Unit 3.0

What is this strategy?
A Math Talk is a pedagogical tool for building math thinking and academic discourse in a student-centered, teacher-led way. Math Talks should not be used to introduce math content, but when a topic is new, a Math Talk can be an opportunity for informal assessment of student familiarity and background.

Why would I use this strategy?
Math Talks serve to further understanding of math content while addressing Standard for Mathematical Practice 3: Construct viable arguments and critique the reasoning of others. They give students the opportunity to develop flexibility and fluency with mental visualization and computation. They offer opportunities to revisit math topics, approach common misconceptions, and deepen understanding by sharing multiple strategies and perspectives on a concept or skill.

When do I use this strategy?
This strategy can be used at any time, but is often done at the beginning of a math class. Because it does not need to be focused on the lesson's content, the content of the Math Talk can vary according to the needs of students. Math Talks should happen 3 to 5 times a week for 10–15 minutes each.

How could I use this strategy during this unit?
Below are the Math Talks suggested for this unit. These Math Talks are also listed with each lesson. See the Math Teaching Toolkit section on Math Talks for more information. Since this is the first unit of the year, you will be establishing a variety of new routines. The lessons this week include two Math Talks:

Re-engage with Previous Content

Number Strings
Objective: Add two-digit numbers using efficient strategies, building towards greater fluency with addition.
Description: In second grade, students worked to develop fluency with adding two-digit numbers using paper and pencil methods based on decomposing and recomposing numbers by place value. In third grade, students should continue to build their fluency with addition. These addition strings will lead students to use the previous expression to help solve the next.

Suggested Math Talks:
Question/Prompt: ***What is the sum? How do you know?***

Show the first expression, allow for discussion of a few strategies, then show the next expression. Do as many expressions from one string as time and interest allow.

15 + 15	16 + 16	18 + 18
15 + 16	17 + 17	18 + 19
15 + 17	17 + 18	18 + 17
15 + 18	16 + 17	19 + 19

Anticipated Student Responses: 15 + 17

- **Use of previous expression:** *I made the 17 into 15 by taking off 2, then added 15 + 15 to get 30. Then I added the 2 back on to get 32.*
- **Decomposing by place value:** *I added the two tens and got 20, and added the 5 and 7 and got 12. Then I added 20 to 12 and got 32.*
- **Counting on:** *I started with 17 because it is bigger than 15, and I counted 15 more and got 32.*

Students may describe use of the standard algorithm to explain their thinking. This algorithm is taught formally in fourth grade once students have had sufficient experience with conceptual understanding of addition using the properties of operations and place value. Use questions to help students relate this strategy to decomposition by place value. For example: *How many tens are there? How many ones? Why only record the "2" of the 12?*

Unit 3.1

Below are the Math Talks suggested for this unit. These Math Talks are also listed with each lesson. Math Talks should happen 3 to 5 times a week for 10–15 minutes each.
See the **Math Teaching Toolkit** on **Math Talks** (http://www.sfusdmath.org/math-talks.html) for more information.

Engage with Current Content

Subtraction: Counting up

Objective: Students count up using place value understanding as an efficient subtraction strategy, building towards greater fluency with subtraction.

Description: Students may use a number of strategies to solve these subtraction expressions, though these math talks lend themselves to using the strategy of Counting Up. This strategy builds on students' strengths with addition by adding up from the *subtrahend* (the number being subtracted) to the *minuend* (the whole). Help students think about jumps to get to the nearest 10 or friendly number. The larger the jumps, the more efficient the strategy will be. These expressions progress in a way that will lead students to use the previous expression to help them solve the next one.

Suggested Math Talks:
Question/Prompt: *What is the answer, and how do you know?*

Show the first expression, allow for discussion of a few student strategies, then show the next expression. Do as many expressions from one string as time and interest allows.

Category 1: Subtracting from a multiple of 10.		**Category 2:** Subtracting from a multiple of 100.	
20 – 15 20 – 14 20 – 9 20 – 8	50 – 44 50 – 39 50 – 29 50 – 24	100 – 89 100 – 69 100 – 49 100 – 37	500 – 449 500 – 419 500 – 299 500 – 249

Anticipated Student Responses: 100-89

- **Counting Up:** *I started with 89, added 1 to get to 90 and then another 10 to get to 100. 1 + 10 = 11*
- **Decomposing by place value:** *100 – 80 = 20, 20 – 9 =11*
- **Compensation***: I added 1 to 89 to get 90. 100 – 90 = 10. Then I added 1 back to the difference. It equals 11.*

Credits: Adapted from *Number Talks: Whole Number Computation, Grades K-5* by Sherry Parrish, pp. 207 - 211.

Engage with Current Content

Patterns in the Addition Chart

Objective: Students find and analyse patterns in the addition chart and relate these to the properties of addition.

Description: Show students one of the addition tables and ask: *What patterns do you notice? Why might these patterns happen?*

The Math Talk BLM has larger versions of these. You can also use the charts on the Math Talks Addition Chart Slides to project these to your class.

+	1	2	3	4	5
1	2	3	4	5	6
2	3	4	5	6	7
3	4	5	6	7	8
4	5	6	7	8	9
5	6	7	8	9	10

+	1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10	11
2	3	4	5	6	7	8	9	10	11	12
3	4	5	6	7	8	9	10	11	12	13
4	5	6	7	8	9	10	11	12	13	14
5	6	7	8	9	10	11	12	13	14	15
6	7	8	9	10	11	12	13	14	15	16
7	8	9	10	11	12	13	14	15	16	17
8	9	10	11	12	13	14	15	16	17	18
9	10	11	12	13	14	15	16	17	18	19
10	11	12	13	14	15	16	17	18	19	20

Patterns to notice in the smaller table and possible discussion of reasons and connections:

- In each column and each row of the table, even and odd numbers alternate.

The reason for the alternating pattern is that each time we move to the right one box or down one box, we are adding one more to our sum. For example, (2+3)+1=2+(3+1)=2+4 shows what happens when you move one box to the right from the entry for 2+3 (note that this is an example of the associative property of addition).

Another explanation is that an even number plus one gives an odd number gives an odd number while an odd number plus one gives an even number.

- The diagonal, from top left to bottom right, contains the even numbers 2,4,6,8, and 10.

The reason why these numbers are even is that the first one comes from finding the sum 1+1, the second blue box comes from finding the sum 2+2, and so on. If we double the numbers in the sequence 1, 2, 3, 4, 5 we get the sequence 2, 4, 6, 8, 10.

• All numbers in the other diagonal, from bottom left to top right, are 6's
This diagonal shows the five different ways of writing 6 as a sum of two whole numbers: 1+5, 2+4, 3+3, 4+2, and 5+1. Each time we move up one the first summand is decreased by one while each move to the right increases the second summand by one. What we are using, in effect, is the associative property of addition. For example: 1+5=1+(1+4)=(1+1)+4=2+4 The net effect is to obtain the same total of 6 when adding.
• The table is symmetrical - all the numbers in the upper right are the same as the numbers in the lower left.
The reason why mirror image squares - squares across the 2, 4, 6, 8 10 diagonal - have the same numbers is the commutative property of addition: the sum of two numbers is the same regardless of the order in which they are added. For example, diagonal of squares has the sums 2+1, 3+2, 4+3, and 8+4, while the upper green diagonal has the same sums in reverse order: 1+2, 2+3, 3+4, and 4+5. Since the order of the addends does not influence the sum, it is sufficient to know one of these diagonals and this then determines the other. So the commutative property of addition cuts the amount of facts that need to be memorized almost in half.

Similar patterns can be observed and explained in the larger table.

+	1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10	11
2	3	4	5	6	7	8	9	10	11	12
3	4	5	6	7	8	9	10	11	12	13
4	5	6	7	8	9	10	11	12	13	14
5	6	7	8	9	10	11	12	13	14	15
6	7	8	9	10	11	12	13	14	15	16
7	8	9	10	11	12	13	14	15	16	17
8	9	10	11	12	13	14	15	16	17	18
9	10	11	12	13	14	15	16	17	18	19
10	11	12	13	14	15	16	17	18	19	20

Adapted with permission from IllustrativeMathematics.org

Addition and Subtraction Math Talks for Future Units

The focus in 3rd grade for the rest of the year moves away from addition and subtraction. You can continue to engage your students with these important topics through Math Talks.

Suggested Math Talks:
Question/Prompt: *What is the answer, and how do you know?*

Description: Students may use a number of strategies to solve these addition expressions, though these math talks lend themselves to using the strategy of decomposing by place value. In this strategy, each addend is decomposed into expanded form and like place value amounts are combined. When mentally combining quantities, students typically work left to right because it is easier to keep the subtotals in mind.

