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| **Learning Plan** |
| **Subject** | *Mathematics* | **Week** | *2* | **Duration** | *4 hrs* | **Form** |  *1* |
| **Strand** | Number for Everyday life | **Sub-Strand** | Real Number and Numeration System (RNNS) |
| **Content Standard** | 1. Demonstrate knowledge and understanding of the real number system and the operations of the various subsets.

 2. Demonstrate knowledge and understanding of the real number system with respect to the concepts and vocabulary of sets, establish their relationships and carry out simple surveys using the properties of sets |
| **Learning Outcome(s)** | 1. Apply the relationship and differences between the set of rational and irrational numbers and use these to solve problems.

 2. Analyze and solve real world problems involving union, intersection and complements and their applications to three sets problems using simple surveys. |
| **Learning****Indicator(s)** | 1. Establish the properties of real numbers with respect to commutative, associative, identity, inverse, distributive, etc. 2. Review the properties of subsets (two and three), their vocabulary and operations and use it to solve real life problem. |
| **Essential Question(s)**  | 1. How can available resources aid in fostering understanding of the lesson?
2. How do commutativity, associativity, distributive impact the outcomes of arithmetic operations and how are these properties applied to the real world?
3. How do these properties relate to other mathematical concepts and how will it help in fostering the understanding of these concepts?

