**DRAFT**

**Mathematics - Class I**

**Suggested Guidelines**

**Domain: Number and Operations**

| ***STEP 1*** | |
| --- | --- |
| **Standard*.*:***Students will be able to count, read, write, compare, order, add, subtract, multiply and divide numbers. They will be able to recognize fractions as part of the whole, represent fractions, order and add and subtract fractions. They will be able to solve problems in contexts using appropriate number operations.* | |
| **Student Learning Outcomes**:  **Counting, place value, comparing, ordinal numbers, read and write numbers.**  *Students will be able to:*   * *Count, read and write numbers 2-digit numbers up to 99;* * *Recognize place value of 2-digit numbers;* * *Compare and order 2-digit numbers using appropriate language;* * *Identify numbers before, after and in between two numbers.* * *Read and write numbers up to 99 (2-digit numbers)*   ***Addition and subtraction:***  *Students will be able to:*   * *Find, recall and use addition and subtraction facts (number stories) to 20.* * *Compare numbers to find how many more and how many less.* * *Add and subtract numbers including:* * *3 single digit numbers* * *2 digit number with a single digit (without regrouping).* * *2 digit number and tens.* * *Two 2-digit numbers (without regrouping).* * *Solve real-world word problems with addition and subtraction using concrete objects and pictorial representations  (involving missing numbers, money, quantities and measures).*   ***Money:***  *Students will be able to:*   * *Identify Pakistani coins (Rs. 1, 2, 5 and 10) and notes (Rs. 10, 20, 50, 100, 500, 1000 and 5000)* * Solve problems involving addition and subtraction of Pakistani currency.   ***Multiplication and Division:***  *Students will be able to:*   * *Count and write in 2’s, 5s and 10s using concrete objects (such as counters, pebbles, popsicle sticks etc) and pictorial representations (such as number line, hundred square grid)* * *Recognise counting in 2s, 5s and 10s as multiplication tables of two, five and ten.* * *Recognize multiplication as repeated addition through concrete objects and pictorial representations (for instance, using groups and arrays)* * *Recognize through concrete objects and pictorial representations that the multiplication of any two numbers can be done in any order.* * *Recognize division as repeated subtraction using concrete objects and pictorial representation, (groups, arrays and sharing).* * *Recognize, using concrete objects and pictorial representation ,that the division of one number by another number cannot be done in any order.* * *Solve simple real world problems involving multiplication and division using any method, (for instance materials, repeated addition, groups and arrays, mental methods, and known multiplication tables).*   ***Fractions:***  *Students will be able to:*   * Recognise, find, name and write fractions:   - half ()  - quarter ( )  - two-quarters ( )  - three-quarters ( )  of a length, shape, set of objects or quantity using pictorial representations. | |
| **Counting, place value, comparing, ordinal numbers, read and write numbers:**  **Knowledge:**  Students will be able to:   * Count forward and backward from any given 2-digit number. * Place value of 2-digit numbers (hundreds, tens, ones/units) * Compare and order numbers using appropriate language. * Recognize Ordinal numbers up to 10. * Read and write numbers up to 99   **Addition and Subtraction:**  **Knowledge:**  Students will be able to do:   * Addition and subtraction of facts up to 20 * Addition and subtraction of: * 3 single digit numbers * 2 digit number with a single digit number (without regrouping) * 2 digit number with a tens * Two 2-digit number without regrouping. * Addition and subtraction of real life problems using concrete objects and pictorial representations (involving missing numbers, money, quantities and measures)   *Advanced/Additional:*   * *Addition and subtraction of:* * *3 single digit numbers* * *2 digit number with a single digit number (with or without regrouping)* * *2 digit number with a tens* * *Two 2-digit number (with or without regrouping).*   **Money:**  Students will be able to:   * Recognize Pakistani coins (Rs. 1, 2, 5 and 10) and notes (Rs. 10, 20, 50, 100, 500, 1000 and 5000)   **Multiplication and Division:**  Students will be able to:   * Know counting in 2s, 5s and 10s. * Know multiplication tables of two, five and ten. * Know multiplication as repeated addition. * Know division as repeated subtraction. * Know multiplication and division of real life problems using any method (for instance materials, repeated addition/subtraction, groups, arrays, sharing, mental methods, and known multiplication tables)   **Fractions:**  Students will be able to:   * Know fractions half (), quarter ( ), two-quarters ( ), three-quarters ( ) of a length, shape, set of objects, or quantity using pictorial representations. | **Counting, place value, comparing, ordinal numbers, read and write numbers:**  **Skills:**  Students will be able to:   * Count objects and numbers to and across 99 (2-digit numbers) forwards and backwards, beginning from zero or one, or from any given numbers (using objects such as counters, base ten material, pebbles and pictorial representations such as hundred square grid, number line etc). * Recognize the place value of each digit in a 2-digit number (tens and ones/units). * Compare and order numbers up to 99 using appropriate language (for instance: more and less, greater, smaller, equal to, same as, increasing, decreasing, smallest to  largest and vice versa etc.) * Identify numbers before, after and between the numbers. * Recognize the position of objects and write it using ordinal numbers up to 10th. * Read numbers up to 99 in numerals and write numbers up to 10 in words   *Advanced/Additional:*   * *Compare and order numbers from zero up to 99 using <, >, and = signs.* * *Read and write numbers up to 99 in numerals and in words (i.e. write numbers up to 99 in words)*   **Addition and Subtraction:**  **Skills:**  Students will be able to:   * Find, recall and use addition and subtraction facts to 20. * Compare numbers to find how many more and how many less. * Add and subtract: * Up to 3 single digit numbers (i.e. up to three 1-digit numbers) * 2 digit number with a single digit number (without regrouping) * 2 digit number with a tens * Two 2-digit number without regrouping. * Solve real-world word problems with addition and subtraction using concrete objects and pictorial representations. (involving missing numbers, money, quantities and measures)   *Advanced/Additional*   * *Recognise and use the inverse relationship between addition and subtraction to check calculations.* * *Recognise that the addition of two numbers can be done in any order (commutative) while subtraction of one number from another cannot.* * *Add and subtract:* * *3 single digit numbers* * *2 digit number with a single digit number (with or without regrouping)* * *2 digit number with a tens* * *Two 2-digit number (with or without regrouping).*   **Money:**  Students will be able to:   * Identify Pakistani coins (Rs. 1, 2, 5 and 10) and notes (Rs. 10, 20, 50, 100, 500, 1000 and 5000) * Solve problems involving addition and subtraction of Pakistani currency.   *Advanced/Additional:*   * *Identify international currency and its denominations such as dollar, pound, cents, pence (as per needs of the students)* * *Solve problems involving addition and subtraction of Pakistani currency and a few selected international currency.*   **Multiplication and Division:**  Students will be able to:   * Count and write in 2’s, 5s and 10s using concrete objects (such as counters, pebbles, popsicle sticks etc.) and pictorial representations (such as number line, hundred square grid) * Recognize counting in 2s, 5s and 10s as multiplication tables of two, five and ten. * Recognize multiplication as repeated addition using concrete objects and pictorial representations (for instance materials, groups and arrays) * Recognize through concrete objects and pictorial representations that the multiplication of any two numbers can be done in any order. * Recognize division as repeated subtraction using concrete objects and pictorial representation. (for instance groups, arrays and sharing) * Recognize using concrete objects and pictorial representation that the division of one number by another cannot be done in any order. * Solve simple real life problems involving multiplication and division using any method (for instance materials, repeated addition/subtraction, groups, arrays, sharing, mental methods, and known multiplication tables).   **Fractions:**  Students will be able to:   * Recognize, find, name and write fractions:   - half ()  - quarter ( )  - two-quarters ( )  - three-quarters ( )  of a length, shape, set of objects or  quantity, using pictorial representations. |
| ***STEP 2*** | |
| **Assessments**  **Formative Assessments**  Some types of formative assessments the teacher may use are:   * Question & Answer(open and closed) * Quick Quiz * Learning Walks * Projects, * Selected responses (may include MCQs, true: false, matching short answers, fill-in-the blanks, etc), * Observation diaries * Inquiry charts, * Four Corners: Gather students in the middle of the room, and read multiple-choice questions and their possible answers aloud. Students then move to the corner that represents what they believe is the correct answer. The top left room corner can be option A, the bottom-left can be B and so on   **Summative Assessments** Some forms of summative assessment are:   * End of Unit Test * Class test * Periodic/Monthly tests * Mid-year Exam * End of Year Exam * Standardized tests. * External Exams   **Some sample questions that can be used as part of summative assessment are:**  1. Choose the correct answers.  i. I have 2 tens. What number is it?  a) 2 b) 20 c) 12 d) 02  ii. How many tens are there in number 14?  a) 1 b) 10 c) 4 d) 14  iii. 28 is same as:  a) 0 tens 8 ones b) 2 tens 8 ones  c) 8 tens 2 ones d) 1 tens 0 ones  iv. 29 – 17 =  a) 12 b) 2 c) 22 d) 46  v. Which one of these numbers is greater than 5 but smaller than 9?  a) 6 b) 10 c) 4 d) 11  vi. Farah has 2 fewer buttons than Aira.  How many buttons does Farah have?  a) 7 b) 9 c) 11 d) 13  2. Answer these.  i. What is the missing number in the △?    ii. 2 tens + 18 = \_\_\_\_\_\_\_\_\_\_\_\_  iii. 6 + 8 + 9 = \_\_\_\_\_ tens \_\_\_\_\_ ones  iv. 4 tens – 7 = \_\_\_\_\_\_\_\_\_\_  v. 25 – 20 = \_\_\_\_\_\_\_\_\_\_ tens \_\_\_\_\_\_\_\_\_\_ ones  3. Fill each box with “+” or “-” to make the equations equal.   | **20** |  | **4** | **=** | **10** |  | **6** | | --- | --- | --- | --- | --- | --- | --- | | |
| ***STEP 3*** | |