Category 2: Two-digit numbers		**Category 3:** Three-digit numbers				
46 + 38	53 + 38	158 + 221	365 + 247	275 + 147	246 + 356	168 + 254
54 + 29	48 + 22	136 + 113	138 + 292	386 + 137	377 + 340	205 + 134

Suggested Math Talks:
Question/Prompt: *What is the answer, and how do you know?*

Description: Students may use a number of strategies to solve these subtraction expressions, though these math talks lend themselves to using the strategy of Counting Up. This strategy builds on students' strengths with addition by adding up from the *subtrahend* (the number being subtracted) to the *minuend* (the whole). Help students think about jumps to get to the nearest 10 or friendly number. The larger the jumps, the more efficient the strategy will be. These expressions progress in a way that will lead students to use the previous expression to help them solve the next one.

Category 3: Subtracting from a number other than a multiple of 100, though strings begin with a multiple of 100.					
200 – 29 220 – 29 223 – 29	300 – 270 315 – 270 315 – 280	400 – 250 400 – 249 430 – 249	400 – 329 420 – 329 423 – 318	300 – 174 315 – 174 335 – 219	500 – 249 525 – 249 1000 – 499

Credits: Adapted from *Number Talks: Whole Number Computation, Grades K-5* by Sherry Parrish, pp. 207 - 211.

Unit 3.2

Below are the Math Talks suggested for this unit. These Math Talks are also listed with each lesson. Math Talks should happen 3 to 5 times a week for 10–15 minutes each. See the **Math Teaching Toolkit** section on Math Talks at www.sfusdmath.org/math-talks for more information.

Re-engage with Previous Content

Addition: Making Tens

Objective: Students look for ways to make tens as an efficient addition strategy, building towards greater fluency with addition.

Description: Students may use a number of strategies to solve these addition expressions, though these math talks lend themselves to using the strategy of making tens. Within each expression, students find at least one pair of numbers that can be added first to make ten. Some expressions require decomposition of one number to create a pair of numbers that makes a ten. Working with number pairs to make tens can support students to work with elapsed time using numbers that add to ten during this unit.

Suggested Math Talks: Question: *What is the answer, and how do you know?*

Category 1: Two numbers that make a ten.		**Category 2:** Two pairs of numbers that make a ten.		**Category 3:** Decompose at least one number to make a ten.	
7 + 3 7 + 5 + 3 3 + 6 + 7	9 + 5 + 1 8 + 9 + 1 1 + 4 + 9	4 + 6 + 8 + 2 9 + 3 + 1 + 7 5 + 6 + 5 + 4	5 + 3 + 5 + 4 + 7 9 + 5 + 8 + 2 + 1 4 + 5 + 6 + 3 + 7	9 + 3 9 + 5 9 + 6 9 + 9	10 + 13 17 + 16 10 + 25 7 + 45

Example anticipated student responses for 9 + 5 + 1:

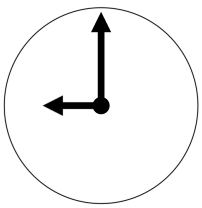
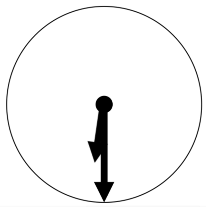
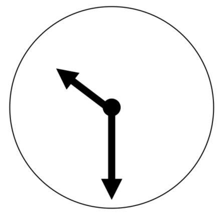
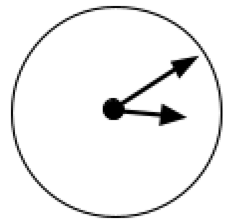
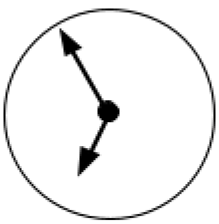
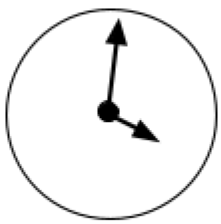
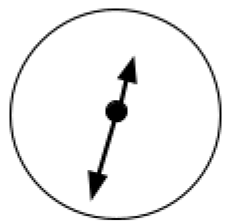
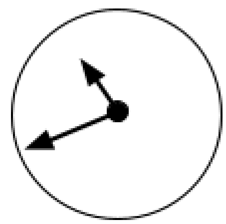
- **Making 10 strategy:** *I added the 9 and 1 to make 10. Then I added 10 + 5 to get 15.*
- **Decomposing a number to make 10 strategy**: *I decomposed 5 into 1 and 4 to add a 1 to 9 and make a 10. Then I added 1 and 4 to 10 to make 15.*
- **Counting on:** *I started with 9 and counted 5 more to get 14 and then I counted 1 more to get 15.*

Credits: Adapted from *Number Talks: Whole Number Computation, Grades K-5* by Sherry Parrish, pp. 185 - 188.

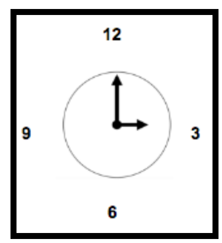
Engage with Current Content

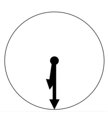
<u>Clock Talks</u>
Objective: To apply knowledge of analog clocks to determine the time.
Description: These math talks are designed to help students to reason about time and apply their understanding of how the hours and minutes are sequenced and positioned on a clock.

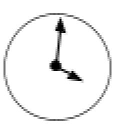
Suggested Math Talks:

Question: *What time is it? How do you know?*			
			
			

Anticipated Student Reasoning:
Students may reason about the time based on anchoring of the hour hand and its relationship to the 3, 6, 9 and 12, or based on the position of the hour and minute hands.




I see the hour hand almost pointing down to where the 6 is but a little past it, so I know the hour is still 6. I see the minute hand pointing straight down so I know it's 30 minutes past 6, so the time is 6:30.


I see the hour hand is past the 3, but it's closer to the 3 than to the 6, so it's probably close to 4:00. I see the minute hand pointing almost straight up, but it looks like it's a little past the 12 but not all the way to the 1, maybe about 2 minutes past the 12. So I think it's about 4:02.

Resources: Clock Talks BLM

Unit 3.3

Below are the Math Talks suggested for this unit. These Math Talks are also listed with each lesson.

Math Talks should happen 3 to 5 times a week for 10–15 minutes each. See the **Math Teaching Toolkit** section on **Math Talks** for more information.

Re-engage with Previous Content

Addition: Landmark Numbers and Compensation
Objective: Students solve addition expressions that lend themselves to the strategy of using landmark numbers and compensation as an efficient addition strategy, building towards greater fluency with addition.

Description: Students may use a number of strategies to solve these addition expressions, though these math talks lend themselves to using the strategy of landmark numbers and compensation. *Landmark numbers* (sometimes called friendly numbers) are numbers that are easy to use in mental computation. The goal of *compensation* is to manipulate the numbers into easier, friendlier numbers to add. These two strategies are related because when compensating, you remove a specific amount from one addend to make a landmark number and give that exact amount to the other addend.

Suggested Math Talks:
Question/Prompt: *What is the answer and how do you know?*

Category 1: One addend is 1 away from a landmark number		**Category 2**: One addend is 2 away from a landmark number.		**Category 3**: Two and three digit addends with addends that are 1 or 2 away from landmark number.	
9 + 8 19 + 5 9 + 26 16 + 19	39 + 16 28 + 39 59 + 13 23 + 49	8 + 4 18 + 6 28 + 17 27 + 28	18 + 63 38 + 37 67 + 28 48 + 52	99 + 38 98 + 47 98 + 99 99 + 99 + 5	119 + 26 118 + 17 129 + 16 124 + 26

Anticipated Student Responses: 16 + 19

- **Landmark numbers strategy**: *I made 19 into 20 by adding 1, then added 20 to 16 and got 26. Then I had to subtract the 1 that I added before and got 25.*
- **Landmark numbers and compensation strategy**: *I made 19 into 20 by taking 1 from 16 and adding it to 19. So 19 became 20 and 16 became 15. Then I added 20 and 15 and got 35.*
- **Breaking into place value:** *I added the 6 and the 9 and got 15. Then I added the ten from each number and got 20. Then I added 15 and 20 and got 35.*

Credits: Adapted from *Number Talks: Whole Number Computation, Grades K-5* by Sherry Parrish, pp. 189 - 192.

Engage with Current Content

Multiplication Arrays

Objective: Students explain their strategies for counting and grouping dots in array formation, encouraging the use of multiplication properties of operations and building towards fluency with single-digit multiplication.
Description: These math talks help student build flexibility with multiplication equations. Objects in array formation can readily be "chunked" into smaller arrays that can be added together to find a total. Just as students engaged in dot talks to gain familiarity with addition and subtraction in earlier grades, they can describe how they see groups of dots and relate that to multiplication. As students describe their thinking, record their description both on the array and using more formal expressions, so students begin to see the relationship between both representations.

The convention that we follow in the SFUSD curriculum is to notate Rows x Columns = Total. This convention lines up with our left → right tendency to write multiplication equations starting with the number in the left (which counts the rows) and continuing to the number at the top (which counts the columns). This is the same convention that mathematicians use in later mathematics, such as linear algebra.

