabet (a, e, i, o, u) from among 26 possibilities)

Independent Practice *(10 minutes)*

1. Read the following on the board:
   A bag contains 4 red balls, 3 blue balls, and 5 white balls. If one is selected at random, what is the probability of choosing: (i) a red ball   (ii) a blue ball   (iii) a white ball
2. **Say:** Remember to simplify the fraction in your answer to its lowest form.
3. Ask pupils to work independently.
4. Walk around to check for understanding and clear misconceptions.
5. Ask 3 different pupils to write the 3 answers on the board and explain.
    (Answers: (i) $\frac{4}{12} = \frac{1}{3}$ (ii) $\frac{3}{12} = \frac{1}{4}$ (iii) $\frac{5}{12}$)

Closing *(3 minutes)*

1. Ask pupils to look at the answers to the independent practice section. Ask questions to check their understanding of probability:
   a. Is it more likely that you will choose a red ball or a blue ball? Why?

   (Answer: It is more likely to choose a red ball because the fraction is larger ($\frac{1}{3} > \frac{1}{4}$), it has a higher probability)
   b. Is it more likely that you will choose a red ball or a white ball? Why?

   (Answer: It is more likely to choose a white ball because the fraction is larger ($\frac{5}{12} > \frac{1}{3}$). it has a higher probability)

Lesson Title: Probability Fraction Problems	Theme: Probability	
Lesson Number: M-07-147	Class/Level: JSS 1	Time: 35 minutes

Learning Outcomes	Teaching Aids	Preparation
By the end of the lesson pupil will be able to solve probability problems with fractions.	1. 10 small pieces of paper 2. Questions	1. Write the number 1–10 on the pieces of paper. 2. Write the questions, in the Introduction to the New Material, Guided Practice and Independent Practice, on the board.

Opening *(3 minutes)*

1. Ask a question for pupils to brainstorm: If we toss a coin, what is the chance it will land on heads?
2. Allow them to think for a moment before giving the answer. Allow them to discuss the reason. (Answer: There is a $\frac{1}{2}$ ('one-in-two') chance of the coin landing on heads. This is because there is one head but two possible outcomes (heads or tails).)
3. **Ask:** If there is a $\frac{1}{2}$ chance of something happening, is it likely or unlikely?
4. Allow pupils to share their ideas and guide them to the answer. (Answer: It is neither likely nor unlikely. There is an even chance of it happening or not happening)
5. **Say:** Today, we are going to learn how to solve probability problems with fractions.

Introduction to the New Material *(13 minutes)*

1. Fold the pieces of paper and put them in a pile on a desk.
2. Read these questions on the board:
    a) What is the probability of drawing a 7?
    b) What is the probability of drawing a 7 or 8?
    c) What is the probability of drawing an odd number?
3. Ask pupils to find the answer to (a) in their exercise books. Allow them to work for a minute.
4. Ask them to share the answer to a. (Answer: $\frac{1}{10}$; one-in-ten)
5. Ask them to look at question (b) and think about how they would find the answer. Allow them to discuss.
6. **Say:** For question (b) there are two possible outcomes to consider. We could draw a 7 or we could draw an 8. We know that there is a one-in-ten chance of drawing the 7, and it is the same one-in-ten for 8.
7. **Say:** When you see 'or' in a probability question, it means there are multiple ways to select something, or multiple chances. We add the different probability fractions together.
8. Write on the board: Probability of drawing 7 or 8 $= \frac{1}{10} + \frac{1}{10}$
9. Ask a pupil to solve the addition problem on the board. Ask all other pupils to do the task in their exercise books. (Answer: $\frac{1}{10} + \frac{1}{10} = \frac{2}{10} = \frac{1}{5}$)