| **Learning Activities**  **Counting, place value, comparing, ordinal numbers, reading and writing numbers:**  *Students will be able to:*   * *Count, read and write 2-digit numbers;* * *Recognize place value of 2-digit numbers;* * *Compare and order 2-digit numbers using appropriate language;* * *Identify numbers before, after and in between two numbers.* * *Read and write numbers up to 99 (2-digit numbers)*   **NOTE: For suggested activities and teacher exposition on place value, please refer to class 2 suggested guidelines.**  **Activity 1:** **Greater Than or Less Than**With your students, go around your class and count different objects. For example, you might want to count the number of chairs in the office and then count the number of chairs in another room.Then have your students say and write a “number” sentence comparing the number. They may want to draw pictures and use the greater than, less than, or equal to words.Then ask your students to find objects that are greater than, less than, or equal to a number. For example, you might ask your student to find a group of something that is equal to the number of chairs in the kitchen or the total number of chairs in their home.This would allow your students to practice adding skills as well as practice inequalities.**Activity 2:****To the Letter**  1. Connect maths and spelling together. Together with your students, collect a group of spelling words in a list. 2. Ask: *How many letters does each word have? Which words have more letters? Which words have fewer letters? Which words have the greatest or least number of letters? Which words have the same number of letters?* 3. Then have your student write “number” sentences using the words and the appropriate inequality symbol.   **Activity 3:** **Rocking Out**  1. Have your students collect small rocks from their homes or around the schoolyard. Then have students bring in their rocks and count them. 2. Then divide the class into small groups and have them make inequalities using their collections. 3. Have them write their number sentences in words using numbers and symbols. 4. As an extension you can ask them to figure out how many more or less rocks they have than another member of their group.   **Activity 4:**  **Class Hundred Chart**   1. Using hundred pieces of scrap paper, index cards, sticky notes, or chalk, have your whole class create a large “hundred” chart on the floor. 2. Then have a few student volunteers pick a number and stand on it. 3. Each student should call their number out. 4. Then give different directions, such as “Find a number that is greater than the number you are standing on” or “Find a number that is 10 less than the number you are standing on.” 5. Take turns, so every student gets to stand and move on different numbers.   **Addition and Subtraction:**  **SLOs:**   * *Find, recall and use addition and subtraction facts (number stories) to 20.* * *Compare numbers to find how many more and how many less.* * *Add and subtract numbers including:* * *3 single digit numbers* * *2 digit number with a single digit (without regrouping).* * *2 digit number and tens.* * *Two 2-digit numbers (without regrouping).* * *Solve real-world word problems with addition and subtraction using concrete objects and pictorial representations  (involving missing numbers, money, quantities and measures)*   **Activity 5:**  **Addition and Subtraction fact families:**  **Resources required:** Video Addition and Subtraction fact families from the link <https://youtu.be/ujuCuY7MPAU>; internet, index cards (with one addition and subtraction sentence written on it)   1. Preview the movie ‘Addition and Subtraction Fact Families’ to plan for any adaptations 2. Write out sets of addition/subtraction fact families on index cards with one number sentence per card so there are enough for the whole class. For example, 2 + 4 = 6; 4 + 2 = 6; 6 - 4 = 2; 6 - 2 = 4 3. Write the following two number sentences on the board: 2 + 4 = 6; 4 + 2 = 6. Ask students what they notice. They should notice that both sentences include the same numbers. They may also observe that the order of the two numbers being added doesn’t matter,as either way the sum is 6. 4. Now write these two sentences on the board along with the first two: 6 - 4 = 2; 6 - 2 = 4. Again, ask students what they notice. They should observe that both sentences include the same numbers and that both begin with 6. 5. Finally ask them to look at all four sentences together. What do they notice? Help them recognize that all four statements include just the numbers 2, 4, and 6. Explain that these are a fact family. 6. Tell students that today they will learn about fact families and then play a game where they reunite facts from the same family. Play the BrainPOP Jr. video ‘Addition and Subtraction Fact Families’ for the whole class. 7. Pause as needed to reinforce student understanding of key concepts and vocabulary. 8. After the movie, distribute a fact family index card (see Preparation) to each student. Tell students that they need to find the rest of their family for a family reunion! Allow students time to walk around the classroom finding the other three facts that make up their family. 9. Finally, invite each family to review their facts and then present themselves to the rest of the class. If time allows, challenge them to put the numbers that make up their fact family on a fact family triangle. 10. Conclude the lesson by challenging students to the Easy or Hard Quiz to assess their understanding.   **Activity 6:** **Fact Family Home**Invite students to draw a picture of a four-story home with three windows in every story. Put two minus signs between the first two windows on the bottom floors, and a plus sign between the first two windows on the top floors. Then put an equal sign between the last two windows on all four floors. Let the students fill the windows with fact family equations. You can also fill in the fourth floor with 3 + 4 = 7 and have your students complete the other equations. **Activity 7:**  **Basic addition and subtraction using variety of pictorial strategies.**  Resources:   * Video ‘Basic Addition’ from the link <https://youtu.be/cJ_boPjzKtI> * Video ‘Basic Subtraction’ from the link <https://youtu.be/yTYVVV1_nJw>. * Video ‘Doubles’ from the link <https://youtu.be/PGa0yVoOLVM>.  1. Play the video ‘Basic Adding’ to help students know how addition can be done, as well as the vocabulary for addition and subtractions procedures. 2. Demonstrate a few addition questions. 3. Give a few questions to make students practice basic addition using any method that they prefer. 4. Now play the video ‘Basic subtraction’ to help students know various strategies to subtract. 5. Demonstrate a few subtraction questions. 6. Give a few questions to make students practice basic subtraction using any method that they prefer. 7. Show the video ‘Doubles’ to build student understanding of this mental math strategy.   **Activity 8:**  **Using variety of strategies to add single digit numbers through an online game**  **Resources:**   * Online game ‘Addition blocks’ from the link <https://www.brainpop.com/games/additionblocks/>. * Video ‘Doubles’ from the link <https://youtu.be/PGa0yVoOLVM>.  1. This lesson plan uses a free online game called Addition Blocks. The game is useful for providing practice with addition facts, but does not explicitly teach addition, so make sure students have already had some practice with mental math strategies prior to playing the game. 2. Before introducing the game to your students, preview it yourself by diving right into game play, or click on "How to Play" for directions. You can easily differentiate the game for students by instructing them to click "Options" and then select a specific speed and level of difficulty. The following is recommended: **1st - 3rd grade** Speed: Slow; Difficulty: Easy. 3. Show the video ‘Doubles’ as well as ‘Basic Adding’ to build student understanding as well as recap this mental math strategy before playing the game. 4. Project the online game ‘Addition Blocks’ for the class to see. Show students how to set the speed and difficulty level by clicking on "Options," and then demonstrate game play. 5. Model how to play the game. Use think-aloud strategies to show students how you use mental math during game play. You might want to have a few student volunteers play and share their thinking as well. 6. Provide 10-15 minutes for students to explore the game on their own or with a partner. 7. Lead students in a whole-class discussion about the mental math strategies they used during game play. Was it easier to combine two numbers or more than two numbers to create the target number? Why? Which combinations were the easiest to add, and which were the hardest? 8. Explain that students will now practice mental math strategies for addition by creating and playing a hands-on game with a partner. Pass out 25-50 blank index cards to each pair of students, or give students construction paper and have them create cards by folding and cutting the paper into equal sized squares. Instruct students to write one digit numbers on the cards. Younger students may want to write only digits from 1-9. 9. Encourage students to work with their partner to create an addition game using their cards. They can spread their cards in an array like in the Addition Block game, then take turns selecting a target number for their partner to make with cards. Or, they can create their own original concept for a game. Provide at least 10 minutes for students to plan and practice playing their games, 10. Allow students to revisit the Addition Blocks game as well as their original games throughout the school year to build fluency with addition facts. You might also want to pair up students with different partners and allow them to teach one another their games. Encourage students to talk about their mental math strategies together.   **Activity 9:**  **Using a variety of strategies to add and subtract 2 digit numbers.**  **Strategy 1: Base-Ten Blocks**  **Resources for teacher support:**   * Video ‘Adding Using base ten blocks’ from the link <https://youtu.be/aQMjLFlbsDA> * Video ‘Subtracting using base-ten blocks’ from the link <https://youtu.be/hkQhlXQjGT0>.  1. View the two videos ‘Adding using base ten blocks and subtracting using base ten blocks’ to know how to add and subtract 2-digit numbers with a single digit, a ten or another 2 –digit number. 2. If you are short of resources, you could always create rods by gluing ten beans/buttons on a popsicle stick to represent rods and using individual beans/buttons would represent ones. You could always use pictorial representations such as sticks to represent tens, while circles or dots to represent ones. 3. You may search for other videos on Youtube to know how to use base ten blocks to add and subtract either through concrete experience or through pictorial representations. 4. Using base ten blocks to add and subtract two digit numbers is a very concrete model for students to use. It’s very easy for them to visually see the process of putting together the tens and ones plus the act of regrouping is a lot easier to visually see here as well. 5. One way to have the students use base ten blocks is to do two things. The first would be to actually use base ten blocks as they’re adding and subtracting for every single problem. 6. The next option would be to draw sticks and circles to represent tens and ones, if your classroom is limited, on base ten block materials. 7. If you give students a whiteboard, it would be very easy for them to map out every single problem that they can add or subtract without using base ten blocks, but ideally, they would learn better on those manipulatives to visually see their problems being solved.   **Strategy 2: Break-apart (partitioning or expanding) strategy**  **Resources for teacher’s support:**   * Video ‘Simple tricks to help with partitioning and addition’ from the link <https://youtu.be/1Cf08KP92zo>. * Website Addition with partitioning from the link <https://www.mathswithmum.com/addition-by-partitioning/>. (Interactive demonstration, video, worksheets and a lesson) * Video ‘Addition and subtraction: Mental calculations’ from the link <https://youtu.be/-18qLbg1Gmk>.  1. View the 2 videos given above to know about the partitioning method to add numbers. You may search other videos and websites to learn more about this easy method to add numbers. 2. Strategy number 2 is all about the break-apart method which also could be known as the expanded form method. The reason it is called break apart just because the students are actually taking apart the two digit and splitting it into tens and ones. 3. Students will be able to add the tens from each number and the ones from each number and make their math a little bit easier. It does get a bit difficult when students have to do some regrouping on their addition or subtraction problem, so that is definitely a big step that you have to teach when using this strategy. However, without regrouping, it is quite an easy method to use. 4. You may scaffold children’s learning of this method by providing blanks to help students develop a further understanding of how to break apart/partition numbers.   **Strategy 3: Give and Take away (or Rounding and Adjusting):**  **Resources for Teachers support:**   * Adding and subtracting using rounding and adjusting from the website link - <https://classroom.thenational.academy/lessons/adding-and-subtracting-using-the-round-and-adjust-strategy-chk64e>. (It includes a video, questions and other support material to help understand this method) * Video ‘Addition and subtraction: Mental calculations’ from the link <https://youtu.be/-18qLbg1Gmk>.  