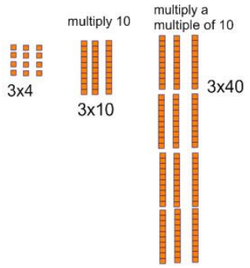
TLC Framework

Grade 3 - Amanda Wang (Springfield P.S.), Kiran Pothula (CBO), 2018

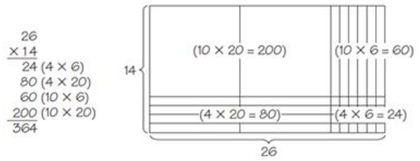
Ontario Curriculum Overall Expectations:

- solve problems involving the addition and subtraction of single- and multi-digit whole numbers, using a variety of strategies, and demonstrate an understanding of multiplication and division (grade 3, number sense & numeration) □

Curriculum Specific Expectations	Diagnostic Assessment	Connections to PRIME (focus: phases 1 through 3, which correlate with academic grades K through 5)			Summative Task
- relate multiplication of one-digit numbers and division by one-digit divisors to real- life situations, using a variety of tools and strategies (e.g., place objects in equal groups, use arrays, write repeated addition or subtraction sentences) (***Sample problem:*** Give a real-life example of when you might need to know that 3 groups of 2 is 3 x 2.)	**Operations - Concept 2:** Multiplication and division are extensions of addition and subtraction. Multiplication and division are intrinsically related.				
	Look fors: **Multiplication:** Mlle Wang made six table groups with 4 students in each group? How many students were in her class? Use as many strategies and ways as you can. **Division:** How can you show 36 toys shared by 6 children equally? Use as many strategies and ways as you can.	**Phase 1:** This student uses repeated addition to count the total of a set of equal groups and repeated subtraction to count the number of equal groups in a total. **Indicator 3:** Adds repeatedly in "multiplication situations," but does not use the formal symbolism of x. **Indicator 4:** Subtracts repeatedly in "division situations," but does not use the formal symbolism of ÷.	**Phase 2:** This student is beginning to be comfortable with multiplication and division notation to describe concrete or pictorial situations presented in a context. He/she solves and creates simple multiplication and division problems concretely. **Indicator 8:** Represents a single meaning of multiplication in concrete contexts (repeated addition, equivalent sets, or arrays) using multiplication language orally and symbolically. **Indicator 9:** Represents a single meaning of division in concrete contexts (sharing or grouping) using division language orally and symbolically. **Indicator 10:** Uses appropriate mathematical symbols to describe concrete multiplication/division contexts. **Indicator 11:** Solves simple open sentences in the forms of a x b = and c ÷ a = where c is a multiple of a, concretely or pictorially. **Indicator 12:** Solves and creates simple multiplication and division problems by modelling concretely.	**Phase 3:** This student uses symbolic notation to describe a variety of multiplication and division meanings. He/she uses strategies to multiply, and solves and creates multiplication problems. He/she multiplies by 10 and 100 and uses multiplication to divide. **Indicator 9:** Uses multiple meanings of multiplication (repeated addition, equivalent sets, arrays, area of a rectangle, and manipulative comparisons) in concrete and abstract contexts involving whole numbers. **Indicator 10:** Uses multiple meanings of division (grouping and sharing) involving whole numbers. **Indicator 11:** Uses appropriate mathematical symbols to describe abstract multiplication and division contexts involving whole numbers. **Indicator 12:** Solves open sentences of the forms a x b = and c ÷ a = , where one factor is a 1-digit number and the product is less than 1000. **Indicator 13:** Solves and creates simple multiplication problems involving whole numbers (3-digit x 1-digit). **Indicator 14:** Uses computational strategies based on mathematical principles to learn multiplication facts. **Indicator 15:** Interprets divisibility in terms of a multiplicative relationship. **Indicator 16:** Relates multiplication by 10 and 100 to place value concepts concretely.	Assessment Tasks 1) The Great Cover-Up http://oame.on.ca/eduproject/ontariomathedresources/files/Number%20Sense%20and%20Numeration%201-3%20Revised.pdf Page 309 2) Choose a number between 30 and 50. How many different arrays can you make? Choose another number. How many different arrays can you make? How are the two numbers you chose similar and different? 3) Represent $10.00 in more than 2 ways using different coins.
		Manipulatives: Counters Dice & dominoes Linking cubes Cuisenaire rods 10-frames Mira: to explore doubles, allow students to use a transparent mirror to see the double of what they put on one side of the mirror *(Making Math Meaningful, pg. 185)*	**Manipulatives:** Square tiles Number lines 100 charts (for skip counting) Counters Play money Calculators	**Manipulatives:** Number lines Calculators	
		Equal Groups: Whole unknown (multiplication) Equal Groups: Size of groups unknown (partition division) Equal Groups: Number of groups unknown (measurement division) **Working with friendly numbers and base ten blocks.** 1. There are 20 classes of students at Springfield Public School. Each class receives 3 games cart passes. How many passes are there? (Model 3 x 20 as 3 groups of 2 tens)	Comparison: Product unknown (multiplication) Comparison: Set size unknown (partition division) Comparison: Multiplier unknown (measurement division) **Skip Counting/Counting On** 1. Demonstrate skip-counting on number lines. Start with friendly numbers and gradually use factors of up to 7.	Combinations: Product unknown Combinations; Size of a set unknown To multiply 12 x 5, Chris thinks "6 x 10." Explain his thinking. *(Making Math Meaningful, pg. 180)*	