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| **Pedagogical Strategies** | Problem-based learning;Collaborative LearningTalk for Learning Gamification  |
| **Teaching & Learning Resources** | Mathematical setsManilla CardsTechnology tools such as calculators etc. |
| **Key Notes on Differentiation** |
| ***Learning Tasks***1) Establish that for a given set of numbers a, b and c, 1 is the multiplicative identity and 0 is the additive identity2) Determine identity elements, additive and multiplicative inverses of real numbers3) Establish the distributive property real numbers that connects (\*) and ( + ) or (\*) and ( − ) 4. Extend content expectation to include applying the properties of operations, commutative, associative, distributive, etc. to real life and solving simple problems involving them.**Pedagogical Exemplars**A blend of the following pedagogical exemplars will be considered. 1. Using think-pair-share: Initiate activities to help learners, individually, in pairs and in groups, investigate the properties of operations, commutative, associative, distributive, etc. with respect to addition ( + ), subtraction ( − ), multiplication ( × ), and division ( ÷ ). Encourage self-confidence, diversity and leadership in achieving the properties of operations, commutative, associative, distributive, etc. 2. Talk for learning; think-pair-share; and group work/collaborative learning. Lead learners to establish (individually, in pairs and in groups) that for any given set of numbers a, b and c the following properties hold.  a) Enumerate the properties of operations in respect of commutative, associative, distributive, identity, inverse, etc.  b) Using strategies including think-pair-share; and group work/collaborative activities.  c) Employ differentiated content, assessment and process to ensure among learners, tolerance, truth, honesty, respect for others’ views, etc. 3. Talk for learning; think-pair-share; and group work/collaborative learning: Use appropriate strategies teach application of properties of operation in solving daily problems involving real numbers4. Gamification as a starter to stimulate the learners interest for the lesson.**Key Assessment**Level 3: Answer at least three questions from the following: 1) Establish that for any given set of numbers a, b and c the following properties hold.  a) Commutative, b) Associative, c) Distributive, 2) identify the property of operation in each of the following a) 4\* $\frac{1}{4}$ = $\frac{1}{4}$ \*4 = 1 b) 4 \* 3 = 3 \* 4 = 12 c) 4 \* 0 = 0 \* 4 =0 |
| **Keywords** | *Commutative, associative, distributive, identity, inverse* |
| **Lesson 1: Properties of Operation; Commutative, Associative, Distributive, Identity, Inverse** |
| **Main Lesson drawing on Concepts, Skills and Competencies to reinforce as in the Subject Teacher Manual** |
| ***Teacher Activity***  | ***Learner Activity*** |
| **Starter *Activity (XX minutes)*** *Using gamification, engage the whole class in a Number Game.****Instructions******Number Game***1. *Write numbers on pieces of manila cards*
2. *Tasks two learners to pick a card each.*
3. *Task learners to perform an operation on the numbers picked.*
4. *Task them to exchange their cards and perform the same operation on them.*
5. *Write the answers on the board.*
6. *Do this four times.*
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| ***Introductory Activity (XX minutes)*** *In mixed ability groups, task learners to discuss and write down their observations of the answers they got from the game.* ***Activity 1 (XX minutes)****Using think-ink-share, in their mixed ability and gender group, guide students to use the observation to establish the concept of the properties of operation.****Hint:*** *The properties are commutative, associative, distributive, identity, inverse.****Activity 2 (XX minutes)****In their mixed ability and gender grouping using think-pair-share, guide students to investigate the additive identity, multiplicative identity, additive inverse, multiplicative inverse.****Hint****4+0=0+4=4* *5*$×$*1=1*$×$*5=5 3+(-3)=-3+3=0* *6*$×\frac{1}{6}$*=*$\frac{1}{6}×6=1$*Repeat this with different examples and let learners generalize the following;**0 is the additive identity element**1 is the multiplicative identity**-n is the additive inverse of n*$\frac{1}{n}$ *is the multiplicative inverse of n****Activity 3*** *In their mixed ability and gender group, assist learners to investigate and establish the distributive property using their calculators.****Hint:***10\*(6 + 4) = (10 \* 6) + (10 \* 4) = 100*Repeat this with different examples and let learners generalize*a\*(b + c) = a \* b + a \* c, [\* is distributed over +)10\*(6 - 4) = (10 \* 6) - (10 \* 4) = 20*Repeat this with different examples and let learners generalize*a\*(b − c) = (a \* b) − (a \* c), [‘\*’ is distributed over ‘ –‘)***Activity 4****Assist learners to solve real life problems using properties of operation.**Eg. Yaw went to Texaco to shop for clothes. A shirt cost Gh$15 and a trouser cost GH$40. If Yaw bought 3 shirts and 3 trousers, how much did spend on his clothes?* | ***Introductory Activity (XX minutes)****Discuss and write down their observations of the answers they got from the game.****Activity 1 (XX minutes)****Establish the concept of the properties of operation****Activity 2 (XX minutes)****Investigate the additive identity, multiplicative identity, additive inverse, multiplicative inverse.****Activity 3****Investigate and establish the distributive property using calculators.****Activity 4****Solve real life problems using properties of operation* |
| **Assessment DoK aligned to the Curriculum and Subject Teacher Manual** |
| *Answer at least two of the following questions;****Level 1:*** *State the commutative property****Level 2:*** *I*dentify the property of operation in each of the following a) $4×\frac{1}{4}=\frac{1}{4}×4=1$ b) 4 \* 3 = 3 \* 4 = 12 c) 4 \* 0 = 0 \* 4 = 0***Level 4:*** *The cost of weeding a square foot of land is GH$80. How much will Asare get if he weeds two pieces of land that are 15 square feet and 20 square feet?* |
| **Lesson Closure** ***In completing this part, refer to the Essential Questions to check that learning has taken place.*** |
| ***Activity (XX minutes)*** *Using oral presentation, tasks learners to summarize the lesson taught.**Task learners to practice on the next lesson.* |
| **Reflection & Remarks** |
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| **Lesson 2** |
| **Starter**  | **Main Lesson drawing on Concepts, Skills and Competencies to reinforce as in the Subject Manual** | **Assessment DoK aligned to the Curriculum and Subject Manual** |
| ***Teacher Activity***  | ***Learner Activity*** |  |
| ***Activity (e.g. 30 minutes)*** *In a whole class play the game:* ***“Real Number Relay”.******Instructions*** * 1. *Prepare large sheets of paper with categories written on them, such as "Whole Numbers," "Integers," "Rational Numbers," "Irrational Numbers," and "Real Numbers." Place these sheets at different locations in the classroom or outdoor area.*
	2. *Write various numbers on the index cards, including integers, fractions, decimals, and irrational numbers. Ensure that there is a mix of different types of numbers.*
	3. *Divide the class into teams, and assign each team a starting point.*
	4. *Each team will send one member at a time to pick a number card, identify the type of number it represents, and place it on the correct category sheet.*
	5. *Emphasize that the team members must be accurate and quick, as the goal is to complete the relay in the shortest time.*
1. *After the relay race, gather the students and review the placement of numbers on each category sheet.*
2. *Discuss any challenging numbers and clarify any misconceptions.*
3. *Score the teams based on accuracy and speed. Celebrate the winning team and acknowledge individual efforts.*
 | ***Introduction (e.g. 25 minutes)***1. *In mixed-ability groups, present learners with a model of the real number system and tasked them to identify numbers that are rational and those that are irrational. Encourage learners to show respect for individual views, beliefs, religions, and cultures as they interact and collaborate in their groups and make presentations of their work.*
2. *Call groups to make presentations of their notes to the class.*