1. Use the teachers resources provided to know in detail about this strategy. You may search more to gain further information about this strategy. The second resource gives a lot of strategies to add and subtract numbers (including partitioning, number line, bridging, rounding and adjusting etc.) 2. The third 2-digit addition and strategy would be the give-and-take method. The process of this method is different between the addition and subtraction problems. So it is important that you give the students a lot of practice here. 3. In an addition problem, if you take two from one number, you have to add two to the other number. 4. However, in a subtraction problem, if you take two from one number, you have to take two from the second number as well. 5. This strategy does require a lot of practice because the students really have to focus on which strategy fits with addition or subtraction, however, once given practice, it is the easiest to use. One suggestion is to give them lots of hands-on practice. 6. It’s also very important to teach the strategy of finding the number that is closest to a 10 to make their problem as easy as they can.   **Strategy 4: Open number line**  **Resources for teachers support:**   * Video ‘Adding and subtracting – using a number line’ from the link <https://youtu.be/ucDucqYbffs>. * Video ‘Addition and subtraction: Mental calculations’ from the link <https://youtu.be/-18qLbg1Gmk>.  1. Use the resources provided for teachers support to know about addition and subtraction with an open number line. You may browse for more videos as there are many supportive resources available on net. 2. Open number lines are the fourth strategy for 2-digit addition and subtraction problems. An open number line is where students have make jumps in order to represent adding or subtracting tens and ones. 3. On a subtraction problem the students will begin on the biggest number. Then, they will jump back the number that they are supposed to subtract. 4. When a student makes these jumps, they will represent the tens with a bigger jump and the ones, with smaller jumps. 5. It is important that the students label each of these jumps at the bottom (or top) of the number line. This will help them see the act of taking 10/1 or adding 10/1.   **Strategy 5: Simple Algorithms**   1. This 2-digit addition subtraction strategy is the standard algorithm. 2. The standard algorithm is lining up the addition or subtraction problem vertically where the tens and ones are stacked on top of each other. 3. This can be done with or without regrouping. 4. It is suggested to break up your lessons into first teaching the standard algorithm without regrouping. And then once your student has mastered that, then you can start teaching standard algorithm with regrouping.   ***Multiplication and Division:***  *Students will be able to:*   * *Count and write in 2’s, 5s and 10s using concrete objects (such as counters, pebbles, popsicle sticks etc) and pictorial representations (such as number line, hundred square grid)* * *Recognise counting in 2s, 5s and 10s as multiplication tables of two, five and ten.* * *Recognize multiplication as repeated addition through concrete objects and pictorial representations (for instance using groups and arrays)* * *Recognize through concrete objects and pictorial representations that the multiplication of any two numbers can be done in any order.* * *Recognize division as repeated subtraction using concrete objects and pictorial representation. (groups, arrays and sharing)* * *Recognize using concrete objects and pictorial representation that the division of one number by another number cannot be done in any order.* * *Solve simple real life problems involving multiplication and division using any method (for instance materials, repeated addition, groups and arrays, mental methods, and known multiplication tables.*   **Activity 10:**  **Variety of strategies to teach skip counting in 2s, 5s and 10s**   1. Bead the thread: Use beads and a thread to teach students skip counting. Ask them to bead the thread according to selected skip counting. Ask them to count the beads in skip counting. 2. Use the website <https://www.weareteachers.com/skip-counting/> to explore, choose and use from amongst 21 skip counting activities. Another great website is <https://earlyimpactlearning.com/19-counting-by-2s-activities-easy-medium-and-hard/> which though gives ideas on skip counting by 2s; however many of them could be adopted for skip counting in 5s and 10s. 3. Once you have given them ample practice of skip counting in twos, fives and tens, introduce these skip counts as multiplication tables. 4. Again make them skip count with different activities, but this time round, ask them to read them as times tables and write them as multiplication statements (such as 2 x 3 = 6 read as 2 three times is six etc.)   **Activity 10:**  **Teaching multiplication through groups and arrays (Introduction and explaining Arrays to children):**  NOTE: Multiplication and division need to be taught through concrete and pictorial representations at this early age. Therefore arrays are the suggested strategy for teaching multiplication and division.  Children may use objects such as beans/buttons/ rocks/ marbles to develop arrays (while providing concrete experience) or draw dots/ flowers/circles etc. to represent arrays (while working through pictorial representations.  A brief introduction to arrays as well as how to introduce arrays and groups to students in order to multiply is provided below for teachers new to concept.  The activity steps provided below and the videos shared would serve two purposes. One is to provide guidelines on introducing and using (or drawing) arrays and the second to introduce repeated addition (with or without arrays) to multiply and find answers.   1. Arrays can help your children develop concepts of multiplication and division. An array is a set of objects organized into equal groups. For example, 6 objects can be arranged into several different arrays: 1 group of 6 objects, 6 groups with 1 object in each group, 3 groups with 2 objects in each group, or 2 groups with 3 objects in each group. 2. An arrays is a set that shows equal groups arranged in rows and columns. Arrays are all around us: A pack of socks might have 3 pairs, a carton of eggs might have 2 rows of 6 eggs, a tray of muffins might have 3 rows of 2 muffins, etc. Together with your students, think of objects that are grouped in sets. 3. Watch the following videos to understand what arrays are and how do you make arrays from groups: you may show it to your students (if resources are available)  * Arrays from the link <https://youtu.be/DdVj0qhvtiU> * Multiplication using Arrays from the link <https://youtu.be/z8lcZUWbqT0>  1. Familiarize your students and yourself with arrays by organizing objects in different ways during your demonstration. Give lots of practice of arrays by demonstrating through different examples, for instance 5 x 3; 4 x 4; 1 x 5 etc. 2. Use both concrete and pictorial representations during your demonstration so that students have ample visual practice of arrays. Explain purpose of arrays using beans/buttons /rocks /counters (or through drawing dots/circles/flowers to represent arrays). 3. Give practice questions and resources to students to solve multiplication sums by developing arrays. If resources are not available, you may ask students to draw arrays to find answers to your given questions. 4. Remind your students that when they multiply, they put equal groups together to find the total. Like addition and subtraction, multiplication is an operation, a way to manipulate numbers. 5. We use the symbol *x* to show multiplication. In the number sentence 3 x 2, you must add the number 3 two times in order to find the product, or answer. This is called repeated addition. You can also add the number 2 three times in order to find the answer. 6. Explain that Arrays can help people count more easily. Explain to your children that instead of counting objects one by one, they can organize the objects into equal groups and count the groups. 7. At this point show them the videos given below or see them yourself (before the lesson) to make notes for yourself on how to explain arrays and how to use them for multiplication (including explaining multiplication as repeated addition):  * Making Equal groups from the link <https://youtu.be/Gh5psiNzayk> * Arrays and repeated addition from the link <https://youtu.be/IXQO5jo2utg> * Array multiplication from the link <https://youtu.be/lRgKavUxvKY> * Multiplication with arrays from the link <https://youtu.be/sIIiROTvPKY>  1. Remind children that the order in which numbers are multiplied does not affect the outcome: 3 x 2 will yield the same answer as 2 x 3. 2. Draw or model different arrays and have children write multiplication number sentences that describe them. 3. Introducing your children to arrays at an early age will help build a solid foundation for multiplication and division. Arrays can help your children visualize and understand more complicated math operations.   NOTE: The same notion of arrays would be used to explain both multiplication and division. Use the same videos given above (making equal groups) as well as the ones provided below in activity 13 to build your understanding about arrays and division. Remember multiplication and division are opposites of one another.Making groups of equal size and finding the product in an array would yield multiplication while finding the share for each person or group in an array would yield division.  **Activity 11:**  **An Array of Arrays**   1. Give bags of counters, beans, coins, or other small objects to small groups or partners. 2. Have them arrange the objects into equal groups and discuss different ways to organize the same number of objects. 3. Remind students that the groups should have equal numbers of objects. Have students draw their different arrangements and practice counting the groups. 4. Help students write multiplication or addition number sentences to go with each arrangement to calculate the total.   **Activity 12:**  **Egg Carton Counting:**   1. Have students work in small groups and give each group a half-dozen egg cartons. 2. Have one student put beans or counters in each section of the carton. 3. Remind the student to put in the same number of beans or counters in each section. 4. Then have the other students in the group count to find the total number. 5. Have students discuss different strategies to count, such as counting on, skip-counting, or making an addition or multiplication sentence. 6. Have students write down and compare their answers. Allow each student in the group an opportunity to fill the egg carton.   **Activity 13:**  **Division through arrays:**  Activity 12 does give information on how to connect division as you teach for multiplication. However for further guidance, a few videos and websites are shared. Both activities involve a good comprehensive demonstration by teachers followed by practice questions by students regarding multiplication and division.  Therefore the focus of these activities is to help teachers develop their demonstration and exposition as they explain multiplication and division through arrays and not through the traditional methods.   1. Watch the following videos to make notes for demonstrating, (once again) how arrays can be used to divide.  * Division array strategy from the link <https://youtu.be/EAd8fOTC8Dk> * Arrays division from the link <https://youtu.be/RXdb9X2d-_k>.  1. Visit the following websites to develop your understanding regarding arrays and how multiplication and division are interrelated. It also gives in-depth understanding for the teacher to ensure that students are able to know and understand that multiplication and division are opposite of each other and developing arrays would help solve not only multiplication but division problems as well.  * Teaching relationship between multiplication and division using arrays from the link [https://www.hmhco.com/blog/teaching-relationship-between-multiplication-division-using-arrays#](https://www.hmhco.com/blog/teaching-relationship-between-multiplication-division-using-arrays) * Arrays, multiplication and division from the link <https://nrich.maths.org/8773> * dividing with arrays through the link <https://www.ixl.com/math/lessons/dividing-with-arrays>.  