2. Move from friendly numbers (groups of 10), to numbers that require the use of more than one kind of base ten blocks. (e.g., Model 3 x 23 as 3 groups of 2 tens and 3 groups of ones)



3. Increase to larger numbers and those that coincide with multiplication table, up to 7 x 7

10-Frames

1. Provide students with 10-frames to work with friendly numbers (2, 5 or 10).

Fosnot: Muffles' Truffles

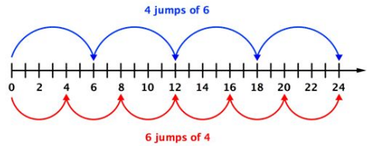
- Show empty 10-frame and ask students, "One truffle fits in each square, How many truffles would this box hold? How do you know?"

2. Provide students with 10-frames to work with larger numbers.

Fosnot: Muffles' Truffles

- Show empty 10-frame and ask students, "One truffle fits in each square, How many truffles would this box hold? How do you know?"
- *One day Muffles makes ten different kinds of truffles. This is the list of the different trays Patricio sees when he comes into work that day:*
  - *218 raspberry truffles*
  - *132 strawberry truffles*
  - *174 dark chocolate truffles*
  - *83 vanilla truffles with cinnamon and nutmeg*
  - *126 green truffles with pistachios*
  - *308 truffles with pecans and caramel*
  - *97 butterscotch crunch truffles covered in milk chocolate*
  - *22 truffles with white and dark chocolate swirls*
  - *44 chocolate covered cherry truffles*
  - *46 almond and raisin truffles*

How many boxes does Patricio need for each flavours? How many leftovers of each kind will there



2. Practise skip counting using a hundreds chart (identify number patterns).

Skip counting by 4s Chart

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99

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3. Use the same value of coin to skip count, and then transition to skip counting and counting on using different coin values.

Array Model

Fosnot: Muffles' Truffles

One day a customer comes into Muffles' shop and asks him why he only packages his truffles in boxes of ten, in two rows with five columns. "What if I want to buy more or fewer? Don't you have other sizes of boxes?" This question gets Muffles wondering: what other sizes of boxes could he make? What should he charge for them?

