**Action Plan Tasks**

**Introducing Multiplication – late grade 2 to grade 3**

**Overarching Learning Goal:** Multiplicationand division are extensions of addition and subtraction. Multiplication and division are intrinsically related. Numbers are made up of different combinations of groups of other numbers.

**Hints:** Avoid using the word “times” or referring to the algorithm sign of “x” with students. Use language such as “two groups of 10” instead of “2 x 10”.

**Task # 1: Repeated Addition**

**Whole Class Instruction with Group Work**

**Learning Map:** Multiplication is repeated addition. (Small, 2013, p. 172)

**Learning Goals:** We will learn that repeated addition is linked to multiplication.

**Success Criteria:** I can show equal groups of a number.

 I can use skip counting to find an amount.

**Look Fors**: Students’ work shows groups of twos.

Students can count the groups of two.

**Problem Solving:** The Chopstick Problem (Burns, 2015, p. 374)

**Materials:** enough pairs of chopsticks for each student

**Minds-On:** Explain the purpose of chopsticks and show students how to use them (pick up a dime to impress them). Explain that each person needs two chopsticks to use them to eat.

**Guiding Question:** How many chopsticks are needed for 4 people?

How many chopsticks are needed for every person in this class?

**Hand-On Exploring:** In small groups of 2 or 3**,** students to determine how many chopsticks are needed by the whole class showing their work using words, pictures, and/or numbers.

**Debrief with** **Math Talks:** In their groups, using the Math Talks protocol, students explain how they got their answer. Teacher to select order of student group answers from simplest to the most complex. Teacher to summarize students’ findings and strategies used to determine the answer.

Explain that if 18 students need chopsticks and each student has two chopsticks it is the same as 18 + 18 = 36 or 2 + 2 + 2 … = 36 or skip counting by 2 using students or 10 + 10 = 20 and 8 + 8 = 16 a double so 20 + 16 = 36.

**Summarizing:** Students can make their learning visible by showing equal groups of two and skip counting them to equal 18 pairs of chopsticks or 36 chopsticks in total.

**Task # 2: Equal Groups or Sets**

**Whole Class Instruction with Group Work**

**Learning Map:** Things come in different size equal groups in real life.

**Learning Goals:** We will learn that things come in different size equal

groups (Burns, 2015) or equal groups or sets (Small, 2013, p. 172).

**Success Criteria:** I can show equal groups of a number.

 I can use skip counting to find an amount.

**Look Fors:** Students can identify and arrange items in groups

**Problem Solving:** Things That Come in Groups (Burns, 2015, p. 375)

**Materials:** Chart paper, markers, tape, pictures showing groups from real life showing things that come in 2s, 3s, 4s, 5s, 8s, 10s and 12s.

**Minds-On:** Show pictures from real life by providing examples of things that come in equal groups (e.g. shoes, fruit, juice boxes, pastries, retail displays). Explain that “equal groups” means each group contains the same amount of something.

Show pictures of things that come in equal groups of twos. Ask the class to brainstorm things that come in equal groups of twos. Make a list of the suggestions. Common suggestions include body parts of eyes, ears, hands, feet, thumbs etc. Also suggest student look beyond their bodies for groupings such as wheels on bicycles, wings on birds, legs on insects etc.

**Guiding Questions:** How many things come in equal groups?

How many different equal groups can there be?

**Hand-On Exploring:** In small groups of 2 or 3, students are given a number (i.e. 3, 4, 5, 6, 8, 10, and 12) and show their understanding of groups on charts paper. Students to list examples of things that come in equal groups.

**Debrief with** **Math Talks:** In their groups, using the Math Talks protocol, students explain how they got their answer. Teacher to select order of student group answers from simplest to the most complex. Teacher to summarize students’ findings and strategies used to determine the answer. Create lists of groups based on discussion.

Continue to develop the lists of groups of 2, 3, 4, 5, 6, 8, 10, and 12. For a homework question, ask students to add to the lists from family suggestions.

**Summarizing:** Students can make their learning visible by showing equal groups of different amounts and identify these groups to real life occurrences.

**Task # 3: Rectangular Arrays**

**Whole Class Instruction with Group Work**

**Learning Map:** Arrays represent equal groupings in a rectangular fashion.

**Learning Goals:** We will learn that arrays are geometric models that show

multiplication. (Burns, 2015)

A rectangular array shows how many items inside it.

This is the area of the rectangle. (Small, 2013, p. 173)

**Success Criteria:** I can show equal groups of a number using rectangular arrays.

 I can skip count using rows/columns of arrays to find out the

 number in rectangular arrays.

 I recognize that different rectangles can have the same number

 of items inside them.

I can see that the number of items on the inside of the rectangular

 array is the area of the rectangle.

**Look Fors:** Students can identify and arrange items in groups using arrays.

 Remind students that arrays are always either rectangles or

 squares. Students can tell how much is inside of the rectangle.