1. Once you have developed a good understanding, demonstrate for students through simple examples such 15 ÷ 3; 24 ÷ 4 etc. and explain as you develop arrays using beans/buttons/rocks/counters. 2. Give practice questions and resources to students to solve division sums by developing arrays. If resources are not available, you may ask students to draw arrays to find answers to your given questions.   **Activity 14:**  **Online division quiz through arrays.**   1. Ask students to access the website <https://www.khanacademy.org/math/cc-third-grade-math/intro-to-division/imp-division-intro/e/division-with-arrays>. 2. A quiz is provided with arrays developed. They are required to identify the division sum that represent each of the array. 3. Have students complete the online quiz. (NOTE: where internet cannot be provided, you may copy the questions and use these questions to hold a quiz in your class or give it as an individual work). 4. Let students compare their scores and explain to one another the errors that they made.   **Activity 15:**  **Division through Making Equal groups**  **Teachers/students resources:**   * Video ‘Making Equal groups’ from the link <https://youtu.be/Gh5psiNzayk>.  1. There are many approaches to teaching division, and we recommend employing different strategies and providing plenty of examples to help children visualize and understand division. 2. Making equal groups and exploring different ways to share helps children understand the basic principles behind dividing. 3. You may use arrays as given in the activity – division through arrays, to help children understand the relationship between multiplication and division. 4. Explain to your children that when groups are equal, they each have the same number of items. 5. Division can be a difficult for some children to grasp, so it is important to use tangible materials to model real-life division situations. 6. Present your child with 6 counters (pennies, beans, buttons, etc.) and pretend they are cookies. Using cookies or another treat is always a good way to get kids engaged. As soon as you tell them that they will be working with cookies, their investment in making sure there are “fair” groups will go up and their math skills will suddenly improve! 7. Then ask your child to split them into two fair groups. He or she can dole them out one by one or draw pictures or make a tally chart to divide the counters equally to figure out there will be 2 groups with 3 pennies each. 8. Continue practicing with different numbers of counters and dividing them into different numbers of equal groups. 9. Then present your child with a story problem to model, such as “There are 12 cookies that must be divided among 4 friends. How many cookies does each friend get?” 10. Provide your child with 12 counters and have him or her divide them into 4 equal groups. 11. Your students can create an array to help divide them into equal groups. An array is a set of items that show equal groups in rows and columns. Your students can make an array to show 4 rows of 3 counters each. This means that each friend, as represented by the rows, get 3 cookies each. Pose different division problems and have your child use arrays to solve them. 12. Provide another problem for your child that requires him or her to make and count groups. For example, you can pose the following problem: “Aliya collects stickers in a sticker album. She has 15 stickers, and 3 stickers can fit on each page. How many pages can he fill?” 13. To solve this problem, your students can model using counters, drawing pictures, or making tallies.  * He or she can also use a number line and skip count. Have your student start at 0 and skip-count by 3’s to get to 15. Then your student can count the number of times he or she skip-counted to find the answer. * Your student can also start at 15 and subtract 3 as many times needed to get to 0: 15 – 3 = 12, 12 – 3 = 9, 9 – 3 = 6, 6 – 3 = 3, 3 – 3 = 0. Then count the number of times he or she subtracted.   Have your child practice solving problems using different strategies, and then discuss which strategies work best for which type of problem.   1. You can use arrays and a number triangle to help your child see the connection. For example, the equations 3 x 2 = 6 and 2 x 3 = 6 are related to 6 ÷ 2 = 3 and 6 ÷ 3 = 2. Fact families use the same numbers and different operations, so 3, 2, and 6 are in the same fact family. 2. Division can be a tricky subject for children, but children can grasp concepts more easily by working through different examples and employing different strategies and visualization techniques. 3. We encourage children to use counters and model problems to help them understand basic operations and how they are connected.   ***Fractions:***  *Students will be able to:*   * Recognise, find, name and write fractions:   - half ()  - quarter ( )  - two-quarters ( )  - three-quarters ( )  of a length, shape, set of objects or quantity using pictorial representations.  **Activity 16:**  **Introduction to Fractions:**  **Teachers Support Resource/Students resources:**   * Video ‘Basic Parts of a Whole’ from the link <https://youtu.be/6UJLduCBjno>. * Video ‘More Fractions’ from the link <https://youtu.be/5Eoo2RnGgAM>.  1. It is highly recommended to review the video’s ‘Basic Parts of a Whole’ and ‘More Fractions’ before explaining fractions to students. 2. The two videos introduce fractions and explore unit fractions, including one-half, one-third, and one-fourth. This movie will go beyond unit fractions and further investigate fractions of sets. We encourage children to work with counters, small objects, or even food to help them experiment with different parts of a whole or set. 3. Show the two videos to students. 4. Review with children that a fraction is a number that shows part of a whole. 5. You may wish to introduce a simple fraction such as one-half. You can take a piece of paper and cut it in half to show that there are two equal parts. Remind children that since there are two equal parts, two goes in the denominator, or the bottom of the fraction. Then take one half away. What fraction of the whole paper is left? Point out that there is only one of two parts remaining, so one goes in the numerator, or the top of the fraction. Thus, one-half of the paper is left. 6. You may wish to continue this activity with other unit fractions, (including one-third if you wish), one-fourth, three-fourths, two-fourths. 7. Help children move beyond unit fractions. You can divide a piece of paper into eighths and color two sections blue. Ask children to identify the fraction of the paper that is blue. Help them count the total number of sections (eight) and put that number in the denominator. Then count the total number of blue sections (two) and put that number in the numerator. Thus, two-eighths of the paper is blue (which is one-fourth actually). 8. Repeat the activity by having students identify the fraction of the paper that is *not* blue. Six-eighths of the paper is not blue. 9. Repeat the activity again to explore other fractions, such as three-fourths, (five-sixths, and eight-tenths provided your students are ready and interested to explore further). 10. You may wish to have students work in pairs and trade off coloring in squares and writing fractions that name the colored and plain parts. 11. Help children understand how fractions can name a whole. Divide a piece of paper into fourths and color all the sections blue. What fraction of the paper is blue? Guide children to understand that there are four equal parts, so four is the denominator. How many parts are blue? Guide children to count the blue sections and put four in the numerator. So four-fourths of the paper is blue. That means the whole paper is blue. Help children understand that four-fourths, five-fifths, eight-eighths and so on, all represent a whole. 12. Explain to children that fractions can also name no parts! Take a piece of white paper and divide it into sixths. Since there are six equal parts, six goes in the denominator. How many parts are blue? Since none of the parts are blue, you put zero in the numerator. Repeat this activity to represent other fractions. 13. Explore fractions of sets together. Show a collection of fruit, such as three apples and two bananas. What fraction of the pieces of fruit are apples? Guide children to count all the fruit and put that number (five) in the denominator. Then have them count the number of apples and put that number (three) in the numerator. Thus, three-fifths of the fruit are apples. 14. Then show the same collection and ask what fraction of the fruit are oranges. Help them understand that zero out of the five fruit are oranges! 15. You may want children to work in pairs and use counters or objects to create a set. Then have them challenge each other to name fractions that describe their sets, being sure to write their fractions down. 16. Fractions can be challenging for some children, but hands-on exploration can help young learners understand and practice the concepts so they can become experts!   **Activity 17:**  **Ready, Sets, Go:**   1. Have each student prepare a set of small objects. They can group together different colors of crayons, blocks, counters, shapes, beads, beans, or other small items. Encourage them to be creative! 2. Then have students get in small groups and ask questions about each other’s sets. What fraction of the set is red? What fraction of the set is not red? Have students write down their fractions and check each other’s work. 3. Then challenge each small group to use their combined objects to show another fraction. For example, you might ask them to create a set that is two-fourths red, one quarter (one-fourth) blue; three quarters yellow etc. Have students work together to put together a set that illustrates the fraction.   **Activity 18:**  **Pretend Pizza Party**   1. Host a pretend pizza party in your classroom! 2. Give students different blank circles, squares, or rectangles that are divided into halves, one-fourths, two-fourths, three quarters (three-fourths). 3. Then ask students to draw different toppings or glue shapes or small objects to their pizzas. Encourage them to be creative. 4. They may want to use paper clips as toppings, or even use grass, leaves, or shells. 5. Then have pairs write fractions that describe their pizza. What fraction of the pizza has paper clips? 6. Have them write out their fractions on the back of their pizzas. 7. Ask volunteers to share their pizzas with the class, or place the pizzas in a center or independent work station as a self-checking fraction practice activity.   **Activity 19:**  **Interactive Online Fraction games:**   1. A good way to learn about fractions is through drawing or playing an interactive online games. 2. Following are a few recommended interactive online games. Allow children to access them to develop an in-depth understanding of fractions. (NOTE: You may play them in the class and have whole class participate in responding)  * Math games from <https://www.mathgames.com/fractions>. The site has many interactive games on fractions per level. Choose the one’s suiting your students’ needs. * Splash Learn from <https://www.splashlearn.com/fraction-games>. The site requires you to register as a teacher and have access to many interactive games/per level/per topic for free. Choose the one’s suiting your students’ needs. * Maths Playground from <https://www.mathplayground.com/index_fractions.html>. Choose the one’s suiting your students’ needs. * Top marks from <https://www.topmarks.co.uk/maths-games/7-11-years/fractions-and-decimals>. The site is a very renowned website for interactive games, however you will have to choose wisely for your students. | |
| **References:**  BrainPop (2021) Retrieved from: <https://educators.brainpop.com/topic-lesson-directories/bp-jr-topic/?brainpop-subject=math&subject-title=Math>  BrainPop Jr. (2021) Retrieved from: <https://jr.brainpop.com/math/>  NewZealand Government (2021) Retrieved from: <https://nzmaths.co.nz/units-work>  Elementary Nest (2021) Retrieved from: <https://elementarynest.com/teaching-strategies-for-2-digit-addition-and-subtraction/>  Rising Star Mathematics. Teacher’s Guide. (2017) Hodder Education: London. UK | |