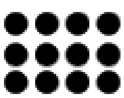
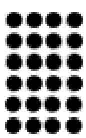
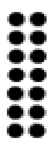
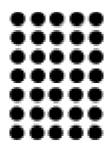
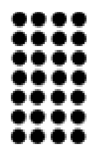
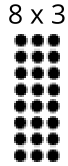
Columns

Rows

X	1	2	3	4
1	1 x 1 = 1	1 x 2 = 2	1 x 3 = 3	1 x 4 = 4
2	2 x 1 = 2	2 x 2 = 4	2 x 3 = 6	2 x 4 = 8
3	3 x 1 = 3	3 x 2 = 6	3 x 3 = 9	3 x 4 = 12
4	4 x 1 = 4	4 x 2 = 8	4 x 3 = 12	4 x 4 = 16

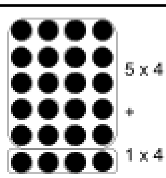
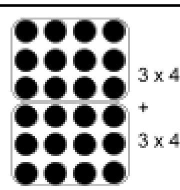
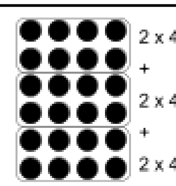
4 x 2 = 8 means an array of 4 rows and 2 columns has 8 total objects in it.

Suggested Math Talks:
Question/Prompt: *How many dots are there and how do you see them?*

3 × 4	6 × 4	7 x 2	7 x 5	7 x 4	8 x 3
					

Later in the unit, when students have begun developing a sense of the commutativity of multiplication, you can rotate the arrays and look at the differences and similarities in how students break them up.

Anticipated Student Responses: 6 x 4

		
I saw 6 rows and 4 columns, so I first took 5 rows because I know 5 × 4 = 20, then I had one row of 4 left so I added 20 + 4 = 24	*I saw 3 × 4 which is 12, and then I saw that group again so I doubled 12 and got 24.*	*I saw it in 3 groups. I saw two dots along the side so I counted by 2s 4 times and got 8. I saw three groups like that. 8 + 8 + 8 = 24*

Resources: 3.3 Multiplication Array Math Talks BLM

Unit 3.4

Below are the Math Talks suggested for this unit. These Math Talks are also listed with each lesson. Math Talks should happen 3 to 5 times a week for 10–15 minutes each. Math Talk Images are here.

See the **Math Teaching Toolkit** section on Math Talks at www.sfusdmath.org/math-talks for more information.

Re-engage with Previous Content

Addition: Doubles/Near Doubles

Objective: Students leverage their knowledge of sums for doubles to solve near doubles addition expressions, building towards greater fluency with addition.

Description: Students may use a number of strategies to solve these addition expressions, though these math talks lend themselves to using the strategy of making tens. Sums of doubles have been shown to be easier to remember than sums of other numbers. If students see an expression using numbers that are one away from each other, they can decompose the greater number to make a double plus one, add the doubles, then add on the remaining one. This strategy will help during this unit because they can use it to add the equal sides of rectangles when finding their perimeter (Lesson Series 3).

Suggested Math Talks:
Question/Prompt: *What is the answer and how do you know?*

Category 1: Doubles with sums up to twenty.			**Category 2:** Two digit doubles.			**Category 3:** Two and three-digit doubles		
5 + 5 5 + 6 5 + 7 5 + 8	15 + 15 15 + 16 17 + 15 18 + 15	20 + 20 19 + 19 19 + 21 19 + 18	30 + 30 29 + 29 29 + 28 28 + 27	40 + 40 39 + 39 39 + 38 38 + 37	25 + 25 25 + 28 24 + 27 24 + 28	50 + 50 49 + 49 48 + 49 49 + 52	100 + 100 99 + 99 99 + 98 99 + 97	100 + 100 99 + 101 98 + 97 97 + 102

Example anticipated student responses for 19 + 18:

- *I changed 19 to 18 so I could make a double that I know. 18 +18 = 36. Then I added 1 since it was 19 originally so it is 37.*
- *I changed 19 to 18, then added 8 + 8 = 16 and 10 + 10 = 20. Then I added those pieces together: 20 + 16 is the same as 20 + 10 + 6 which is 36.*
- *I added 1 to 19 to make 20 and I added 2 to 18 to make 20. I know that 20 +20 =40. I added 3 to make those numbers friendly, so I will subtract 3 from 40 and get 37.*
- *I added 1 to 18 to make 19. 19 +19 =38. Since I added 1 to make 18, 19, I will subtract 1 from the total 38 which equals 37.*

Credits: Adapted from *Number Talks: Whole Number Computation, Grades K-5* by Sherry Parrish, pp. 193 - 196.

Engage with Current Content

Which Shape Does Not Belong

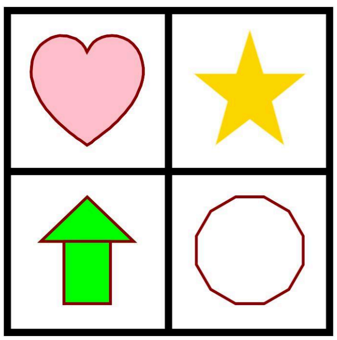
Objective: Students strengthen their ability to describe shapes according to their attributes and use these attributes to categorize them as three alike and one different.

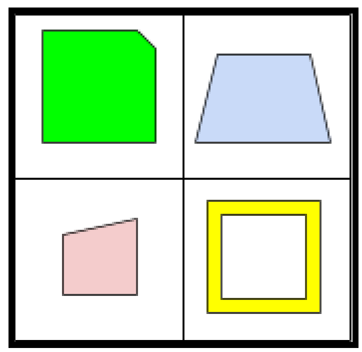
Description: This unit includes 4 math talks that use shapes to in a Which Does Not Belong four square. See wodb.ca for more information about these puzzles as well as more examples. Project the image and ask students to study it to determine which of the shapes does not belong in the group of 4. Tell them that they will have to justify their reasoning. There are more than one correct answer for any given Which Does Not Belong puzzle, so look to bring this out in students.

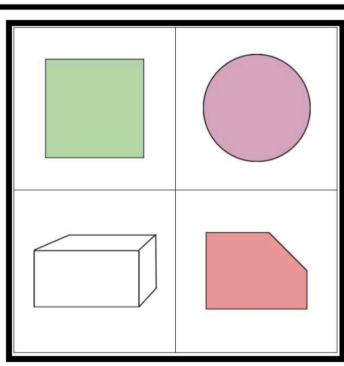
Note: These particular math talks will build students' understanding of question 1 on the Milestone Task. Also note that this type of puzzle is a part of the SFUSD Math Core Curriculum lower elementary as well as upper elementary.

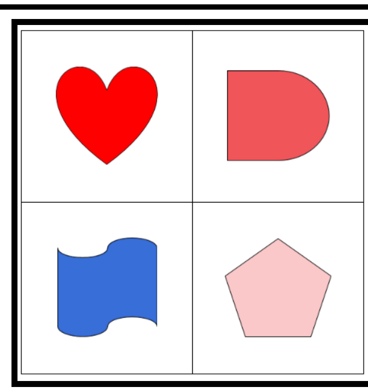
Suggested Which One Does Not Belong puzzles:

Question/Prompt: *Which one doesn't belong? Why?*









Resources: 3.4 Math Talk Images BLM

Credits: Several puzzles adapted from www.wodb.ca and used with permission of Mary Bourassa and Noam Szoke.

Unit 3.5

Below are the Math Talks suggested for this unit. These Math Talks are also listed with each lesson. Math Talks should happen 3 to 5 times a week for 10–15 minutes each. The Multiplication Array Math Talks BLM is here. See www.sfusdmath.org/math-talks.html

Re-engage with Previous Content

Subtraction: Place Value and Negative Number Concepts

Objective: Students solve subtraction expressions that lend themselves to being decomposed by place value as an efficient subtraction strategy, building towards greater fluency with subtraction.

Description: Students may use a number of strategies to solve these subtraction expressions, though these math talks lend themselves to using the strategy of using decomposition by place value and negative number concepts. To decompose by place value, each number is broken apart into its respective place value. This can be represented by recording each number using expanded notation. Numbers in the same place value are grouped and then subtracted. In problems that require decomposing a ten, a variety of strategies may be used, including using known addition facts, decomposing the number in the ones place of the subtrahend (number being subtracted), adding up by place value, or using the concept of negative numbers.