**Problem Solving:** Candy Boxes (Burns, 2015, p. 376)

**Materials:** Tiles, 12 per students, half-inch/centimeter grid paper, chart paper, markers, tape, pictures showing groups from real life showing things that come in 2s, 3s, 4s, 5s, 8s, 10s and 12s.

**Minds-On:** Show pictures from real life by providing examples of things that come in equal groups (e.g. shoes, fruit, juice boxes, pastries, retail displays). Explain that “equal groups” means each group contains the same amount of something.

Show pictures of things that come in equal groups of twos. Ask the class to brainstorm things that come in equal groups of twos. Make a list of the suggestions. Common suggestions include body parts of eyes, ears, hands, feet, thumbs etc. Also suggest student look beyond their bodies for groupings such as wheels on bicycles, wings on birds, legs on insects etc.

Using candy boxes, show how arrays can be different shapes with the same amount of items or candies. (e.g. 1 group of 6 equals 6 and 2 groups of 3 equals 6 and 3 groups of 2 equals 6)

**Guiding Questions:** Why do the rectangular shapes change but the number

of candies remain the same?

How many different rectangles can you make using

3, 4, 5, 6, 8, 10, 12 tiles?

**Hand-On Exploring:** In small groups of 2 or 3, students are given a number (i.e. 3, 4, 5, 6, 8, 10, and 12) and show their understanding of groups using tiles on grid paper. Students cut out their rectangular shapes/boxes and organize them by numbers on chart paper.

**Debrief with** **Math Talks:** In their groups, using the Math Talks protocol, students explain how they got their answer. Teacher to select order of student group answers from simplest to the most complex. Teacher to summarize students’ findings and strategies used to determine the answer. Based on numbers, create a summary of rectangular groups from the discussion. Make a list of what students have learned about arrays. Remind students that the inside of the rectangle is the area.

**Extension:** Assign student pairs numbers from 1 to 36. Ask students to make as many different rectangular boxes. Prepare a horizontal chart for numbers between 1 to 36 to post the students’ rectangles beside the corresponding numbers. Also post rectangular completed in a whole class investigation for 4, 6, 12, and 24. The teacher can label the sides of the arrays based on length of sides (e.g. 1 tile by 6 tiles, 2 tiles by 3 tiles, 3 tiles by 2 tiles).

**Guiding Questions:** For which numbers are there rectangles that have sides with

 two squares on them? Write the numbers from smallest to

 largest.

For which numbers are there rectangles that have sides with

three squares on them. Write the numbers from smallest to

largest.

Do the same for the numbers with rectangles that have four

and five squares on a side.

Which numbers have rectangles that are square?

How many squares are in the next larger square you can

make?

What is the smallest number with exactly two different

rectangles? Three different rectangles? Four?

Which numbers have only one rectangle? List them from

smallest to largest.

What is the different between the area of the rectangular

array and the perimeter?

**Summarizing:** Students can make their learning visible by showing different rectangles related to different numbers of tiles. The number of tiles is the area of the rectangle.

**Task # 4: Groups and Combinations**

**Whole Class Instruction with Group Work**

**Learning Map:** Multiplication is combining equal groups which can also be

called repeated addition. Different combinations of equal groups

can make the same number.

**Learning Goals:** We will use pictures of circles and stars to show multiplication

 equations. We will read multiplication equations. (Burns, 2015)

**Success Criteria:** I can add equal groups together using strategies like skip counting.

 I can show groups using circles.

 I can put numbers into equal groups.

**Look Fors:** Students can arrange items in equal groups.

 Show students how to draw a 5 sided star.

**Game:** Circles and Stars (Burns, 2015, p. 378)

**Materials:** one 6 sided (1-6) dice, 1 die per pair of students, 11 x 17 paper folded into 8 sections per pair of students, pencils.

**Minds-On:** Remind students how numbers can be made into groups.Explain how equal groups need to have equal numbers in each group. Any groups with less that than the other groups are leftover. Model how to play the game with the class. Model how to represent groups using circles and stars.

1st Roll = 3 circles 2nd Roll = 6 stars 1st Roll = 1 circle 2nd Roll = 2 stars

**Hands-On Exploring:** In small groups of 2, students play the game representing the numbers using circles and stars.

**Circles and Stars: Rules of the Game** (Burns, 2015, p. 379)

Each group of two needs: one 6 sided die, Two 11 x 17 paper folded into 8 sections.

Play with a partner. Take turns and follow the rules.

1. Roll the die. Draw that many circles.
2. Roll the die again. Draw that many stars in each circle (you can also draw another shape if you have trouble drawing a star).
3. On your folded paper, record the total number of stars you drew.
4. Your partner goes next.

Continue to play the game until you have drawn circles and starts in each section. Optional: The player who has the most starts drawn on their sheet is the winner.

**Guiding Questions:** How many groups do you have?

How many are in each group?

How will you record your work as an addition equation?

How will you record your work as a multiplication equation?