**Domain: Algebra**

| ***STEP 1*** |
| --- |

| **Standard*.*:***Students will be able to explore patterns in a variety of ways* | |
| --- | --- |
| **Student Learning Outcomes**: *Students will be able to:*   * *Identify and extend the next shape in patterns with 2 or 3 orientations.* * *Identify and extend patterns using 2-D and 3-D shapes.* | |
| **Knowledge:**  Students will be able to understand:   * *Patterns using 2- D and 3-D shapes as well as through pictorial illustrations.* | **Skills:**  Students will be able to…   * Identify and extend the next shape in patterns with 2 or 3 orientations. * Identify and extend patterns using 2-D and 3-D shapes as well as through pictorial illustrations.   *Advanced/Additional:*  *Students will be able to:*   * Explore simple tessellations. |

| ***STEP 2*** |
| --- |

| **Assessments**  **Formative Assessments**  Some types of formative assessments the teacher may use are:   * Question & Answer(open and closed) * Quick Quiz * Learning Walks * Projects, * Selected responses (may include MCQs, true: false, matching short answers, fill-in-the blanks etc.) * Observation diaries * Inquiry charts, * Four Corners: Gather students in the middle of the room, and read multiple-choice questions and their possible answers aloud. Students then move to the corner that represents what they believe is the correct answer. The top left room corner can be option A, the bottom-left can be B and so on   **Summative Assessments** Some of the forms of summative assessment are:   * End of Unit Test * Class Test * Periodic/Monthly Tests * Mid-year Exam * End of Year Exam * Standardized tests. * External Exams   **Some of the sample questions that can be used as part of summative assessment are:**   * + - 1. Fill in the blanks.  1. 8 + 6 = \_\_\_\_\_\_ + 9 2. 12 + \_\_\_\_\_\_\_ = 19 3. 11 – 5 = \_\_\_\_\_\_\_ + 3 4. \_\_\_\_\_\_\_\_ - 7 = 9 – 9    * + 1. **Complete the pattern.**   **Draw the next shape and write the number in the shape.**   |  |  |  |  |  | | --- | --- | --- | --- | --- | |
| --- | --- | --- | --- | --- | --- |
| ***STEP 3 \_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*** |
| **Learning Activities**  *Students will be able to:*   * *Identify and extend the next shape in patterns with 2 or 3 orientations.* * *Identify and extend patterns using 2-D and 3-D shapes.*   **Activity 1:**  **Patterns Introduction and exposition:**  **Teachers’/Students’ resources:**   * Video ‘Patterns” from the link <https://youtu.be/MBrdGGqUu1E>.   There are many tasks provided within this activity 1. You may split it into number of lessons as per your need or follow the sequence and do all tasks of this activity (if you have sufficient time).   1. Patterns are great ways to introduce and develop algebraic thinking. Encourage your children to build patterns, and experiment in different ways by using shapes, colors, sounds, or movements. 2. Challenge your children to find patterns all around them, in their surroundings, in their clothes, or even in music. Help them to identify the unit that repeats in the pattern and predict what comes next. 3. **Review** with your children that a pattern is something that repeats over and over again. Patterns can use colors, shapes, sizes, sounds, and movements, as in dance routines. 4. Show different examples of patterns and encourage your children to find them on their own. 5. Show the video ‘Pattern’ to students to help explain patterns. 6. Then go through different patterns of movement, such as alternating jumping jacks with hopping once. You can also create sound patterns together by stomping, clapping, snapping, and tapping. If possible, play music for your children or bring in examples of music and have children identify the pattern. 7. **Encourage**your children to make their own patterns using two to four elements in a unit. They can use pattern blocks, different colored marbles or counters, or other small objects. They can also draw pictures or draw or paint stripes of different colors. 8. Instruct them to select two to four items or colors, and arrange them in a specific order. This is their unit of pattern. Then have them build the pattern by repeating the unit over and over again. 9. Have your children practice creating patterns using a variety of materials and challenge them to break the patterns into individual units. 10. Then, ask them to begin patterns for someone else to continue. Help your children to identify what type of pattern they have created: ABAB, ABC, ABB, or others. 11. **Present** a simple pattern to your children and have them figure out what comes next. Guide them to look for the individual unit first. Then follow the pattern with the unit in mind to figure out what comes next. 12. They may want to take notes, use words or sounds, or draw pictures to help them keep track of items in the pattern. For example, when using a sound pattern, such as clap, clap stomp, clap, clap, stomp, clap, clap, stomp, children can write down what happens in words, use abbreviations, or use colors or counters to represent each movement. Then help them read their symbols to figure out what comes next; a clap! 13. **Draw** or use shapes to create a pattern, but leave one shape out. Ask your children to find the missing shape. Guide them to find the unit and see where the missing shape falls in the sequence. 14. Invite children to create their own missing shape patterns and take turns guessing. This activity promotes algebraic thinking and problem solving skills. 15. Explain that patterns are everywhere. There are plenty of examples found in nature, such as stripes on a zebra or the arrangement of petals on a flower. Encourage your children to explore the world around them and see maths in unexpected places.   **Activity 2:**   1. Clap out a simple pattern and invite students to join in. Experiment with other basic patterns using clapping, foot stomping, and other movements. Invite children to describe and explain the patterns you created. Introduce the term pattern, which means "something that repeats over and over again." 2. Provide some experience with visual patterns. Read the pattern out loud together (e.g. "triangle, triangle, square") and help students decide what comes next. 3. Use the website <https://www.topmarks.co.uk/Search.aspx?q=FINISH%20THE%20PATTERN> to choose an interactive game for your students where they complete the patterns. 4. Allow children to explore patterns in small groups using manipulatives. They may want to make patterns with cars and trucks, different colored bears, etc. Other students may want to create patterns using art supplies. 5. Have volunteers share patterns they created. Encourage students to look for more patterns throughout the day. 6. You may want to line them up in a boy-girl pattern on the way to lunch and have them identify patterns in the school that they see on their walk.   **Activity 3:**  **Clap and Tap**   1. Clap and tap out a pattern for your students to follow, such as clap, clap, tap, clap, clap, tap, clap, clap, tap. Make sure you repeat the pattern at least three times to help students find the unit. 2. Stop the pattern and have students figure out what comes next, a clap or a tap. Then invite student volunteers to clap and tap their own patterns for other students to guess.   **Activity 4:**  **AABB**   1. Post a pattern for your students to follow, such as AABB, ABC, ABCD, etc. 2. Then have them use whatever items they wish to create the pattern. They may want to use beads, marbles, pattern blocks, connecting cubes, or draw pictures. 3. Have students check over each other’s work. Then have student volunteers share their patterns with the class.   **Activity 5:**  **Missing Link**   1. Have small groups or pairs use pattern blocks or use small items to create a pattern. 2. Then have them remove one of the blocks or items to create a missing space. 3. Have other group members figure out the missing item. 4. Encourage your students to explore patterns that go beyond color or shape, such as texture and luster. |
| **References:**  BrainPop (2021) Retrieved from: <https://educators.brainpop.com/topic-lesson-directories/bp-jr-topic/?brainpop-subject=math&subject-title=Math>  BrainPop Jr. (2021) Retrieved from: <https://jr.brainpop.com/math/>  NewZealand Government (2021) Retrieved from: <https://nzmaths.co.nz/units-work>  Elementary Nest (2021) Retrieved from: <https://elementarynest.com/teaching-strategies-for-2-digit-addition-and-subtraction/>  Rising Star Mathematics. Teacher’s Guide. (2017) Hodder Education: London. UK |