Although negative numbers are not formally taught until middle school, students may have some informal understandings of what happens when you subtract a "bigger" number from a "smaller" number. They may describe their thoughts using terms such as "owing" or "borrowing". See below for an example of a student response that incorporates negative number concepts. **Work with negative numbers is not an expectation until middle school; these math talk help students think flexibly about subtraction.**

Suggested Math Talks: Question/Prompt: *What is the answer and how do you know?*

Category 1: Introduction using two digit numbers that are close to each other in value.		**Category 2**: Two-digit computation problems with greater distance between each number.		**Category 3**: Three-digit computation problems.	
20 – 10 24 – 16 23 – 15 33 – 16	30 – 10 36 – 19 48 – 29 44 – 26	50 – 10 53 – 17 54 – 26	60 – 30 66 – 38 64 – 29	100 – 40 100 – 46 100 – 19 114 – 75	200 – 100 215 – 126 223 – 134

Anticipated Student Responses: 24 – 16

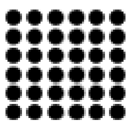
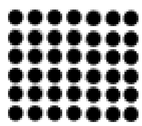
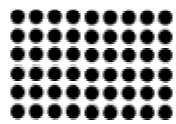
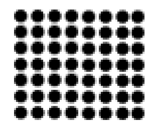
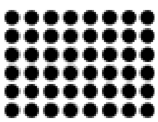
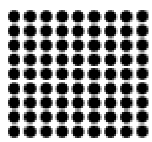
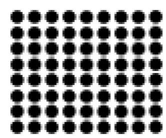
- Using known addition facts: *I know that 24 - 10 is 14. And I know that 14 - 6 is 8 because I know my addition facts and 6 + 8 = 14.*
- Decomposing the subtrahend: *I know that 24 - 10 is 14. I think of 6 as 4 + 2. Then I subtract 4 from 14 to get 10. I have to subtract another 2 from 10 and get 8.*
- Adding up: *If I add 10 to 16 I get 26. Then I have to go back 2 to get to 24. So I added 10 and subtracted 2, which totals 8.*
- Using negative number concepts: *I know that 20 - 10 is 10. And I know that if I subtract 4 - 6 I will have to give back or owe 2. If I have 10 and I give back 2, I will have 8.*

Credits: Adapted from *Number Talks: Whole Number Computation, Grades K-5* by Sherry Parrish, pp. 217 - 220.

Engage with Current Content

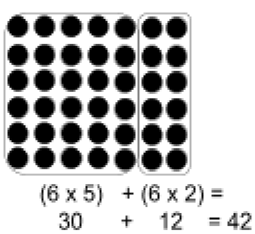
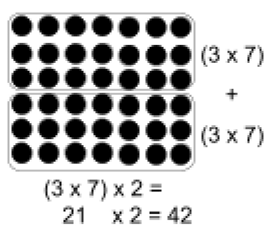
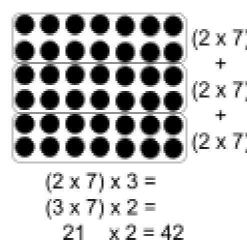
<u>Multiplication Arrays</u>
Objective: Students explain their strategies for counting and grouping dots in array formation, encouraging the use of multiplication properties of operations and building towards fluency with single-digit multiplication.
Description: (These math talks continue with the same process as the multiplication arrays in Unit 3.3.)
Students continue to use arrays as a way to see multiplication and develop flexibility with decomposing and composing and, especially, its importance in use of the Distributive Property. In this unit, students can be expected to break apart arrays both horizontally and vertically, calculate the number of dots in each part, and recombine them to find the total number of dots in the array.

Suggested Math Talks:
Question/Prompt: *How many dots are there and how do you see them?*

6 x 6 	6 x 7 	6 x 9 	7 x 8 
6 x 8 	9 x 9 	8 x 9 	

*Present these dot talks to students in both landscape and portrait orientation.

Anticipated Student Responses: 6 x 7

		
I saw 6 rows and 7 columns, so I first took 5 columns because I know 6 x 5 = 30, then I had 2 columns of 6 left and I know 6 x 2 = 12. Then I added 30 + 12 which is 42.	*I saw 3 x 7 which is 21, and then I saw that group again so I doubled 21 and got 42.*	*I saw groups of two dots across the top so doubled 7 and got 14. I saw that same group 3 times but 14 x 3 was too hard. So I went back to 3 groups of 7 x 2, and I knew that was the same as 2 groups of 7 x 3, which is 2 groups 21 which is 42.*

Resources: 3.5 Multiplication Array Math Talks BLM

Unit 3.6

Below are the Math Talks suggested for this unit. These Math Talks are also listed with each lesson.
Math Talks should happen 3 to 5 times a week for 10–15 minutes each. Math Talk Visuals are here.
See **Math Teaching Toolkit** section on **Math Talks** for more information
(http://www.sfusdmath.org/math-talks.html).

Re-engage with Previous Content

Addition: Adding Up in Chunks

Objective: Students solve addition expressions that lend themselves to adding up in chunks as an efficient addition strategy, building towards greater fluency with subtraction.
Description: Students may use a number of strategies to solve these addition expressions, though these math talks lend themselves to using the strategy of adding up in chunks. This strategy is similar to the strategy of breaking each number into its place value except the focus is on keeping one addend whole and adding the second number in easy to use chunks. This strategy is slightly more efficient because you are not breaking apart every number.

Suggested Math Talks:
Question/Prompt: *What is the answer and how do you know?*

Category 1: Progresses from adding on multiples of 10 to a two-digit number to adding tens and ones in chunks.		**Category 2**: Progresses more quickly from adding on 10 to a two-digit number to adding tens and ones in chunks.		**Category 3:** Progresses from adding on multiples of 10 or 100 to a two- or three-digit number to adding hundreds, tens and ones in chunks.	
26 + 10 26 + 30 26 + 50 26 + 53	44 + 10 44 + 20 44 + 30 44 + 35	29 + 10 29 + 15 29 + 20 29 + 24	57 + 10 57 + 14 57 + 30 57 + 36	56 + 40 56 + 50 156 + 40 156 + 43	117 + 200 117 + 400 117 + 420 117 + 426

Anticipated Student Responses: 29 + 24

- **Adding up in Chunks** - I kept 29 and added 20 to it to make 49. Then I counted up from 49 by 4. I got 53.
- **Breaking into Place Value** - I broke 29 into 20 + 9 and 24 into 20 + 4. Then I added the two 20's to get 40. Then I added 9 + 4 to got 13. Then I broke 13 into 10 + 3. I added 40 and 10 to get 50 and then added 3 more to get 53.
- **Making Tens**- I added 1 to 29 to make 30. Then I added 24 to 30 and I got 54. But then I had to subtract 1 from 54 to make 53.

Credits: Adapted from *Number Talks: Whole Number Computation, Grades K-5* by Sherry Parrish, pp. 201 - 204.

Engage with Current Content

Subitizing Multiplication

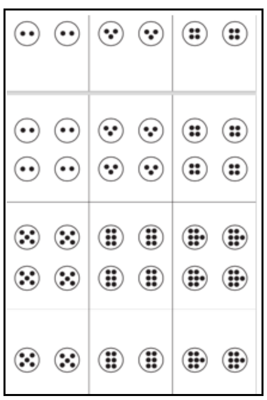
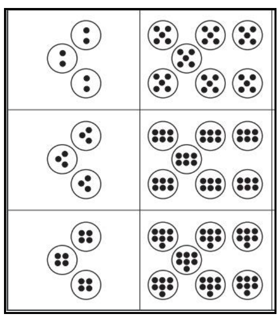
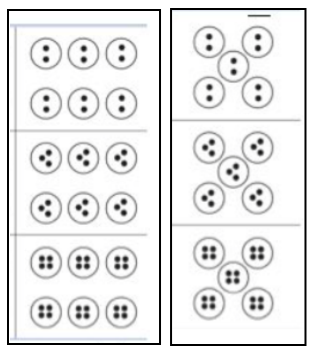
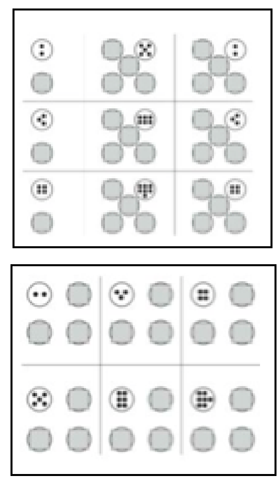
Objective: Students use various equal grouping strategies to find the total number of dots, thus using the properties of operations in a semi-concrete manner to build towards greater fluency with single-digit multiplication.

Description: The ability to subitize is an important part of developing a strong mathematical foundation. There are two components of subitizing: conceptual and perceptual. Perceptual subitizing is the instant visual recognition of a pattern such as the dots on a die. Conceptual subitizing is recognizing smaller groups and combining them, such as 3 dots and 4 dots (addition), or 6 groups of 5 dots in each (multiplication). Students have been using subitizing to group dots and relating it to addition since kindergarten. Iin Grade 3, encourage students to use their understanding of equal groups to find the number of dots using multiplication strategies. Students may see the entire image as one multiplication problem (eg. 4 groups of 7 dots) or they may see it as a combination of problems (4 groups of 6 dots plus an extra 4 dots).