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10. **Say:** There is a one-in-five chance of drawing a 7 or 8.
11. Ask pupils to look at question (c) and think about how they would find the answer. Allow them to discuss.
12. Count the odd numbers between 1 and 10. (Answer: There are five: 1, 3, 5, 7, 9)
13. **Ask:** If there are 5 odd numbers, what fraction can we use to describe the probability of drawing one of them? (Answer: $\frac{5}{10}$)
14. Ask pupils to simplify this and give the answer to (c). (Answer: $\frac{1}{2}$ there is a one-in-two chance of drawing an odd number)
15. Read another example on the board: In a bag there are 3 blue balls, 5 red balls, and 2 white balls.
    a) What is the probability of choosing a blue ball?
    b) What is the probability of choosing either a blue ball or a red ball?
    c) What is the probability of choosing a green ball?
16. Ask pupils to give the answer to (a). (Answer: $\frac{3}{10}$ or 3-in-10)
17. **Ask:** How will we solve (b)? (Answer: Add the probability of choosing a blue ball together with the probability of choosing a red ball)
18. Ask pupils to find the answer to b in their exercise books. Ask one of them to share the answer with the class. (Answer: $\frac{3}{10} + \frac{5}{10} = \frac{8}{10} = \frac{4}{5}$)
19. **Say:** There is a four-in-five chance of choosing either a blue ball or a red ball.
20. Ask pupils to think about (c) for a minute. Ask them to share their ideas with the class and discuss. (Answer: The probability of choosing a green ball is zero. It's impossible because there are no green balls.)

Guided Practice *(7 minutes)*

1. Read this question on the board: A coin is tossed once, what is the probability of obtaining:
    a. A head   b) Either a head or tail   c) Neither head nor tail
2. Allow pupils to discuss and solve the problem.
3. Move around the classroom and inspect their work, and clarify misconceptions.
4. Ask 3 different pairs to give their answers. (Answers: (a) $\frac{1}{2}$, there's a one-in-two chance of obtaining a head; (b) $\frac{1}{2} + \frac{1}{2} = \frac{1+1}{2} = \frac{2}{2} = 1$, It is certain that either a head or tail will be obtained, (c) 0, it is impossible that neither a head nor tail will be obtained)
5. Do correction where necessary.

Independent Practice *(10 minutes)*

1. Read this question on the board:
   There are six red balls and nine blue balls in a box. A ball is selected at random. Find the probability that the ball is:
   i. Red   ii. Blue   iii. Either red or blue   iv. Neither red nor blue   v. Yellow
2. Ask pupils to solve the problem independently.

3. Move round to see that pupils are working and clear any misconceptions.
4. Ask 5 different pupils to each stand and give an answer. (Answers: (i.) $\frac{6}{15} = \frac{2}{5}$, there is a 2-in-5 chance of selecting a red ball; (ii.) $\frac{9}{15} = \frac{3}{5}$, there is a 3-in-5 chance of selecting a blue ball; (iii.) $\frac{6}{15} + \frac{9}{15} = \frac{6+9}{15} = \frac{15}{15} = 1$, it is certain that the ball will be either red or blue; (iv.) 0, It is impossible that the ball is neither red nor blue; (v) 0, it is impossible because there are no yellow balls in the box.)
5. Do correction where necessary.

Closing *(2 minutes)*

1. Give an exit ticket problem.
2. **Say:** There are 12 boiled eggs and 18 fresh eggs together in a tray. If you choose one at random, what is the probability of selecting a boiled egg?
3. Ask pupils to solve the problem before the class ends. (Answer: $\frac{12}{30} = \frac{2}{5}$; there is a 2-in-5 chance of selecting a boiled egg)
4. Walk around to check and make sure they understand the topic.
5. Do correction where necessary if time permits.

Lesson Title: Probability as a Percent	**Theme:** Probability	
Lesson Number: M-07-148	**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of this lesson, pupils will be able to interpret probability statements involving percent.		**Teaching Aids** Problems		**Preparation** Write the problem, in the Opening, Guided Practice and Independent Practice, on the board.

Opening *(3 minutes)*

1. Read this problem on the board: A matchbox contains 25 used sticks and 75 unused sticks. What is the probability that a stick chosen at random is unused?
2. **Ask:** How many matchsticks are in the box? (Answer: 25+75=100 matchsticks)
3. Ask pupils to solve the problem in their exercise books. Ask one pupil to give the answer. (Answer: $\frac{75}{100} = \frac{3}{4}$; There is a 3-in-4 chance of the matchstick being unused)
4. **Say:** Today we will learn how to talk about probability with percentages. You can already discuss probability as a fraction of a whole, and you can already convert between fractions and percentages.