**Domain: Measurement**

| ***STEP 1*** |
| --- |

| **Standard *1, 2, 3, etc.*:***Students will be able to measure, compare and order lengths mass, capacity and time using non-standard units and mathematical language. They will also be able to solve problems in context, involving lengths, mass/weight and capacity.* | |
| --- | --- |
| **Student Learning Outcomes**: *Students will be able to:*   * *Measure, compare and order lengths, mass, capacity and time using non-standard units and mathematical language.* * *Read and write time in hours (o’clock) from analogue clock and digital clock.* * *Read and write temperature to the nearest appropriate unit i.e. () using pictorial representations and relating temperature scale to number line.* * *Show time in an hour on an analogue clock.* * *Name days of the week and months of the Solar and Islamic year.* | |
| **Knowledge:**  Students will be able to understand:   * appropriate non-standard units that can be used to measure: * heights/ lengths of two or more objects in any direction. * mass of two or more objects. * capacity of two or more objects. * mathematical vocabulary used to compare and order : * heights and lengths of two or more objects in any direction. * Mass/ weight of two or more objects * Capacity of two or more objects. * the number of minutes in an hour and the number of hours in a day. * Days of the week and months of both Solar and Islamic calendar year.   *Advanced/Additional*:   * *appropriate standard unit and language to measure temperature ( )* | **Skills:**  Students will be able to:   * measure: * heights and lengths, using non-standard units (such as equal sized counters, blocks, popsicle sticks, etc.) * mass , using non-standard units (such as pebbles, blocks, counters etc.) * capacity ,using non-standard units (such as vessels, glasses, jars etc.) * Compare and order heights and length of two or more objects in any direction by selecting and using appropriate mathematical vocabulary (such as, tall, taller, tallest; short, shorter, shortest; long, longer, longest; length, height) * Compare and order mass/weight of two or more objects in any direction by selecting and using appropriate mathematical vocabulary (such as mass, weight, light, lighter, lightest, heavy, heavier, heaviest etc.) * Compare and order capacity of two or more objects by selecting and using appropriate mathematical vocabulary (such as, filled, almost filled, more, less, equal to, full, half, empty, capacity, volume etc.) * Read and write temperature to the nearest appropriate unit i.e. ) using pictorial representations and relating temperature scale to number line. * Read and write time to the nearest hour using: * analogue clock and * digital clock. * Draw the hands on a clock face to show time in an hour. * Name days of the week and months of the: * Solar year * Islamic year * Find a particular day and date from solar calendar and date from Islamic calendar.   *Advanced/Additional:*   * *Use appropriate mathematical vocabulary to compare temperature (such as hot, hottest, warm, warmer, cool, cooler, coolest, twice as, half as etc.)* * *Read and write time to half past hour using:* * *analogue clock* * *digital clock.* * *Draw the hands on a clock face to show half past time.* |
| ***STEP 2*** | |
| **Assessments**  **Formative Assessments**  Some types of formative assessments the teacher may use are:   * Question & Answer(open and closed) * Quick Quiz * Learning Walks * Projects, * Selected responses (may include MCQs, true: false, matching short answers, fill-in-the blanks, etc.) * Observation diaries * Inquiry charts, * Four Corners: Gather students in the middle of the room, and read multiple-choice questions and their possible answers aloud. Students then move to the corner that represents what they believe are the correct answer. The top left room corner can be option A, the bottom-left can be B and so on   **Summative Assessments** Some forms of summative assessment are:   * End of Unit Test * Class Test * Periodic/Monthly Tests * Mid-year Exam * End of Year Exam * Standardized Tests. * External Exams   **Some of the sample questions that can be used as part of summative assessment are:**   1. Draw a **longer** nail.   **C:\Users\Muazffar\Desktop\iron nail.jpg**   1. Measure the length of the ribbon.     The ribbon is about \_\_\_\_\_\_\_\_\_\_  long.   1. Arrange these beaded wires from the shortest to the longest.      | \_\_\_\_\_\_\_\_ |  | \_\_\_\_\_\_\_\_ |  | \_\_\_\_\_\_\_\_ | | --- | --- | --- | --- | --- | | shortest |  |  |  | longest |  1. Arrange the objects from the lightest to the heaviest by using numbers 1, 2, 3.      |  | F:\my work\AES\Pictures\deer.jpg | F:\my work\AES\Pictures\mouse.png | F:\my work\AES\Pictures\cat (3).jpg | | --- | --- | --- | --- | |  | \_\_\_\_\_\_ | \_\_\_\_\_\_ | \_\_\_\_\_\_ | |  | F:\my work\AES\Pictures\watermelon...jpg | F:\my work\AES\Pictures\strawbery.jpg | F:\my work\AES\Pictures\mango.jpg | |  | \_\_\_\_\_\_ | \_\_\_\_\_\_ | \_\_\_\_\_\_ | |  | F:\my work\AES\Pictures\penguin.jpg | F:\my work\AES\Pictures\bee (3).jpg | C:\Users\Muazffar\Desktop\humming bird.gif | |  | \_\_\_\_\_\_ | \_\_\_\_\_\_ | \_\_\_\_\_\_ | | |
| ***STEP 3*** | |
| **Learning Activities**  *Students will be able to:*   * *Measure, compare and order lengths, mass, capacity and time using non-standard units and mathematical language.*   **Resources:**  Activity 1: Internet access/lap top to play the Video Non-standard measurement (if possible) from the link <https://youtu.be/JCmqVAYujv4> ; non-standard units such as pencils, cubes etc.  **Activity 1:**   1. Before the activity, determine the distances you want students to measure, such as whiteboard/blackboard to window; window to door; teacher’s desk to flag; etc. Write them on chart paper or on the whiteboard for all students to see. 2. Point to a large object, such as a window in the classroom, and ask students how they would measure the window. Allow time for them to answer. The most likely response would be,” with standard measuring tools, such as a ruler”. Ask the same about a small object, like a pencil. 3. Now ask how they would measure if they didn’t have a ruler or other measuring tool. Some may come up with the idea of measuring with objects. If they don’t, give an example, such as, measuring the window with sheets of paper. Ask if they could use sheets of paper to measure the pencil and why or why not. Then ask how they could measure the pencil without a ruler or tape measure. 4. Play the video – Non-standard Units. Explain that today they would join the characters, Moby and Annie, to discover how to measure length, width, and height without a ruler. Then play the movie, pausing at various points to reinforce student understanding of key concepts. NOTE: If the video cannot be played, then view the video on your own and use its contents to demonstrate how to measure using non-standard units. 5. After the movie (or demonstration), draw students’ attention to the chart you created with different distances to measure (see Preparation). Ask students how they think they might be able to measure these distances without a ruler by using footsteps. 6. Challenge students to measure each of the distances on the chart in footsteps, and write their results in a notebook. Model how to measure by taking steps heel to toe with no spaces in between. Explain that it is important not to have any space between footsteps for accuracy in measurement. Before they begin measuring, have students practice stepping heel to toe with no spaces in between. 7. Ask students to predict whether all their measurements will be the same. Then, give them time to measure and record each distance. 8. After everyone has measured, bring the class together and ask students to share their results with each other.  Ask these follow-up questions:    1. Was your prediction correct? Why or why not?    2. Why do you think your answers differ?    3. Which requires more steps, larger or smaller feet? Explain.    4. Why is it important to use the same-sized feet (or other object) when measuring? 9. Now share other non-standard units such as cubes, pencils, paper, buttons, counters etc. and ask them to measure their books, copies, even pencils, with them. (Determine smaller things that you want them to measure before this instruction). 10. **Note**: You could use this activity as another lesson on the same non-standard unit for length. Working in pairs, have one student select an object in the classroom to measure and have the other partner measure it using nonstandard units. Pairs should discuss the best nonstandard unit to use and record their measurements in their notebooks. Allow partners to take turns in selecting and measuring. As a class, discuss what each pair measured and the nonstandard unit they used to measure it. Which measurements were more difficult to make? Why? 11. **Note:** Use similar plan (step 1-10) to help student’s measure liquids and weights/mass using non-standard units. 12. **Note:** Starting from here on, this could be a separate lesson or you may continue with this same lesson to help students compare and order objects using the mathematical vocabulary. Refer to objects they have measured and ask which was the longest and which was the shortest. Write the relevant mathematical vocabulary used for length on the board and ask students to order the things they have measured using the relevant vocabulary (given above). 13. **Note:** You may use similar discussion cues as mentioned in step 12 to make students compare and order capacity and mass using the relevant mathematical vocabulary.   **Activity 2:**  **Measurement I Spy**   1. Play an I Spy game with your students where they have to guess an object based on a clue about how you would measure it. For example, if the object is small, such as a cup, your clue might say that you can measure its height with paper clips. If the object is big, like a table, you might say that you can measure it with books.   **Activity 3:**  **Which Way to Measure?**   1. As you take a walk around the school, invite your students to think of nonstandard units they might use to measure the length, width, or height of what they see. For example, a building, a bicycle, or a bird, in the park. Which unit is most appropriate for each thing they see? 2. As an extension, ask children about standard units to measure length. Which would be best to measure, the bird or the bicycle?   **Activity 4:**  **A Tale of Two Spoons**   1. Instruct your students to put ten spoonfuls of water into a measuring cup. 2. Give your students a soup spoon or tablespoon to use. How much water is in the measuring cup? Record the answer. 3. Then give your students a serving spoon to use. How much water is in the measuring cup? Record the answer and compare it with the first measurement your students took. 4. Discuss with your students why using the same unit of measure consistently is essential when measuring something.   **Student Learning Outcome:**  *Students will be able to:*   * *Use relevant mathematical vocabulary to compare and order measures.*   **Activity 5:**  **Long, longer, longest**   1. Pass around baskets of ribbons of assorted lengths for children to choose and compare. Ensure they match up one end of the ribbons so that they are accurately comparing length. Invite them to share what they noticed and write any length words for children to see. Invite a child who describes his ribbon as long to come to the front and compare with other children until a longer ribbon is found. 2. Repeat to find an even longer one i.e. the longest. Find short, shorter and shortest ribbons in the same way. 3. Show how to measure length using cubes. Confirm that the cubes are all the same size, so that if something is 14 cubes long, you know it is longer than something 7 cubes long. Explain that you can use anything to measure with, but it is better if it is always the same size.   **Activity 6:**  **Tall, taller, tallest**   1. Explain that we can measure height in the same way. Use three objects of the same type, but different heights. Ask children to order the objects from tall to tallest. Measure the height of the shortest object using cubes. Ask them to estimate the heights of the taller and tallest objects. 2. Confirm with cubes. How close were their estimates?   **Activity 7:**  **Short, shorter, shortest**   1. Explain that you have seen many taller examples of the object you used to model tall, taller and tallest, so you are going to rename the tallest one ‘short’. Ask what you can now say about the height of the other two objects. Re-order them to show short, shorter and shortest.   **Activity 8:**  **Light and heavy**   1. To ensure children do not think that big means heavy and light means small, prepare three identical boxes containing different amounts of rice or similar. Make sure the difference in mass is big enough for children to feel. 2. Start with two of the boxes. Invite children to pick them up and compare them by holding one in each hand. Show what happens when you use a set of balance scales to compare the two boxes. 3. Introduce the third box. Ask children to compare the masses of all three boxes and to order them from lightest to heaviest without using the scales. Move on to using the scales. Finally, find out how many identical interlocking cubes each box weighs. Start with the lightest so children can see that the next box needs more cubes to balance it and the third one, even more.   **Activity 9:**  **Full and empty**   1. Sand and water play is essential preparation for comparing the capacity of containers. Children do not attach any formal measurements to capacity,but just make direct comparisons. 2. Show children how to tip the contents from one container into another to compare. They need to see the excess spill over the edges to understand that there is not enough room for everything in the second container. It holds less so it must be smaller. They also need to see the opposite, that if the second container has room for more, it must be bigger. 3. Once these ideas are secure, move on to finding out how many times children will need to tip the contents of a smaller container into a larger container until it is full. Use the vocabulary for capacity: full, empty, half full (even if not used exactly), more than and less than.   **Student Learning outcome:**  *Students will be able to:*   * *Read and write time in hours (o’clock) from analogue clock and digital clock.*   **Activity 10:**   * Video ‘Time to the hour’ from the link <https://youtu.be/0TDtQMW4ZGo>. * Video ‘Parts of a clock’ from the link <https://youtu.be/PJ7LBQo_t58>.  1. Explain the notion of time to students. Tell them that time is how we divide the day into units. Learning to tell time will help them schedule their day and gain greater control of their surroundings. 2. Explain that although many clocks that they see are digital, learning to tell time from an analog clock is a necessary skill. 3. For a quick and fun review, show the video “Parts of a Clock”. This video covers the basics of the clock—its parts, how the hands move, and how we use time to plan our day. You may wish to do some of the activities or assign the quizzes to ensure that your children have a firm grasp on the parts of a clock. They will then be ready to tell time to the hour. 4. Now show the video ‘Time to the hour’. 5. Revise that on a clock, the hour hand, or short little hand, points to the hours while the minute hand, or the big long hand, points to the minutes. 6. Explain that when we say the time, we tell the hours first, followed by the minutes. For example, when the hour hand is on 10 and the minute hand is on 12, we say the time is ten o’clock. 7. Emphasise that the term “o’clock” means “of the clock” or “according to the clock.” This phrase is used only with times that are exactly on the hour. Ten o’clock can be written in two other ways: 10 o’clock and 10:00. When we write the time using only numbers, we use a colon to separate the hours from the minutes. Furthermore, we always write the minutes to two places (10:00, 10:01, 10:02, and so on). 8. Explain that as time passes, the hands move. When the minute hand moves all the way around the clock, the hour hand moves from one number to the next. This is an hour. 9. Prompt your children to observe that the minute hand moves faster than the hour hand. Since there are twenty-four hours in a day, but only twelve numbers on a clock, the hour hand must go around the entire clock twice. This is why we have a six o’clock in the morning and a six o’clock in the evening. 10. Explain that twelve o’clock during the day, when the sun is high in the sky, is commonly known as *noon*. Twelve o’clock when the moon is high in the sky is known as *midnight* because it is the middle of the night. 11. The hands on a clock only move in one direction—toward the right, or clockwise. The opposite direction is called counterclockwise. Though the hands never move that way, the term is important to learn. 12. The best way to learn how to tell time is to practice. Use a demonstration clock or any analog clock and present different times on the hour for your child to read. This will help them prepare to learn time to the quarter-hour, half-hour, and minute in the future.   **Activity 11:**  **On Schedule**   1. Have your students keep an appointment book to schedule what they do at specific hours during the day. For example, a student may want to record the time he or she wakes up, eats lunch, and returns home from school. 2. Then make an analog clock by using paper plates, construction paper, crayons, and a brass brad to attach the hands. 3. Set this clock to remind the students about a specific activity. For example, you or a student can set the clock to 7:00 as a reminder that this is the time to wake up. 4. If possible, display different handmade clocks around the classroom and change them to suit you and your students’ needs.   **Activity 12:**  **Story Time:**   1. Together with your students, make up stories that use time and have them note down the times . 2. They could draw pictures of an analog clock to show the time, or move the hour and minute hands of an analog clock to show the time. For example, you can tell a story about a rooster that cock-a-doodle-doos at six o’clock in the morning and then at twelve o’clock in the afternoon and then again at seven o’clock in the evening. 3. Your student can show the times and then make up stories of his or her own.   **Activity 13:**  **Daytime, Night Time:**   1. Have your child write about activities that he or she does during the day. What time does your child go to school? What time does your child have recess? What time does your child have lunch? 2. Then have your child note the times and think about what he does at the same time at night. For example, if your child goes to school at 8:00 in the morning, what does he do at 8:00 at night? 3. Have your child write a chart describing daytime and nighttime events. He or she can decorate the chart with illustrations.   **Activity 14:**   1. Ask children to watch the sand running through a one minute timer to get an idea of how long one minute is. Explain that the best way to get to know how long a minute is, is to do something in that minute, such as hopping or clapping. Do an activity while children count how many times you do it. Ask if they think you would do the activity more or less times if you did it faster. Repeat the same activity faster to show that you do more. Give children lots of opportunities to time themselves for a minute. 2. Explore the concept of slowness. Explain that when you do something slower, you take more time to do it so you can do less of it in a particular length of time. It takes more time to do the same thing when you do it slower.   **Activity 15:**  **Earlier, later**   1. Talk about how we use our senses to tell us that time is passing, e.g. we feel hungry because it is a long time since we last ate. 2. Explain that clocks and calendars help us to think about time passing. Show children an analogue clock and talk through what each hand does. Starting with both hands pointing to 12 o’clock, show how to move the minute hand all the way round the clock, so one hour has passed; the hour hand must now move on to the 1 to show 1 o’clock, an hour later. Explain that you are just showing how the clock hands work and that over an hour, the hands move so slowly that we don’t notice them moving. 3. Once children are familiar with setting the clock to a particular hour, explore one hour later (one more hour) and one hour earlier (one less hour), being careful not to cross 12 o’clock at this stage. | |
| **References:**  BrainPop (2021) retrieved from: <https://educators.brainpop.com/topic-lesson-directories/bp-jr-topic/?brainpop-subject=math&subject-title=Math>  BrainPop Jr. (2021) Retrieved from: <https://jr.brainpop.com/math/>  NewZealand Government (2021) Retrieved from: <https://nzmaths.co.nz/units-work>  Rising Star Mathematics. Teacher’s Guide. (2017) Hodder Education: London. UK | |