Ask students to work in pairs to design rectangular boxes (just one layer) in other sizes (all smaller than 10 x 10). Have students use graph paper and cut out the rectangles as blueprints for Muffles. On the front they should record the numbers of rows and columns (e.g., 2 x 6 for 2 rows and 6 columns). Have them calculate the price of each box, reminding them that the truffles cost $1 each, and write the price on the back.

- *These graph paper arrays can be used to develop fluency with the basic multiplication facts. As students work to calculate the price of each box have them explore relationships between the boxes. For example, if they know a*

Let's say you are working on the problem

11 x 13

Which of these problems would help you to solve it? How?

1 x 11	12 x 12	10 x 11	10 x 13
2 x 10	13 x 13	11 x 11	11 x 12
13 x 2	11 x 2	10 x 10	1 x 13
4 x 13	9 x 13	1 x 3	14 x 11

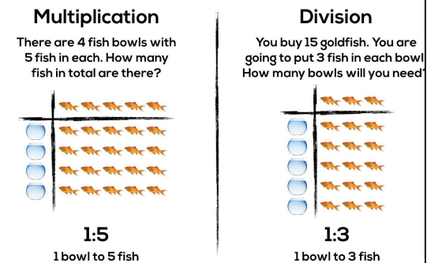
Rate

Meg has 5 pennies and I have 3 times as many as she does. How many do I have? *(Making Math Meaningful, pg. 177)*

I have 15 pennies. I have 3 times as many pennies as Meg. How many does Meg have? *(Making Math Meaningful, pg. 177)*

Meg has 5 pennies and I have 15. How many pennies do I have for each of Meg's? *(Making Math Meaningful, pg. 177)*

Julia's school is having a read-a-thon. Julia's goal is to read 100 pages. If she starts on April 1 and reads 5 pages every night, will she get to her goal by the end of the month or before that? Show how you know. *(Making Math Meaningful, pg. 186)*



Combination Situations

I have 3 shirts and 2 pairs of pants. How many shirt-pant outfits do I have? *(Making Math Meaningful, pg. 177)*

I have 8 shirt-pant outfits and 4 shirts. How many pairs of pants do I have? *(Making Math Meaningful, pg. 177)*

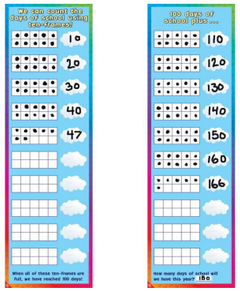
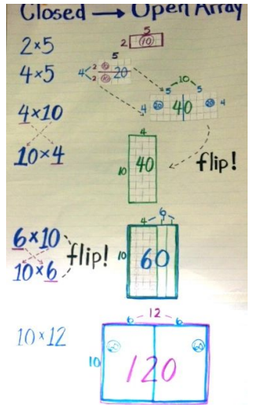
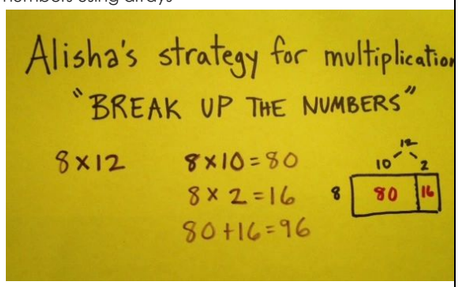
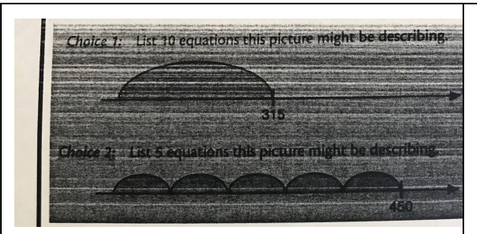
<u>Throwing Darts</u>

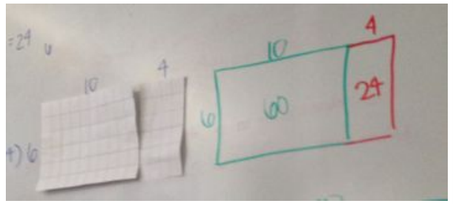
Leah must throw at least 4 darts to get a score of 100. a) What is the least score she can get with 4 darts? b) How could she get a score of 90 with 4 darts. *(Making Math Meaningful, 2009, pg. 53)*