Suggested Math Talks:

Question/Prompt: *How many odts do you see, and how do you see them?*

Cut the pages into cards and present each one separately. Show as many cards from one group as time and interest allows.

2s and/or 4s	7s and/or 3s	6s and/or 5s	4s, 2s, and 5s with all but one group covered
			

*Present these dot talks to students in both landscape and portrait orientation.

Anticipated Student Responses:

- 7 groups of 5: *I see 7 circles with an X of 5 dots in each. I knew the X of 5 groups was 25, and 2 more groups is 10 more which is 35.*
- 6 groups of 6: *I see two groups of 6 dots which is twelve, and I see 3 groups of those 12 dots so I added 12+12+12 which is 36.*
- 6 groups of 7: *I see 3 groups of 7 dots on one side and I know 3 x 7 is 21. There are two groups of 21 dots, so 21+21 is 42*

Resources: 3.6 Multiplication Subitizing Cards BLM or use Large Subitizing Cards in the resources folder.

Credits: Adapted from gfletchy.com. Used with permission of Graham Fletcher.

Unit 3.7

Below are the Math Talks suggested for this unit. These Math Talks are also listed with each lesson. Math Talks should happen 3 to 5 times a week for 10–15 minutes each. Math Talk Visuals are here. See **Math Teaching Toolkit** section on **Math Talks** for more information (http://www.sfusdmath.org/math-talks.html).

Re-engage with Previous Content

Repeated Addition/Multiplication: Halving and Doubling
Objective: Students use multiplication facts and their understanding of halving and doubling to determine unknown facts, building towards greater fluency with single-digit multiplication.

Description:
These problems are ordered so that students are able to find patterns in each set of expressions. Each expression set lends itself to the concept of halving and doubling. Doubling (multiplying by 2) is often easier for students to conceptualize than halving (dividing by 2). These math talks will help build the foundation for inverse operations which will appear later in this unit.

During the math talk, ask students to identify the patterns that they see. Take note of students who identify halving or doubling but do not discourage students from finding other patterns.

Suggested Math Talks:
Question/Prompt: What patterns do you notice? *(Students calculate the sum/product)*

2 + 2 3 + 3 4 + 4 5 + 5 6 + 6	2 × 1 4 × 1 2 × 2 4 × 2 2 × 3 4 × 3	1 × 2 2 × 2 4 × 2 8 × 2 16 × 2	1 × ? = 16 2 × ? = 16 4 × ? = 16 8 × ? = 16 16 × ? = 16

Note: For each math talk, show students the list of expressions instead of one at a time

Anticipated Student Responses:
1: Students may notice the addends are increasing by one and the sums are increasing by 2. Others may use the word “double” to describe the addition expression, ask students to explain what “double” means.
2: Students may notice the pattern in the first factor as 2, 4, 2, 4,... and the second factor as 1,1,2,2,3,3... Students may also notice that, in each pair, one product is double the product before or half of the product after.
3: Students may notice that the first factor is doubling while the second factor remains 2. Students may also notice that the product is double the initial factor when you multiply by 2.
4: Students may notice that the product for each equation is 16, they may also notice that the first factor in each equation is doubling and the second factor (?) is halving.

Engage with Current Content I

Equal Groups Talks

Objective:

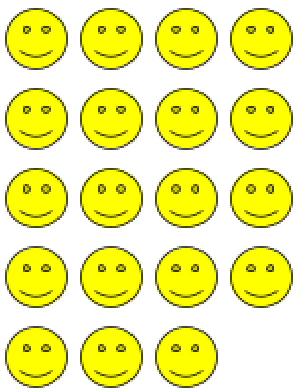
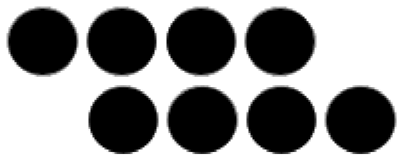
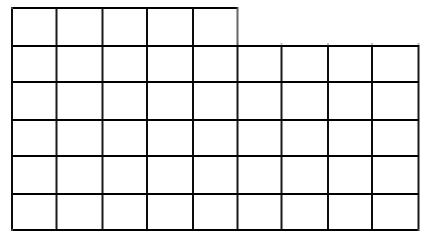
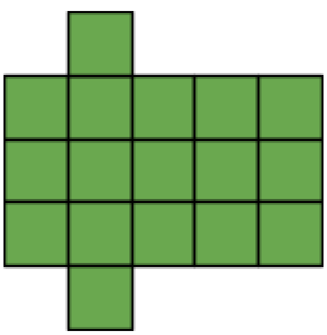
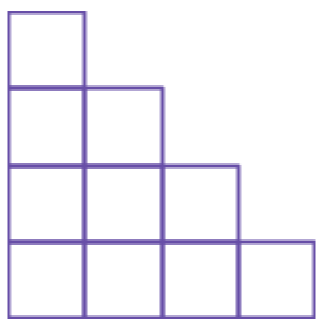
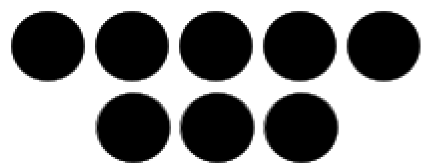
Students begin to conceptualize division by creating equal groups.

Description:

These visual math talks are designed to help students visualize how equal groups can be formed. Through dividing the ducks and dots into equal groups students may begin to see the connection between multiplication and division.

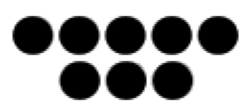
Suggested Math Talks

Question/Prompt: *How many do you see? How do you see them?*

Anticipated Student Responses

Allow students to explain how they were able to find the total number of objects (choose one set to show). Students may explain that they counted one-by-one. If so, ask if they could have found a more efficient way. Others may group objects together. For example, they may notice the six dots in the center and the two outliers. They may also use prior knowledge of rows and columns, for example, there are 4 rows of 4 ducks and three in the last row (4 x 3) + 3. While students are explaining their thinking, highlight important vocabulary such as equal groups, groups of, divided, separated, rows, columns, etc…



Resources: 3.7 Math Talk Visuals BLM

Engage with Current Content II

<u>Relationship Between Multiplication and Division</u>
Objective: Students begin to conceptualize the inverse relationship between multiplication and division.
Description: These math talks are designed for students to understand that division situations can be solved using known multiplication facts.

Suggested Math Talks
Question/Prompt: What is the answer? How do you know?

How might you make equal groups with a total of 18 students?	How might you make equal groups with a total of 36 students?	How might you make equal groups with a total of 20 students?

Anticipated Student Responses: *How might you make equal groups with a total of 20 students?*

Level 1 Strategy: <u>Counting all</u>

- *I thought you could probably make groups of two students, so I started counting the students and thinking of the groups: 1 and 2, 3 and 4, 5 and 6, 7 and 8, 9 and 10, 11 and 12, 13 and 14, 15 and 16, 17 and 18. That made 9 groups with 2 students in each group.*

Level 2 Strategy: <u>Skip Counting</u>

- *I started with 6 students in one group and counted up by 6s for each group 6, 12, 18, 24, 30, 36. That's six 6s so that would make 6 groups with 6 students in each.*
- *I tried taking away groups of 5 students from the 20 students to see if there would be anymore students left over in the end: 20 - 5 is 15, then 15 - 5 is 10, then 10 - 5 is 5, then 5 - 5 is 0. I took away 5 four times and there was nothing leftover so there could be 4 groups of 5 students in each.*

Level 3 Strategy: <u>Multiplication/Division</u>

- *You could make 5 groups of 4 students in each group because 4 x 5 is 20.*
- *I know 20 ÷2 = 10, so 20 divided into 2 groups is 10 students in each group.*

Unit 3.8

Below are the Math Talks suggested for this unit. These Math Talks are also listed with each lesson. Math Talks should happen 3 to 5 times a week for 10–15 minutes each. See **Math Teaching Toolkit** section on **Math Talks** for more information (http://www.sfusdmath.org/math-talks.html).

Re-engage with Previous Content

Multiplication and Division:
Objective: Students continue to build toward fluency with multiplication and division within 100.
Description: Students use mental math to solve each equation. Students share strategies for solving problems mentally.

Suggested Math Talks to Re-engage with Multiplication and Division

Question/Prompt: What is the missing __________ (number,product, quotient, factor, dividend, divisor)?