**Domain: Geometry:**

| ***STEP 2*** |
| --- |

| **Standard:***Students will be able to use properties to describe two dimensional and three dimensional shapes and describe positions, movement, directions and turns using appropriate vocabulary.* | |
| --- | --- |
| **Student Learning Outcomes**: *Students will be able to:*   * *Recognize and identify 2-D shapes (rectangle, square, circle and triangle) and 3-D shapes (cube, cuboid, cone, cylinder and sphere) with respect to their characteristics (i.e. sides and corners for 2-D)* * *Describe the position of an object including, moving in a straight line using positional language (for instance: inside, outside, above, below, over, under, far, near, before, after, right and left)*. | |
| **Knowledge:**  Students will be able to understand:   * 2- D shapes (rectangle, square, triangle, circle) and their properties. * 3-D shapes (cube, cuboid, cone, cylinder, sphere). * Position, direction and movement, using positional words. | **Skills:**  Students will be able to…   * Recognize and identify 2-D shapes (rectangle, square, circle and triangle). * Describe the characteristics/properties of the 2-D shapes including the number of sides and corners. * Recognise ad identify 3-D shapes ((cube, cuboid, cone, cylinder and sphere) with respect to their characteristics. * Identify 2-D shapes on the surfaces of 3-D shapes (e.g. a circle on a cylinder/base of a bottle; a rectangle on a tissue box etc.) * Use mathematical vocabulary (positional words) to describeposition, direction and movement, including movement in a straight line. (for instance inside, outside, above, below, over, under, far, near, before, after, right, left, straight, backward etc.)   *Advanced/Additional:*   * *Describe the properties of 3-D shapes including the number of sides, corners and edges.* |
| ***STEP 2*** | |
| **Assessments**  **Formative Assessments**  Some of the types of formative assessment teacher may use are:   * Question & Answer(open and closed) * Quick Quiz * Learning Walks * Projects, * Selected responses (may include MCQs, true: false, matching short answers, fill-in-the blanks, etc.) * Observation diaries * Inquiry charts, * Four Corners: Gather students in the middle of the room, and read multiple-choice questions and their possible answers aloud. Students then move to the corner that represents what they believe is the correct answer. The top left room corner can be option A, the bottom-left can be B and so on   **Summative Assessments** Some forms of summative assessment are:   * End of Unit test * Class tests * Periodic/Monthly tests * Mid-year Exam * End of Year Exam * Standardized tests. * External Exams   **Some of the sample questions that can be used as part of summative assessment are:**   * + - 1. **Choose the correct answers.**      1. Which shape has a **curved side?**   **a)**  **b)**  **c)**  **d)** Which of the given shapes is not a triangle? **a)**  **b)**  **c)**  **d)** The missing shape in the given pattern is:   **a)**  **b)**  **c)**  **d)** I have 4 sides. All sides are equal. What am I? **a)** circle **b)** square **c)** triangle **d)** rectangle I am a solid. I have one curved and one flat face. What am I? **a)**  **b)**  **c)**  **d)**   1. Write the number of straight sides and corners in the graph given below.      | **Shape** | **Straight Sides** | **Corners** | | --- | --- | --- | | **Square** |  |  | | **Circle** |  |  | | |
| ***STEP 3*** | |
| **Learning Activities:**  *Students will be able to:*   * *Recognize and identify 2-D shapes (Rectangle, square, circle and triangle) with respect to their characteristics (number of sides and corners)* * *Recognize and identify 3-D shapes (cube, cuboid, cone, cylinder and sphere) with respect to their characteristics (i.e. sides and corners for 2-D)* * *Identify 2-D shapes on the surfaces of 3-D shapes (e.g. a circle on a cylinder/base of a bottle; a rectangle on a tissue box etc.)*   **Activity 1:**  **Plane Shapes and Solid Shapes**  **Teachers /students resources:**   * Video ‘Plane Shapes’ from the link <https://youtu.be/sp_r5zC2g_E>. * Solid resources that have a circle, a rectangle, a square, a triangle and an oval as one of its face. * Video ‘Solid shapes’ from the link <https://youtu.be/KSPG24GMufo>.  1. Show the video ‘Plane shapes’. 2. After the video, draw the plane shapes on board and explain each one by one. 3. Explain that a circle is a round shape with no corners or sides. The distance from the center to any point on its line (circumference) is equal. A wheel, analog school clock, and coin are all usually circles. 4. An oval is shaped like an egg—an oblong circle. 5. A square is a shape with four corners and four sides. The length of each side is equal. A sandwich, window, and a tile can be squares. 6. A rectangle is a shape with four corners and four sides. Each pair of opposite sides has the same length. Most refrigerators, computer screens, and bookcases are rectangles. 7. A triangle is a shape with three corners and three sides. The sides do not have to be the same length, nor do all of the angles need to be the same. A slice of pizza, a sail in a sailboat, and a yield sign are all triangles. 8. Explain that shapes are everywhere—in the items we use every day and in the things we see all around us. 9. Encourage your children to look for shapes in their surroundings. How are shapes useful? When would using a square shape be more useful than using a round shape? 10. Show the video ‘Solid shapes’. 11. Now show the objects that you have brought again. Build on their knowledge about solid figures, which are three-dimensional shapes such as cubes, rectangular prisms, pyramids, cylinders, cones, and spheres. 12. Make children identify basic plane shapes on the faces of these objects.   Encourage your children to find basic solid shapes all around them.   1. Most children are familiar with cubes. Give examples that number cubes or dice, ice cubes, and some boxes are shaped like cubes. 2. Introduce fundamental concepts and vocabulary in Geometry, such as vertex/vertices, edges, faces, and bases as you display a cube and explain the characteristics of a cube. 3. Explain that a cube has six flat surfaces, or faces. Each face is shaped like a square with equal lengths of sides. A cube also has twelve edges and eight vertices. 4. Remind your children that a vertex is a corner of a shape. The plural form of the word *vertex* is *vertices*. 5. Present different examples of cubes to your children and help them identify the faces, edges, and vertices. 6. Pick up a cuboid (such as a rectangular tissue box) and explain that a cuboid is a solid figure that has the same number of faces, edges, and vertices as a cube. The faces of a cuboid are shaped like rectangles. Some cuboids have faces that are shaped like rectangles and squares. 7. Explain to your children that a cube is a special kind of a cuboid. Encourage your children to find examples of a cuboid and point out the different faces. Bulletin boards, cereal boxes, shoeboxes, and books are all cuboids. 8. Next pick up an object which is a cylinder. Explain that a cylinder is a solid shape that has two circular faces, no edges, and no vertices. A cylinder has a curved surface and is able to roll. Tuna cans, soup cans, poles, and pipes are all examples of cylinders. 9. You may wish to show how a cylinder can be created by rolling up a rectangle into a tube and attaching two circles to the ends. Conversely, you can take a toilet paper tube and cut it down lengthwise to show that it can turn into a rectangle. 10. Help your children understand that plane shapes can be manipulated to form solid shapes.   Pick up an object which is a cone. A cone is a solid shape that has one curved surface, no edges, and one vertex. Traffic cones, funnels, and ice cream cones are all examples of cones. You may want to draw different examples of cones so students can see how they can vary in dimensions.   1. Lastly, show a sphere (such as a ball) and explain that a sphere is a solid figure familiar to all children. Balls, marbles, and oranges are all spheres. A sphere has no face, no edge, and no vertex. Spheres have a curved surface and are able to roll. 2. Studying shapes, both two-dimensional and three-dimensional, are fun ways for your children to explore the world around them. Ask: *How do we use cubes every day? What kind of shape do we drink out of?* 3. Encourage your children to find examples of solid shapes all around them and ask questions about how they use them. Would they rather play soccer using a ball or a box? Why?   **Activity 2:**  **Sorting Shapes**   1. Have students gather objects around the room that are circles, squares, rectangles, and triangles. 2. Have students identify each item and its shape. 3. Then have them sort the objects into different piles. Which shape is the most common? Which shape is the least common? Why?   **Activity 3:**  **Mosaic Mural**   1. Make a class mosaic. Have students cut out different shapes and color them. 2. The shapes can be of different sizes and orientations. 3. Then, tell the students to glue them together to make a large class mosaic. 4. Discuss different patterns students can make with the shapes.   **Activity 4:**  **Scavenger Hunt**   1. Have students go on a scavenger hunt for shapes in the school or classroom. 2. Divide the students into small groups and give each group a list of different-shaped items to find. 3. You can use clues to point them to the right item. For example, students can find something round that ticks or something rectangular like pages. 4. Groups can write where they found each item, or if possible, bring the item along.   **Activity 5:**  **Getting into Shapes**   1. Have your children put together different shapes to create a new shape. If you do not have building blocks at school, you can use household items such as cans, boxes, balls, and dice. 2. Have your students put different objects or shapes together and then discuss the new shape. What happens if you put two cubes together? What shape does it become? 3. Allow your students to stack and attach different shapes together to create a shape sculpture.   **Activity 6**  **Organizing the Pantry**   1. The kitchen or pantry is a great place to find different solid shapes. 2. Ask your students to collect different items and sort them by shape. This will enable them to see how the dimensions of cuboid, cylinders, and other solid shapes can be drastically different. For instance, a tuna can is a cylinder that is short and squat, but a glass can be a cylinder that’s tall and skinny. 3. Encourage your student to describe how the shapes are alike and different.   **Activity 7:**  **Cuboids and cubes**   * Give children a cube and cuboid. Ask: *What is similar? What is different?* The cube looks the same; however, it is turned because every face is a square. Cuboids can be laid down or stood up on the longer or shorter faces. Collect examples of cuboids, e.g. a box of biscuits, shoebox and examples of cubes e.g. a dice, sugar cube. * Look with children at the drawings of 3-D shapes. Explain that it is difficult to show how the shapes take up space on paper. Demonstrate how they are drawn, using dotted lines for the unseen edges. Give children a cube or cuboid to hold and feel the faces and edges that they cannot see if they hold the shape without turning it.   **Activity 8:**  **More 3-D shapes**   * Give children a sphere, cone and a cylinder. Again, ask them what is similar and what is different about the shapes. They all have a curved surface. The sphere has only a single curved surface and looks the same however you turn it. Same is for the cone. Establish that the cylinder has two ends that are circles joined by a curved surface. * Look with children at the drawings of 3-D shapes in the textbook. Demonstrate how they are drawn. Draw a cuboid with dotted lines for the unseen edges and ask children to explain why some lines are dotted. * Many children have difficulty saying the word ‘sphere’. Practice pronouncing it as a class and individually.   **Activity 9:**  **2-D faces on 3-D shapes**   1. Using the images in various Textbooks, explain that the flat faces on 3-D shapes are called 2-D shapes and that 2-D shapes have no depth. 2. Show children models of a selection of 2-D shapes. 3. Explain that representations of 2-D shapes necessarily have some thickness. Stress that they are models of 2-D shapes.   **Activity 10:**  **2-D shapes**   1. Show each 2-D shape model in turn, asking children to describe it in their own words. Introduce new vocabulary that may be needed. 2. Encourage children to hold each shape and run a finger along the outer edge, counting the sides and then the vertices. Name each shape and compare their properties. Examine similar shapes in various orientations. Ensure that children recognize that the properties do not change and therefore its name is the same. 3. Set up a group sorting activity, asking children to sort out models of 2-D shapes in various ways. Sort different colours and sizes of similar shapes by the shape name, before moving on to children’s own ideas. Explain that the correct definitions and names of 2-D shapes are important, as they will be used throughout their school and everyday life. 4. Place a shape in a feely bag or envelope. Gradually reveal part of the shape, asking children what the shape could be. Ask how they decided their answer. Ensure that children focus on the properties of the shape rather than simply guessing its name. 5. Now ask them to draw 2-D shapes on a piece of paper.   *Students will be able to:***:**   * *Use mathematical vocabulary (positional words) to describe position, direction and movement, including movement in a straight line. (For instance inside, outside, above, below, over, under, far, near, before, after, right, left, straight, backward etc.)*   **Activity 11:**  **Talking about position**   1. Play games with children to secure the meaning of position words. In the playground, give instructions, e.g. *Move forwards five paces, turn left.* On the carpet, ask children to stand up, sit down, face the inside/outside of the circle. Sitting in class, invite them to put their hand behind their back, on top of their head, etc. 2. Most of these position words, e.g. top, middle and bottom, are quite easy words for children to learn and use. Create similar scenarios in the classroom and practice the words using real objects. 3. Determining left and right, as suggested in the misconception cartoon, is more challenging for children. Most children *write* with their *right* hand. Ask children to show you the hand they write with. Establish that is their *right* hand. Discuss with left-handed children that it is more unusual to write with the left hand and explain to them individually that they need to think to themselves that the hand they write with is not their right hand. 4. Show children that another way to find your left hand is to hold up both hands with the palms away from you and the thumbs at right angles. The forefinger and thumb of left hand makes an L shape, L for left. This is something that you can encourage them to use for checking.   **Activity 12:**  **Moving objects:**   1. In this section the moving words are left and right, up and down and forwards and backwards. These commands, along with turning, are the ones that children will use with programmable floor robots and other programmable toys, and can all be practised through play, e.g. games like ‘Simon says’. 2. Ask children to write instructions to get from their classroom to somewhere else in the school, for instance, the Principal’s room, library etc. Ask them to check the number of steps and use position and movement words to write the route. 3. The activity above could be extended by giving clues to a more complicated route. Clues could be given to work out the position of each object. For instance, ask them to use the clues to work out the order of the colored teddy bears:  * The blue teddy is next to the orange teddy. * The yellow teddy is on the right of the blue teddy. * The middle teddy is blue. * The green teddy is the last teddy on the right. * The purple teddy is on the left of the orange teddy.   Explain to the children that the best strategy would be to draw five blank teddy bears. Read all the clues and gradually add facts that are certain, e.g. the blue teddy is in the middle. In this way, complete the activity with children. | |
| **References:**  BrainPop (2021) retrieved from: <https://educators.brainpop.com/topic-lesson-directories/bp-jr-topic/?brainpop-subject=math&subject-title=Math>  BrainPop Jr. (2021) Retrieved from: <https://jr.brainpop.com/math/>  NewZealand Government (2021) Retrieved from: <https://nzmaths.co.nz/units-work>  Rising Star Mathematics. Teacher’s Guide. (2017) Hodder Education: London. UK | |