**Debrief with** **Math Talks:** In their groups, using the Math Talks protocol, students explain how they got their answer. Teacher to select order of student group answers from simplest to the most complex. Teacher to summarize students’ findings and strategies used to determine the answer. Class to make a list of all the combinations students have discovered in the game.

**Minds-On #2:** Model how to play the game with the class. Model how to represent and describe groups. From this, introduce how to write multiplication equations.

1st Roll = 3 circles 2nd Roll = 6 stars 1st Roll = 1 circle 2nd Roll = 2 stars

3 circles of 2 stars equals 6 1 circle of 2 stars equals 2

3 sets of 2 stars equals 6 1 set of 2 stars equals 2

3 groups of 2 stars equals 6 1 group of 2 stars equals 2

3 groups of 2 equals 6 1 group of 2 equals 2

2 + 2 + 2 = 6 2 = 2

3 times 2 equals 6 1 times 2 equals 2

3 x 2 = 6 1 x 2 = 2

**Hands-On Exploring:** Students to play again, this time using the vocabulary of “groups of”, “times” and “equals” to represent what they see in pictures.

**Guiding Questions:** What does the first roll of the die tell you to do?

**as students explore** What does the second roll of the die determine?

Tell me about your work.

How is multiplication like addition?

**Debrief with** **Math Talks:** In their groups, using the Math Talks protocol, students explain how they got their answer. Teacher to select order of student group answers from simplest to the most complex. Teacher to summarize students’ findings and strategies used to determine the answer. Continue to make a list of all the combinations students have discovered in the game.

**Guiding Questions:** Which numbers came up more often?

 Which numbers had the same totals but different

 arrangements of circles and stars?

 What is the smallest number you drew?

 What is the largest number you drew?

 How many different arrangements were there for 12?

**Extension:** Play the game using two dice. With the class, collect data by listing the numbers from 1 to 36 (6 x 6) to show how many ways each number can be represented.

**Debrief with** **Math Talks:** In their groups, using the Math Talks protocol, students explain how they got their answer. Teacher to select order of student group answers from simplest to the most complex. Teacher to summarize students’ findings and strategies used to determine the answer.

Discuss why some numbers have no tally mark. Numbers that cannot have a tally are: 7, 11, 13, 14, 17, 19, 21, 22, 23, 26, 27, 28, 39, 31, 32, 33, 34, and 35 because the dice only contain numbers 1 to 6. Discuss why some numbers have fewer tally marks and other numbers have many. Some numbers have only two ways. Explain that numbers are made up of other numbers like the number 10 is made up of 2, 2, 3 and 5, 5.

**Guiding Questions:** Which numbers have many tally marks?

Which numbers have no tally marks?

What numbers make up other numbers?

What numbers make 5, 10, 25, 30, and 35?

What numbers make 8, 12, and 16?

What numbers make 22, 33?

**Other extensions to reinforce concepts**

1. Connect multiplication to combinations. I there are 4 colours of paper and 3 different envelope sizes, then there would be 12 different combinations of paper and envelopes. (Small, 2013, p. 173)
2. Connect arrays to rates. Using 3 x 4, if Mia has 4 pencils and Amend has three times as many, then Amend has 4 pencils times 3 or 12 pencils. (Small, 2013, p. 173)
3. Patterns in multiples. Pick and number and list twelve multiples of the number (e.g. 1 x 3 = 3, 2 x 3 = 6, 3 x 3 = 9, 4 x 3 = 12 etc). Ask students to colour a 0 to 99 chart to see how the pattern progresses. Ask students to predict the next number in the pattern. (Burns, 2015, p. 381)
4. Times Table Plaids. Pick a number and multiply it. Colour the multiplication table. Pick another number to see which numbers have the same multiples. List the similarities and differences between the number patterns. (Burns, 2015, p. 383)
5. How many were eaten? Using different sized candy boxes (or boxes with sections inside), place 7 cubes inside the box. Student Problem: There are seven candies left in the box. Figure out how many were taken/eaten. Show your work and explain your reasoning.
6. How Long? How many? The object: to make rectangular arrays with Cuisenaire Rods and place them on 10-by-10-centimeter grids until no more space is available. The game encourages students to think strategically as they consider where to place their rectangles to avoid being blocked. (Adapted from Burns, 2015, p. 383).

How to play: students need Cuisenaire Rods, one die, and a grid sheet for each (Make a 10cm x 10cm grid. Also leave space for students to record how many of their squares are covered and uncovered.)

The rules are:

1. On turn, a player rolls the die twice to determine which Cuisenaire Rods to take. The first roll tells "how long" a rod to use. The second roll tells "how many" rods to take.

2. Players arrange their rods into a rectangle, place it on their grid, and trace it. They write the multiplication sentence inside.

3. The game is over when one player cannot place a rectangle because there is no room on the grid. Then players figure out how many of their squares are covered and how many are uncovered and check each other's answers. After students have had experience playing the game, talk with them about strategies for placing rectangles and figuring out their final scores.