8 x 7 = ?	24 ÷4 = ?	? = 6 x 7	24 ÷ ? = 4	3 x ? = 21	32 = ? x 8

Anticipated Student Responses

- **8 x 7 = ?** *I know 8 x 7 is 56 because I broke apart the 7 into 2 and 5 and I know that 8 x 2 = 16 and 8 x 5 =40 and 40 + 16 = 56.*
- **24 ÷4 = ?** *I know that 20 divided into 4 groups is 5 and 4 divided into 4 groups is 1 so 24 divided into 4 groups must be 6 because 5 +1 = 6.*
- **? = 6 x 7** *Fives are easy to multiply so I broke the 6 into 5 and 1. I know that 5x7=35 and 7x1=7 so 7 x 6 is the same as (5x7) + (1x7). 35 +7 = 42.*
- **24 ÷ ? = 4** *I know that 4 x 6 = 24 so the missing number must be 6.*
- **3 x ? = 21** *I knew the missing factor was greater than 6 because 3 x 6 is 18. So I tried skip counting by 3 seven times and found that 3 x 7 =21*
- **32 = ? x 8** *I know 8 x 2 =16 if I double 16 I get 32. So, the missing number has to be double 2, or 4.*

Engage with Current Content

Fractions:
Objective: Reason about the size of fractions
Description: Students determine which they would rather have and why

Suggested Math Talks and Anticipated Student Responses

Entry Task
Would you rather have One whole Oreo Cookie or Two whole mini Oreo Cookies? (Entry Task)

- *I would rather have one whole oreo cookie because it is larger than two whole mini cookies.*
- *I would rather have two whole mini cookies because it is the same amount of cookie but I can share one or keep one for later.*

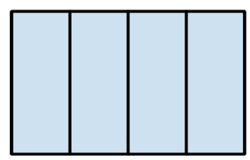
Lesson Series One

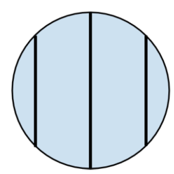
LS1 D1

Which would you rather have? One piece of the brownie or one piece of the cookie? Why?

- *I would rather have one piece of brownie because the pieces are the same size.*
- *I would rather have one piece of brownie because the cookie has some small pieces.*

LS1 Day 1 Math Talk BLM S C



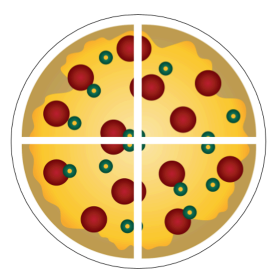
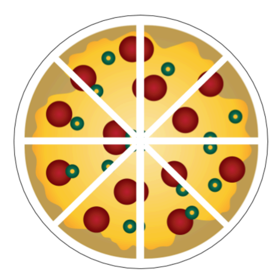



LS1 D2

Would you rather have ¼ of a whole pizza or ⅛ of a whole pizza?

- *I would rather have one fourth of a whole pizza because if you cut a pizza into four pieces the pieces are bigger than if you cut a pizza into eight pieces.*
- *I would rather have one eighth of a whole pizza because one fourth of a pizza would be too big to eat.*

LS1 Day 2 Math Talk BLM S C

LS1 D3
You have more than zero dollars but less than one dollar. How much money might you have?

- *I might have half of a dollar, fifty cents.*
- *I might have a quarter, twenty five cents.*

Apprentice Task
What might go on a number line between zero and one.

- *There are no numbers between zero and one. *Possible Misconception*
- *One half would go halfway between zero and one.*

Lesson Series Two

LS2 D1

Which would you rather have? One half dollar or two quarter dollars?

- *I would rather have two quarters because two is more than one. *Possible Misconception*
- *I would have either because they are the same amount of money.*

LS2 D2

Glenn ate ¼ of his chocolate bar and Maggie ate ½ of her chocolate bar. Glenn says he ate more chocolate than Maggie. How is this possible? • *It is not possible because one fourth is smaller than one half. *Possible Misconception* • *Glenn has a larger candy bar so his pieces are larger.* **LS2 Day 2 Math Talk BLM** S C	**Glenn's chocolate bar**  **Maggie's chocolate bar** 

Expert Task

Would you rather have $\frac{2}{6}$of a whole pie or$\frac{1}{3}$ of a whole pie? Why?

- *I would have either because it is the same amount out of the whole pie.*
- *I would rather have one third of a whole pie because I could always cut it in half (and have two sixths) if I wanted to save some for later.*

Lesson Series Three

LS3 D1: Would you rather have two dollars or four half dollars? Why?

- *I would rather have two dollars because it is more money. *Possible Misconception*
- *I would have either because four half dollars is the same as two whole dollars.*

LS3 D2: Would you rather have $\frac{1}{3}$ of a pizza or $\frac{1}{8}$ of a pizza? Why?

- *I would rather have* $\frac{1}{3}$*of a pizza because thirds are larger than eighths*
- *I would rather have* $\frac{1}{8}$*of a pizza because 8 is greater than 3. *Possible Misconception*

LS3 D3: Would you rather have $\frac{2}{6}$ of a pizza or $\frac{3}{6}$ of a pizza? Why?

- *I would rather have three sixths of a whole pie because it is the same as half.*
- *I would rather have three sixths because three sixths is more than two sixths.*

Milestone Task

Would you rather have one half dollar or two quarter dollars?

- *I would rather have one half dollar because it is the same amount of money but it would be easier to keep track of than two quarters.*
- *I would rather have two quarter dollars because it is still fifty cents but I could buy something for twenty-five cents without needing change.*

Unit 3.9

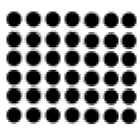
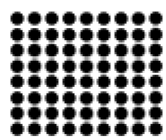
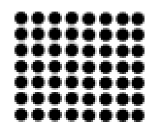
Below are the Math Talks suggested for this unit. These Math Talks are also listed with each lesson. Math Talks should happen 3 to 5 times a week for 10–15 minutes each. Math Talk Visuals are here. See **Math Teaching Toolkit** section on **Math Talks** for more information (http://www.sfusdmath.org/math-talks.html).

Re-engage with Previous Content

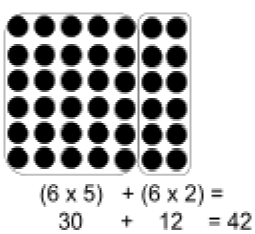
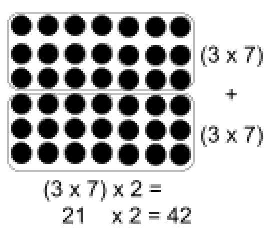
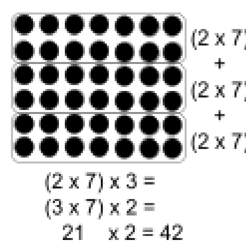
Array Dot Talks
Objective: Students explain their strategies for counting and grouping dots in array formation, encouraging the use of multiplication properties of operations and building towards fluency with single-digit multiplication.
Description: These math talks build on the work students began in previous units decomposing arrays into smaller arrays, calculating the area of the smaller arrays and then added the partial products together to find a total. These math talks encourage students to use the properties of operations to build fluency with multiplication, and re-engage them with their use of the distributive property as they prepare to investigate it again with area.

As students describe their thinking, record their description on the array and use more formal expressions so students begin to see the relationship between both representations.

Suggested Math Talks:
Question/Prompt: *How many dots are there and how do you see them?*

6 x 7	8 x 9	7 x 8
		

Anticipated Student Responses: 6 x 7

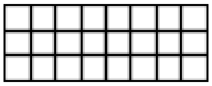
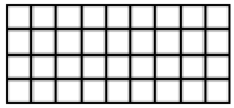
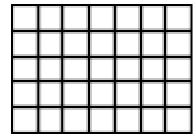
		
I saw 6 rows and 7 columns, so I first took 5 columns because I know 6 x 5 = 30, then I had 2 columns of 6 left and I know 6 x 2 = 12. Then I added 30 + 12 which is 42.	*I saw 3 x 7 which is 21, and then I saw that group again so I doubled 21 and got 42.*	*I saw 3 groups of 2 x 7, that's 3 x 14, but I didn't know how to do 3 x 14. So I went back to 3 groups of 7 x 2, and I knew that was the same as 2 groups of 7 x 3, which is 2 groups 21 which is 42.*

Engage with Current Content

Multiplication With Area

As the unit progresses, switch to doing these Math Talks with the Area of Rectangles.

Use the same process as with the dot arrays, but with area language.
Question/Prompt: *How many squares (or tiles) are there and how do you see them?*

8 x 3	4 x 9	5 x 7
		

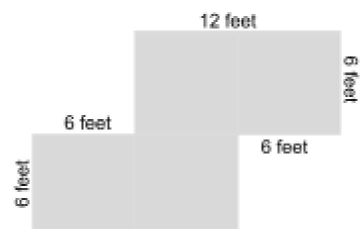
Area and Perimeter Talks

These Math Talks give students opportunities to use the language of area and perimeter. Thinking about both attributes simultaneously helps students clarify the differences between what they are and how they are measured. Emphasis should be on precise language, including units.