**Domain: Statistics and Probability:**

| ***STEP 1*** |
| --- |

| **Standard*.*:***Students will be able to read and interpret data using a variety of data management techniques. They would also be able to explore probability to find likelihood of an event occurrence.* | |
| --- | --- |
| **Student Learning Outcomes**: *Students will be able to:*   * *Read and interpret data using pictographs, block graphs and tally charts (including real-world problems).* * *Describe the likelihood of an event occurring using mathematical language.* | |
| **Knowledge:**  Students will be able to understand:   * Simple pictographs, block graphs and tally charts. * Probability of the likelihood of an event occurring. | **Skills:**  Students will be able to:   * Read and interpret data using pictographs, block graphs and tally charts (including real-world problems). * Describe the likelihood of occurrence of everyday events, using mathematical language (i.e. impossible, less likely and more likely).   *Advanced/Additional:*   * *Construct simple pictographs, blocks graphs, bar graphs and tally charts (including real-world problems).* |
| ***STEP 2*** | |
| **Assessments**  **Formative Assessments**  Some types of formative assessment teacher may use are:   * Question & Answer(open and closed) * Quick Quiz * Learning Walks * Projects * Selected responses (may include MCQs, true/ false, matching short answers, fill-in-the blanks, etc.) * Observation diaries * Inquiry charts * Four Corners: Gather students in the middle of the room, and read multiple-choice questions and their possible answers aloud. Students then move to the corner that represents what they believe is the correct answer. * Periodic/Monthly tests * Mid-year Exam * End of Year Exam * Standardized tests * External Exams   **Some of the sample questions that can be used as part of summative assessment are:**   1. Look at the picture. Some toys are given in the box.     Count the toys in the box. Draw **circles** in the graph to show the counted number.  One circle (⚪ ) stands for 1 toy.   | **Toys** | | | | | | --- | --- | --- | --- | --- | |  |  |  |  |  | | Teddy bears | Balls | Doll houses | Blocks | Cars |  1. The graph shows the vehicles that Simi saw on the road.   Each () stands for 1 unit.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | | Car | Bicycle | Motor bike | Rickshaw | Van |  1. How many **cars did** Simi see on the road? \_\_\_\_\_\_\_ 2. Which vehicle did Simi see the **most?** \_\_\_\_\_\_\_ 3. Which vehicle did Simi see the **least?** \_\_\_\_\_\_\_ 4. How many types of **vehicles** were there? \_\_\_\_\_\_\_ | |
| ***STEP 3*** | |
| **Learning Activities**  **Student Learning Outcome:**  **Students will be able to:**   * *Read and interpret data using pictographs, block graphs and tally charts (including real-world problems).*   **Activity 1:**  **Favorite Fruit (plan for either pictograph/bar graph or block graph)**   1. Create a survey together about students’ favorite fruit. Come up with a question together and have students take the survey. 2. Record their answers on the board using a tally chart. You may want students to come up to the board and record their choice on the tally chart themselves. Be sure to instruct them to mark every fifth tally mark across the other four. 3. Then use the data in the tally chart to create a pictograph. To challenge students, have each symbol in the graph stand for more than one vote, such as two or three. 4. Display the pictograph in the classroom. If possible, serve the fruit that gets the most votes.   **Activity 2:**  **Data Miners**   1. Have students bring in a pictograph, bar graph, or other graph to class. Children may want to clip graphs from magazines or newspapers, or find them online and print them out. 2. Then choose a few graphs to discuss and analyze together. 3. Challenge students to take the same information in the graph and display it using another kind of graph.   **Activity 3:**  **Vote for a Sport (plan for either pictograph/bar graph or block graph)**   1. Be active with your students! Create a survey about favorite sports, such as swimming, soccer, basketball, or baseball. 2. Then have your students do a survey of their friends about their favorite sport. 3. You may want to review how to record votes using a tally chart, and then create a pictograph to display the information. 4. Afterwards, gather the friends together to play the sport that got the most votes.   **Activity 4:**  **Take a Walk (plan for either pictograph/bar graph or block graph)**   1. Plan a hike or walk with your students. Before your trip, make predictions about what interesting things you might see and create a tally chart to organize the possibilities. 2. Bring the tally chart along on your walk and have your students record what they see. 3. Afterwards, analyze the data together. How many birds did you see? How many dogs? How many more squirrels did you see than people? What did you see the most, or the least? 4. Have your students turn the tally chart information into a pictograph and share it with the rest of the class.   **Student Learning outcome:**  **Students will be able to:**   * *Describe the likelihood of an event occurring using mathematical language.*   **Activity 5:**  **Weather Forecast**   1. Ask students to make a prediction about the weather. Together as a class, review different weather forecasts. 2. Use different forecasts from the internet, newspaper, radio, and news programs on television. 3. You may want to research the weather on the same date in previous years. 4. Then, test the students’ predictions. 5. Have students measure the temperature every day and record their observations of the weather. 6. You can make a rain or snow gauge by placing a plastic ruler in a clear cup and leaving it in an open space. 7. Discuss how accurate the forecasts were.   **Activity 6:**  **Toss a Coin**   1. Remind your classroom that it is equally likely for a coin to land on head or tail. 2. Have small groups or pairs toss a coin one hundred times. 3. Have them make a tally chart to record their results. 4. After the tenth, fiftieth, and seventy-fifth tosses, have your students assess how the results have changed. Did their coin land on head or tail the same number of times? Why might tossing the coin over a thousand times get a more accurate result?   **Activity 7:**  **Certain vs. Impossible**   1. Discuss what is certain and impossible with your students. 2. Then make a list of goals that you and your students will be certain to accomplish. Goals might include reading every day, learning a new word each day, or learning a new skill. 3. Post the goals in your classroom and refer to them when needed.   **Activity 8:**  **Spinning Spinner**   1. Find a board game that uses a spinner. 2. Together with your students, make your own spinner for the game. 3. Model the same spinner after changing a few elements; such as, colors or sizes of the sections on the spinner. You can use a pin or a brad to fasten an arrow that spins. 4. Then play the game together using the new spinner. How did the game change? Was it fair or unfair? Why? | |

**References:**

BrainPop (2021) Retrieved from: <https://educators.brainpop.com/topic-lesson-directories/bp-jr-topic/?brainpop-subject=math&subject-title=Math>

BrainPop Jr. (2021) Retrieved from: <https://jr.brainpop.com/math/>

NewZealand Government (2021) Retrieved from: <https://nzmaths.co.nz/units-work>

Elementary Nest (2021) Retrieved from: <https://elementarynest.com/teaching-strategies-for-2-digit-addition-and-subtraction/>

Rising Star Mathematics. Teacher’s Guide. (2017) Hodder Education: London. UK

Growing Success- Assessment, Evaluation and Reporting in Ontario Schools (2013); and Assessment, Evaluation and Reporting Handbook (2013) retrieved from <http://www.edu.gov.on.ca/eng/policyfunding/success.html>