***Activity 1 (e.g. 30 minutes)***1. *In an all-inclusive group discussion, task learners to discuss, with examples, the differences between rational and irrational numbers.*
2. *Task groups to use a model to distinguish between rational and irrational numbers.*

***E.g.*** ***Activity 2 (e.g. 25 minutes)***1. *In their groups, task them to discuss with examples the concept and establish recurring and non-recurring decimals using simple fractions.*
2. *Also, task them to investigate their applications to real life problems.*
 | ***Introduction (e.g. 25 minutes)***1. *In mixed-ability groups, use the model of the real number system given and identify numbers that are rational and those that are irrational. Encourage learners to show respect for individual views, beliefs, religions, and cultures as they interact and collaborate in their groups and make presentations of their work.*
2. *Call groups to make presentations of their notes to the class.*

***Activity 1 (e.g. 30 minutes)***1. *In an all-inclusive group discussion, learners discuss, with examples, the differences between rational and irrational numbers.*
2. *Use a model to distinguish between rational and irrational numbers.*

***Activity 2 (e.g. 25 minutes)***1. *In groups, discuss with examples the concept and establish recurring and non-recurring decimals using simple fractions.*
2. *Also, investigate the applications of recurring and non-recurring decimals to real life problems.*

***Example****:* *A recipe calls for 1/3 cup of a certain ingredient. If you want to make a larger batch of the recipe and need to measure out 5 times the original amount, calculate the total quantity of the ingredient needed in decimal form. Determine whether the result is a recurring or non-recurring decimal.* | ***Level 3*** *Answer at least two of the following questions.*1. *Establish at least two real life applications or uses of rational and irrational numbers.*
2. *investigate and classified each of the following as either rational or irrational number.*

*a.* $75\%$*b. 0.7142857142857143…**c.* $ \frac{125 }{11050}$*d.* $\sqrt{8}$*e. 3.14159265358979…**f.* $2\sqrt{7}$1. *Convert the following decimals into fractions*
2. $0.\dot{5}$
3. $0.\dot{6}\dot{2}$
4. $1.\dot{6}$
5. $2.\dot{8}\dot{1}$
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| **Lesson Closure** |
| ***Activity (10 minutes)*** * 1. *Make a seamless transition to plenary by making reference to the second and third “****Essential Question****”, and engage learners to brainwave ideas on them.*
1. *Lead the class to summarise the main ideas in the lesson for learners to write in their notes. (Offer learners the opportunity to ask questions for further clarification and address any misconceptions if any)*
2. *Have a general class voting to aid reflection.*
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| **Reflection & Remarks** |
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Kindly edit into the New Format. This is just a guide

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