Suggested Math Talks:

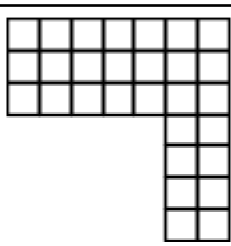
Perimeter Talks

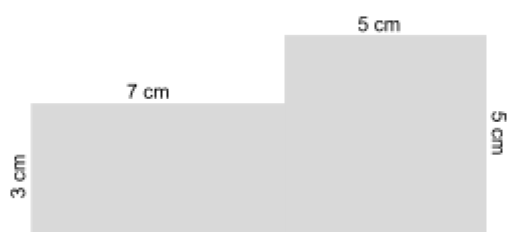
What are the missing dimensions? How do you know? What is the perimeter?



Area and Perimeter Talks

What are the missing dimensions? How do you know? What is the perimeter? What is the area?





A Note about Fluency with Multiplication Facts

Since this unit starts to approach the end of the school year, consider adding daily routines to help students who may not yet be fluent with their single digit facts.

Consider adding multiplication chants, multiplication games, and any other ways to build fluency to the daily routine until all students are fluent.

Below are the Math Talks suggested for this unit. These Math Talks are also listed with each lesson. Math Talks should happen 3 to 5 times a week for 10–15 minutes each. See **Math Teaching Toolkit** section on **Math Talks** for more information (http://www.sfusdmath.org/math-talks.html).

Math Talk Visuals are here S C.

Re-engage with Previous Content

Multiplication Number Talks

Objective: Solve multiplication expressions using the properties of operations and place value concepts, building towards fluency with single-digit multiplication.

Description: This unit includes 6 number talks on multiplication. Although some of the numbers in each expression lend themselves more to using a specific strategy, students may use any strategy to solve.

Suggested Math Talks:

Question/Prompt: *What is the answer and how do you know?*

7 x 8	**5 x 12**	**4 x 12**	**12 x 6**	**4 x 13**	**15 x 6**

Follow up questions may include:

- *What's another way to get the answer?*
- *How could you find the answer if you didn't know that _ x _ was __?* (eg. if you didn't know that 7 x 8 is 56?)

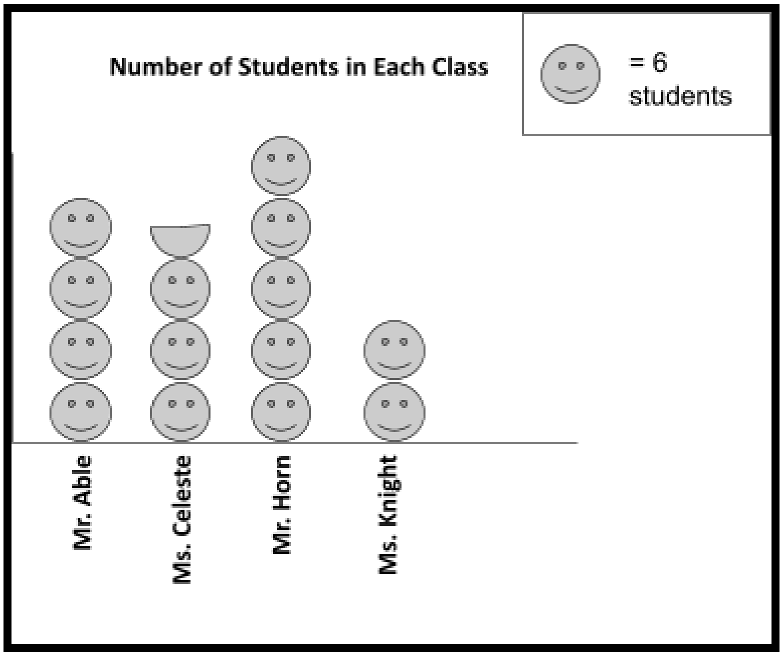
Anticipated Student Responses: The four strategies below are common strategies for evaluating multiplication expressions with larger numbers that you might see for the problem **4 x 17**

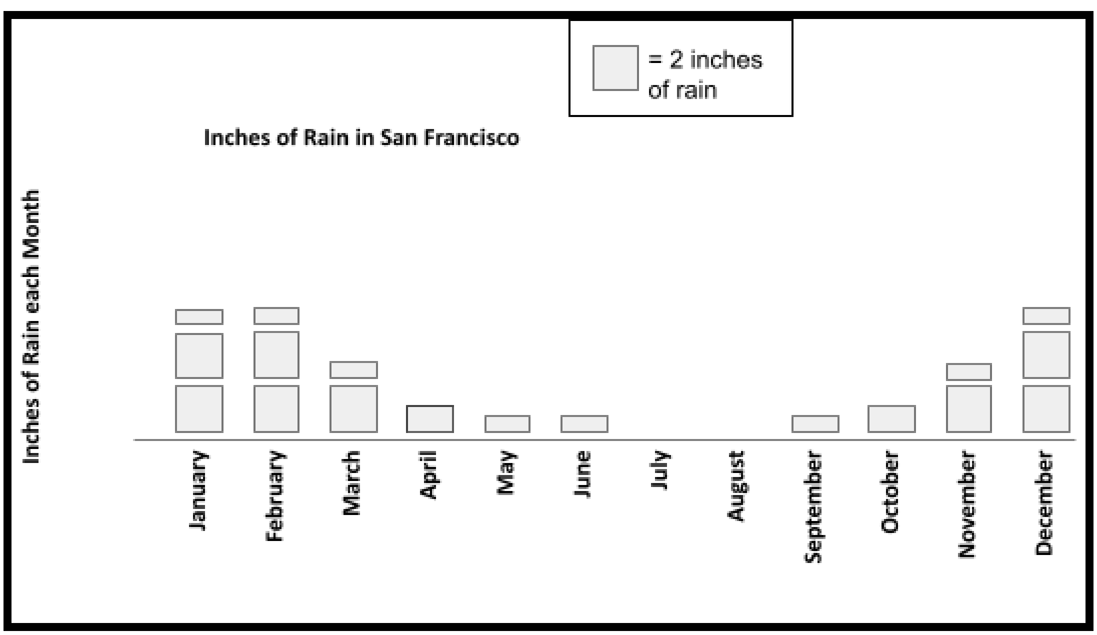
• **Factor a Factor** **Factor 4 into 2 x 2** 4 x 12 = (2 x 2) x 12 2 x 12 = 24 2 x 24 = 48	• **Break a Factor into Two or More Addends** **Break 12 into 10 + 2** 4 x 12 = 4 x (10 + 2) = (4 x 10) + (4 x 2) 4 x 10 = 40 4 x 2 = 8 40 + 8 = 48
• **Halving and Doubling** **Half one factor and double the other** 4 x 12 half the 4 and double the 12 = 2 x 24 half the 2 and double the 24 = 1 x 48 = 48	**Or** **Break 12 into 8 + 4** 4 x 12 = 4 x (8 + 4) = (4 x 8) + (4 x 4) 4 x 8 = 32 4 x 4 = 16 32 + 16 = 48