Introduction to the New **Material** *(14 minutes)*

1. **Say:** In the matchstick problem, we had a 75-in-100 or 3-in-4 chance of choosing an unused stick. We can also express this probability as a percentage.
2. Write on the board: $\frac{75}{100}$
3. **Ask:** How can we write this as a percentage? (Answer: 75%; remind pupils how to convert to percentages if necessary; the numerator in a fraction over 100 can simply be written as a percentage)
4. **Say:** There is a 75% chance that the matchstick we choose will be unused.
5. **Ask:** Do you think it is likely or unlikely that we will choose an unused matchstick?
6. Allow pupils to share their ideas. (Example answer: It is likely, because 75% is more than 50%, which is half)
7. **Say:** It is likely that we will choose an unused matchstick.
8. Draw on the board:

9. **Say:** Percentages that are greater than 50% are likely. Percentages less than 50% are unlikely. 0% is the same as 0, so it means impossible. 100% is the same as one whole, so it means certain.
10. **Ask:** If you toss a coin, what is the probability that it will land on heads?
11. Ask a pupil to give the probability as a fraction. (Answer: $\frac{1}{2}$)

12. Ask pupils to convert the fraction to a percentage in their exercise books. Ask one pupil to write the answer on the board. (Answer: $\frac{1}{2} = 0.5 \rightarrow 0.5 \times 100 = 50\%$).
13. **Say:** There is a 50% chance of the coin landing on heads.
14. **Ask:** Is it likely or unlikely that the coin will land on heads?
15. Allow pupils to share their ideas. Guide them to see that it's neither likely nor unlikely. There is an even chance of the coin landing on heads or tails.
16. **Say:** There are 4 bad oranges and 6 good oranges in a bag. What is the probability of selecting a bad one from the bag?
17. **Ask:** How many oranges are in the bag? (Answer: 10 oranges)
18. Ask pupils to write the probability of selecting a bad orange as a *fraction* in their exercise books. Ask one pupil to write the answer on the board. (Answer: $\frac{4}{10}$)
19. Ask pupils to express the probability of selecting a bad orange as a *percentage* in their exercise books. Ask one pupil to write the answer on the board. (Answer: $\frac{4}{10} = 0.4 \rightarrow 0.4 \times 100 = 40\%$)
20. **Ask:** Are we likely to select a bad orange from the bag?
21. Allow pupils to give their answers in their own words and discuss. (Example answers: It is unlikely. We are more likely to select a good orange, but the percentage of bad oranges is nearly 50%, so we still might get a bad one.)

Guided Practice *(6 minutes)*

1. Read the following on the board: A collection of books consists of 6 Math books and 4 English books. A book is chosen at random from the collection. Find the probability of choosing (a) A math book (b) An English book. Write your answers as percentages.
2. Ask pupils to work in pairs.
3. Move around checking for understanding and clearing misconceptions.
4. Ask a pupil to say out the total number of books. (Answer: 10 books)
5. Ask another pupil to solve (a) on the board. (Answer: $\frac{6}{10} = 0.6 \rightarrow 0.6 \times 100 = 60\%$)
6. Ask another pupil to solve (b) on the board. (Answer: $\frac{4}{10} = 0.4 \rightarrow 0.4 \times 100 = 40\%$)
7. **Ask:** Are we more likely to choose a math book or an English book? (Answer: math book, because 60% is greater than 40%)

Independent Practice *(10 minutes)*

1. Read the following on the board:
   Martina has 100 mangoes for sale. 20 of them are unripe. Another 5 of them are bad. If a mango is picked at random, find:
   a) The probability that it is unripe mango.
   b) The probability that it is a bad mango.
2. **Say:** Write your answers as percentages.
3. Ask pupils to work independently.
4. Walk around checking for understanding and clear misconceptions.
5. Ask them to turn and compare answers with their partner if they finish working.

6. Ask a pupil to solve (a) on the board. (Answer: $\frac{20}{100} = 20\%$)
7. Ask another pupil to solve (b) on the board. (Answer: $\frac{5}{100} = 5\%$)
8. **Say:** There is a 20% chance of choosing an unripe mango, and a 5% chance of choosing a bad mango.