<u>24 Cookies</u>

I am sharing 24 cookies with 3 other people. How could I multiply to figure out the number of cookies I would get? *(Big Ideas 4-8, pg. 27)*

<u>Equations and Open Number Lines</u>

		be? *How many assortment boxes can he make? Muffles sells his fancy truffles for $1.00 each so his boxes cost $10 each. How much money will he collect if he sells them all?* About how many days have you been in school? Tell how you estimated. Tell what mathematical operations you used. *(Marian Small - Good Questions, pg 29)*  The answer is 30. What is the question? How are the numbers 10 and 15 alike? How are they different? *(Marian Small - Good Questions, pg 20-21)* I have 3 boxes with 4 tomatoes in each. How many tomatoes do I have? *(Making Math Meaningful, pg. 177)* I have 12 tomatoes packed equally in 3 boxes. How many tomatoes are in each box? *(Making Math Meaningful, pg. 177)* I have some boxes of tomatoes. I have 12 tomatoes altogether, and there are 4 in each box. How many boxes do I have? *(Making Math Meaningful, pg. 177)* <u>Representing a double</u> Think of a number you would call a double. Prove that it really is. *(Marian Small - Good Questions, pg. 32)* <u>12 Cookies</u> Rafi has 12 cookies on a plate. If he eats three cookies at a time, how many times can he go back for more cookies? *(Big Ideas K-3, pg. 36)* <u>4 Tricycles</u> Show a picture of 4 tricycles to students. Ask students how to use addition and then multiplication to determine the total number of wheels. *(Big Ideas K-3, pg. 46)* <u>Boots and Mittens</u> A group of children wore boots to school. Some of them wore mittens. The teach counted 12 boots and 8 mittens. How many children did not wear mittens *(Making Math Meaningful 2009, pg. 40)* <u>26 Pens</u> Pens come in packages of 3, 5, and 8. Mrs. O'Regan bought 26 pens for her class. How many packages of each type might she have bought? *(Making Math Meaningful 2009, pg. 111)* <u>20 Children</u> You used skip counting to help you put 20 children into several equal groups. How many equal groups might there have been? What numbers would you	*5 x 5 box of truffles cost $25, they can lay this over a 6 x 5 box of truffles to realize that the larger box costs just $5 more. As you encourage the students to explore the relationships among their boxes, you are also supporting the development of the distributive property (6 x 5 = (5 x 5) + (1 x 5)); the communicative property (2 x 6 is 6 x 2); and the associative property ((2 x 2) x 6 = 2 x (2 x 6))* - Demonstrate that the rotation of boxes, or switching the numbers of rows/columns, will not change the total number in the box.  <u>Array Cards</u> Provide an assortment of cards showing various arrays. Ask students to write a number sentence showing multiplication, and then division. You have 24 counters. Draw 4 possible arrays your could make and write the multiplication sentence that goes with it. There are 18 students in dance. The dance teacher wants to arrange the students in rows for the dance recital. Show as many different ways as you can that she could arrange the dancers. Write the division sentence for each. Draw an array to help you. **Distributive Property**: practise working with friendly numbers using arrays  	 *(Good Questions, pg. 62)* Eric said that it is just as easy to find the answer to 5 x 0 as it is to find the answer to 345 x 0. Why did he say that? There are 27 kids in grade 5. Mrs. Green wants to arrange the students into 2 equal rows for their presentation during the awards assemble. Can she do it? Justify your answer.	