Closing *(2 minutes)*

1. **Say:** A meteorologist told me there is a 70% chance of rain tomorrow.
2. **Ask:** Do you think it will rain tomorrow? Is it likely or unlikely?
3. Allow pupils to share their answers with the class and discuss. (Example answers: It is likely that it will rain tomorrow, because 70% a high percentage. It is greater than 50%. However, it still might not rain. If there is a 70% chance of rain, then there is a 30% chance that it will not rain because $100\% - 70\% = 30\%$)

Lesson Title: Solving Probability Story Problems	Theme: Probability	
Lesson Number: M-07-149	Class/Level: JSS 1	Time: 35 minutes

	Learning Outcomes		Teaching Aids		Preparation
	By the end of the lesson pupils will be able to solve story problems involving probability of an events happening.		Problems		Write the problem, in the Introduction to the New Material Guided Practice and Independent Practice, on the board.

Opening *(3 minutes)*

1. Ask questions to review probability. Allow pupils to respond in their own words:
   a. What does a probability of zero mean? (Answer: Impossible for the event to occur)
   b. What does a probability of one mean? (Answer: Certain that the event will occur)
   c. What does it mean if the probability of an event equals half? (Answer: There is an even chance that it will occur or will not occur, it is neither likely nor unlikely)
2. **Say:** Today, we will practise solving story problems involving probability.

Introduction to the New Material *(12 minutes)*

1. Read the following on the board:
   There are 20 teachers working in a school, and 11 of them are female. The principal will choose one teacher at random to lead a faculty meeting.
   - What is the probability that she will choose a female?
   - What is the probability that she will choose a male?
2. Ask pupils to explain how to find the answer to (a). (Answer: Find the fraction of female teachers over the total number of teachers)
3. Ask pupils to explain how to find the answer to (b). (Answer: Find the fraction of male teachers over the total number of teachers. The number of male teachers can be found by subtracting the number of female teachers from the total number of teachers)
4. Ask pupils to find the answers to the two questions in their exercise books.
5. Ask 2 pupils to write the 2 answers on the board and explain their work. (Answers: (a) $\frac{11}{20}$; (b) $20 - 11 = 9 \rightarrow \frac{9}{20}$)
6. Ask pupils to convert both answers to percentages in their exercise books. Ask 2 pupils to show their work on the board. (Answers: (a) $\frac{11}{20} = 11 \div 20 = 0.55 \rightarrow 0.55 \times 100 = 55\%$
   (b) $\frac{9}{20} = 9 \div 20 = 0.45 \rightarrow 0.45 \times 100 = 45\%$)
7. **Ask:** What is the percentage probability that she will choose a female? (Answer: 55%)
8. **Ask:** What is the percentage probability that she will choose a male? (Answer: 45%)
9. **Ask:** Is it more likely that the principal will choose a male or a female?
   (Example answer: It is more likely that she will choose a female than a male.)

Guided Practice *(7 minutes)*

1. Read the probability problem on the board:
   Bendu has 2 tickets for a football match at the national stadium. She will randomly choose one of her family members to go to the match with her. She has a mother, father, 2 sisters, and 3 brothers. What is the probability that she will choose:
   - a. Her mother?
   - b. One of her sisters?
   - c. One of her siblings?
   - d. A male family member?
2. **Say:** Please work in pairs to find the answers. Write your answers as fractions.
3. Move around to check pupils work and clear misconceptions.
4. Ask 4 different pairs to stand and each give one of the 4 answers. (Answers: (a) $\frac{1}{7}$ (b) $\frac{2}{7}$ (c) $\frac{2}{7} + \frac{3}{7} = \frac{2+3}{7} = \frac{5}{7}$; (d) $\frac{1}{7} + \frac{3}{7} = \frac{1+3}{7} = \frac{4}{7}$)
5. **Ask:** Is it more likely that Bendu will choose a male or female family member? (Answer: It is more likely that she will choose a male, because there are more males and the probability of choosing a male is more than half $(\frac{4}{7} > \frac{1}{2})$)

Independent Practice *(10 minutes)*

1. Ask pupils to work independently.
2. Read this problem on a board:
   Sam will buy a new kitten. He found someone with a mother cat, and there were 2 black kittens, 3 grey kittens, and 1 white kitten. Of the kittens, 4 were male. He will choose one at random. What is the probability that he will choose:
   - a. A black kitten?
   - b. Either a black or grey kitten?
   - c. A brown kitten?
   - d. A female kitten?
3. Ask pupils to do the work in their exercise books.
4. Walk around to check for understanding and clear any misconceptions.
5. Ask 4 pupils to stand and each give one of the 4 answers. (Answers: (a) $\frac{2}{6} = \frac{1}{3}$ (b) $\frac{2}{6} + \frac{3}{6} = \frac{5}{6}$
   (d) 0, there are no brown kittens; (d) $\frac{2}{6} = \frac{1}{3}$)