		have said when you counted? *(Open Questions for the Three-Part Lesson, K-3, pg. 80 - Minds On)* <u>Making Equal Groups</u> Tell students that they can use more than 20 but fewer than 30 items, and that you want them to make equal groups. If it's available, have students model the groups using an interactive white board, moving items around. Ask them to write both multiplication and division sentences (number sentences) that describe the equal groups they can make. *(Making Math Meaningful, pg. 179)* <u>Marbles</u> Ask students to choose any number of marbles. Then they have to show different ways that children could share those marbles so each gets the same number. *(Making Math Meaningful, pg. 186)* How is multiplication like addition? How is it different? *(Making Math Meaningful, pg. 189)* How is division like subtraction? How is it different? Put out a jar with 10 counters and indicate to students that it has 10 counters in it. Then provide other containers, initially of the same size as the jar holding 10, each filled with 20 to 60 counters. Have students estimate how many counters they think are in each of the other containers, then count, and write the appropriate numerals. *(Making Math Meaningful, pg. 196)* An engaging context for young students to think about grouping items in tens is a roller coaster with cars that hold 10 people. Students could be asked to fill empty roller coaster cars to show various numbers of people, or could describe how many people are in cars that the teacher models. *(Making Math Meaningful, pg. 196)* <u>Cheerleaders</u> There were 3 rows of cheerleaders. There were 7 cheerleaders in each row. How many cheerleaders were there altogether. Justify your answer. <u>School Band</u> There are 24 members in the school band. They will march in the parade in 4 rows. How many band members will there be in each row. Justify your answer.	 *(Fosnot: Muffles' Truffles, pg. 33-34)* String of related quick images: 2 x 5 1 x 5 4 x 5 (made with two 2 x 5 boxes) 5 x 5 (made with two 2 x 5 boxes and one 1 x 5 box) 2 x 10 (made with two 2 x 5 boxes) 4 x 10 (made with four 2 x 5 boxes) *(Fosnot: Muffles' Truffles, pg. 43-44)* String of related problems: 2 x 5 4 x 5 4 x 10 10 x 4 10 x 6 6 x 10 10 x 12 10 x 18 11 x 18 You multiply two numbers and the product is almost 400. What could the numbers have been? Explain your answer. *(Marian Small - Good Questions, pg 27)* **Area of a rectangle** A rectangle has a length of 4 units and a width of 2 units. What is its area? *(Making Math Meaningful, pg. 177)* A rectangle has an area of 15 square units. One dimension is 3 units. What is the other dimension? *(Making Math Meaningful, pg. 177)* <u>Cookies</u> Use 12 counters. Write a division sentence that describes this situation: There are 12 cookies to share among 3 people. How many cookies will each get? *(Making Math Meaningful, pg. 178)* <u>32 Markers</u> There are 32 markers and 8 groups. How many markers will each group get? Solve in 3 different ways. *(Big Ideas 4-8, pg. 28* <u>Choose 12, 20 or 24 Counters</u> Choose 12, 20, or 24 counters. Tell the ways that you could arrange the counters into equal groups. *(Open Questions for the Three-Part Lesson, K-3, pg. 81 - Action)* <u>Number Line Division</u> Draw a number line picture that shows division. What makes it show division. *(Open Questions for the Three-Part Lesson, K-3, pg. 122 - Consolidate)* <u>Rolling Dice</u> How many different products are possible when you multiply the numbers on two dice? *(Making Math Meaningful 2009, pg. 47)*		

			<u>Manipulatives Carousel</u> Use the manipulative at your table group. ● iPad manipulatives (numberline) ● Pattern blocks ● Base Ten blocks ● Linking Cubes ● (Two coloured) counters Use your manipulatives to solve this question. Mr.Stancu purchased some new equipment for Springfield. For the kindergarden students, he purchased two new wagons and 3 tricycles. For the primary students, he purchased a new games cart (a cart has 4 wheels). For the junior students, he bought 5 new scooter boards (there are 4 wheels on a scooter board). How many wheels are there altogether? Justify your answer by showing your work using manipulatives. There were 6 bicycles, 4 tricycles and 5 wagons in the playground. How many wheels were there? Justify your answer.		