Closing *(3 minutes)*

1. Ask questions about the answers in the independent practice problem to review likely and unlikely events:
   - a. Is it likely that Sam will choose a black kitten? Why or why not? (Answer: No, it is unlikely that he will choose a black kitten because the fraction for black kittens is less than half)

b. Is it likely that Sam will choose either a black or grey kitten? Why or why not? (Answer: Yes, it is likely that he will choose either a black or grey kitten because the fraction for choosing a black or grey kitten is more than half.)

Lesson Title: Writing Probability Story Problems		**Theme:** Probability	
Lesson Number: M-07-150		**Class/Level:** JSS 1	**Time:** 35 minutes

	Learning Outcomes By the end of the lesson pupil will be able to write story problems involving the probability of an event happening.		**Teaching Aids** Questions		**Preparation** Write question, in the Opening Introduction to the New Material and Independent Practice, on the board.

Opening *(3 minutes)*

1. Read this question on the board: There are 3 red balls, 5 yellow balls and 7 green balls in a bag. Find the probability that a randomly selected ball will be yellow.
2. Ask pupils to solve the problem in their exercise books.
3. Ask pupils to share their answers and discuss. (Answer: $\frac{5}{15} = \frac{1}{3}$)
4. **Ask:** Is it likely that a yellow ball will be selected? Why or why not? (Answer: No, it is unlikely because the fraction is less than half.)
5. **Say:** Today we will practise writing our own story problems involving the probability of an event happening.

Introduction to the New Material *(10 minutes)*

1. **Say:** We can talk about the probability of many different types of events happening in our lives. Some are impossible, and others are certain. There are also likely and unlikely events. We now know how to do calculations on different types of events.
2. Write on the board: A woman has 5 clean shirts. 2 are blue and 3 are red.
3. Read each question below to pupils. Ask them to give their answer based on the information on the board. Allow them to discuss each:
   o If she selects one shirt at random, what is the probability that it is blue? (Answer: $\frac{2}{5}$)
   o If she selects one shirt at random, what is the probability that it is either blue or red? (Answer: Certain, 1)
   o If she selects one at random, what is the probability that it is yellow? (Answer: impossible, zero)
4. **Say:** Today you will write your own probability problems.
5. **Ask:** What information is included in a good probability problem?
6. Allow pupils to share their answers and discuss them as a class. For example:
   o It has enough detail to find the probability of a certain event (colour, type, characteristics of items)
   o We can find the total number of items for the denominator of the probability fraction
   o We can identify if a statement is impossible or certain
   o It gives all of the information needed to answer each question asked.

Guided Practice *(10 minutes)*

1. Ask pupils to work in pairs.
2. Ask each pair or group to write one probability problem. It can have one or more questions. It can be about any situation they can think of.
3. Move round to check for understanding and clear any misconceptions. Make sure they are writing clear and correct probability problems.
4. Ask 1 group to stand and read their problem. Ask the other groups in the class to find the answer to the problem. Allow them to discuss.
5. Ask another group to read their problem for the class to solve if time permits.

Independent Practice *(10 minutes)*

1. Ask pupils to work individually to write a probability story problem. After they write the problem, they will exchange exercise books with a partner and solve the problem written by their partner.
2. Walk around to check for understanding and clear any misconceptions. Make sure they are writing clear and correct probability problems.
3. After the pupils solve the problem written by their partner, they should discuss their questions together with their partner.
4. Ask 1 pupil to share his or her problem and answer with the class.
5. Ask another pupil to share a problem if time permits.

Closing *(2 minutes)*

1. **Ask:** What are some times in our lives when understanding probability could be useful?
2. Allow pupils to share their own ideas. (Example answers: When discussing weather/ the possibility of rain, when discussing the chances of a sports team winning or losing, community leaders can use probability of different events happening to plan and invest in resources)

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