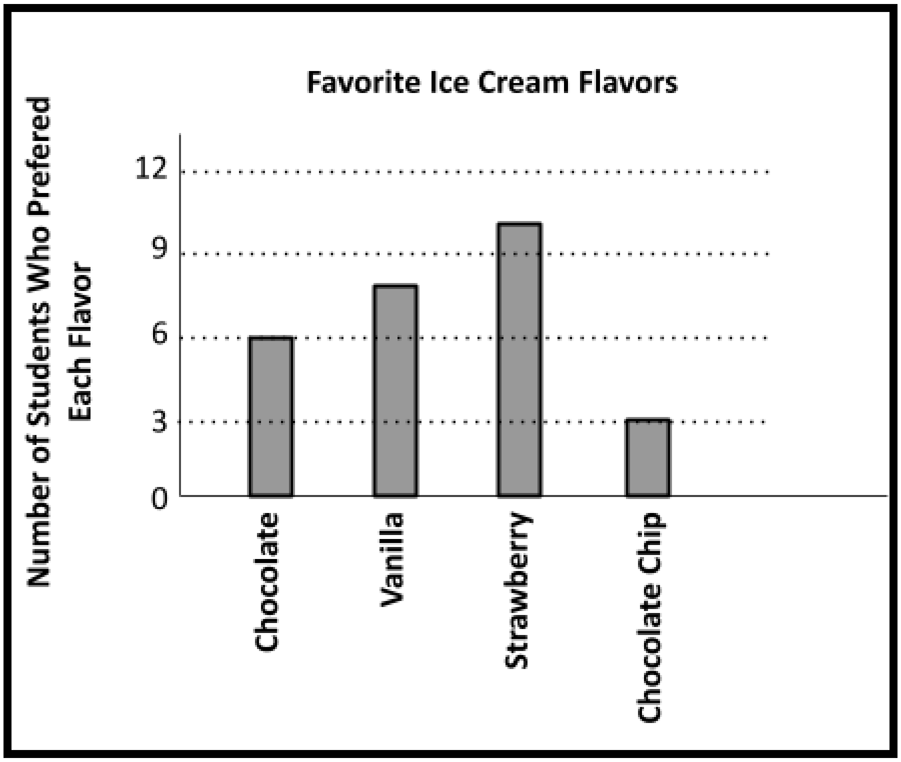
Engage with Current Content

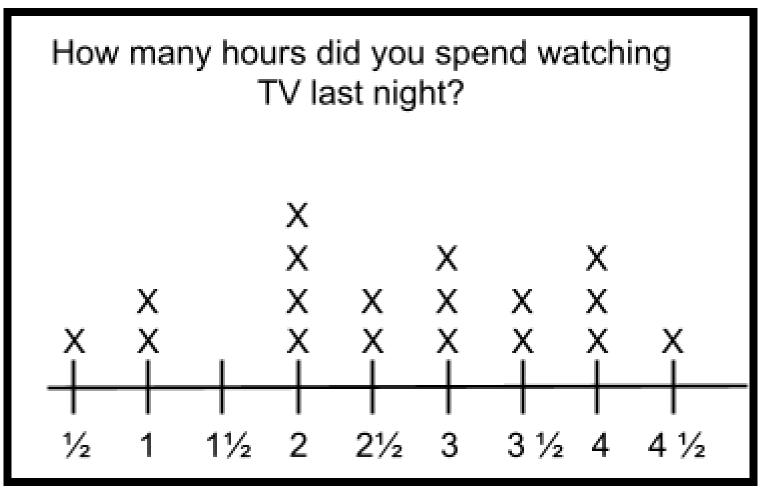
Graph and Line Plot Math Talks
Objective: Interpret data in bar graphs and line plots
Description: This unit includes 4 math talks on interpreting data in graphs and line plots. This gives students an opportunity to integrate the lessons of this unit, and gives you an opportunity for informal assessment of their understanding of the new ideas.

Suggested Math Talks:
Question/Prompt: *What do you notice?*









Follow up questions may include:

- *What questions could you ask about this data that you can answer by looking at the graph/line plot?*

Anticipated Student Responses:
Students can be expected to observe any of the features of bar graphs and line plots that have been emphasized in this unit, including the categories, the scale, the picture if a pictograph. Sample questions they might ask include:

- *How many ___ are there?*
- *How many more ___ than ___ are there?*
- *What many fewer ___ than ___ are there?*

Unit 3.11

Below are the Math Talks suggested for this unit. These Math Talks are also listed with each lesson. Math Talks should happen 3 to 5 times a week for 10–15 minutes each. **Math Talk Visuals are here**. See **Math Teaching Toolkit** section on **Math Talks** for more information (http://www.sfusdmath.org/math-talks.html).

Re-engage with Previous Content

Dot Talks

Objective: Use Multiplicative Reasoning to group dots and find totals efficiently, building towards fluency with single-digit multiplication and beginning to work with two-step equations.

Description: This unit includes 6 math talks that support multiplicative reasoning. Students practice subitizing* groups of dots and applying their knowledge of addition and multiplication to determine the total number of dots. Depending on how students view the dots, they can subitize chunks of dots in a variety of ways. The dots are arranged in a way that support seeing chunks that can be viewed as equal groups.

*Subitizing is the ability to quickly identify the number of items in a small set without counting.

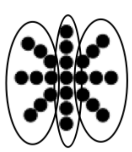
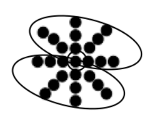
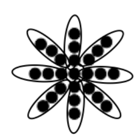
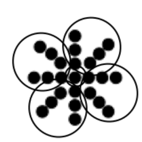
Suggested Math Talks:

Question/Prompt: *How many do you see? What do you notice about them?*

Follow up questions may include: *What's another way to see these dots?*

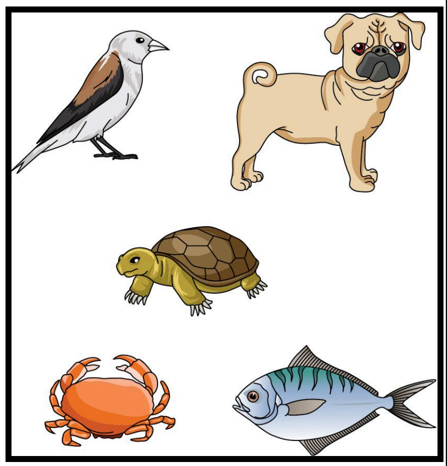
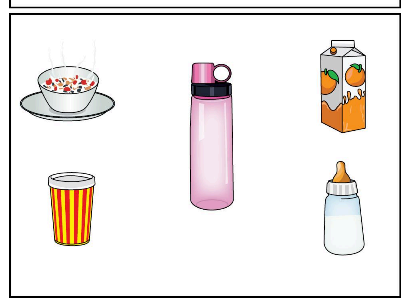
Anticipated Student Responses: These are a few ways that students might see the dots for this formation. Although there are many ways that students can see the dots, limit the number of students who are sharing to keep the Math Talk short.

	*I saw that there were 7 in the line down the middle. On the left side there are 3 groups of 3, that's 9. I doubled the 9 and added 7.* **T: *Why did you double the 9?*** *There is another group of 9 on the right side.*		*I looked at the top part first. I saw 4 groups of 3. I added them together. I saw the same thing on the bottom. Then I added the one in the middle.* ***(3 + 3 + 3 + 3) + (3 + 3 + 3 + 3) + 1*** ***(4 x 3) + (4 x 3) +1*** ***12 +12 + 1*** *or* ***2 x 12 + 1***
	***4 x 7 = 28, 28 – 3 = 25.*** *I saw that there were 4 lines of 7 and thought there were 28. Then I realized that I was counting the middle dot more than once. So, I took away 3 because I can't count the middle dot for 3 of the 4 rows.* ***4 x 7 – 3***		*If you take out the middle, you can see that there are eight rows of 3. Then I added the one back.* ***8 x 3 + 1 = 25.***
			*I saw a flower. I saw the middle dot first. Then I saw two groups of 3 to make 6. I saw 4 groups of 6.* ***1 + 4 x 6***

Engage with Current Content

Measurement Estimation
Objective: Reasoning about Weight and Capacity
Description: This unit includes 5 math talks that ask students to estimate and order objects by weight or capacity (volume). Students apply the work they have been doing in this unit of finding benchmark objects and using them to reason about the weight and capacity of unknown objects. In addition, these math talks give students opportunities to *Construct viable arguments and critique the reasoning of others* (Math Practice #3).

Suggested Math Talks:
Question/Prompt: Compare two objects using: *I think the ___ is lighter/heavier than the ___ because ___*
Or *Which is the heaviest? Lightest? Why do you think so?*
Or *Which has the least capacity? Which has the greatest capacity? Why do you think so?*
Or *What do you estimate is the weight or capacity of each object? Why do you think so?*

Weight	**Capacity**
  	 

Follow up questions may include:
- *Who disagrees? Why?*
- *Put these objects in order from lightest to heaviest and estimate the weight of each.* Or *Put these objects in order from least capacity to greatest capacity and estimate the capacity of each.*

Anticipated Student Responses

	• *I think that the baseball is lighter than the backpack because cantaloupes are smaller than basketballs.* • *I disagree. I think the baseball is heavier because backpacks have air in them and baseballs have stuff.* • *I remember that the water bottle we weighed was more than a kilogram, and the ball we weighed was less than a kilogram. I think the baseball is lighter than the water bottle.* • *I think the weight of the backpack depends on what is in it.*

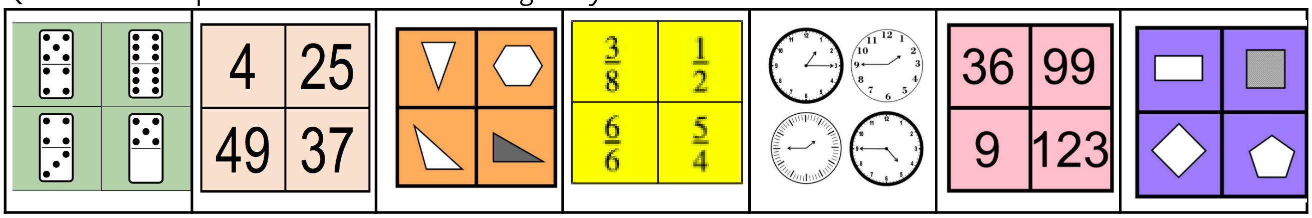
Unit 3.12

Below are the Math Talks suggested for this unit. These Math Talks are also listed with each lesson. Math Talks should happen 3 to 5 times a week for 10–15 minutes each. Math Talk Visuals are here. See **Math Teaching Toolkit** section on **Math Talks** for more information (http://www.sfusdmath.org/math-talks.html).

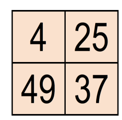
Re-Engage with Previous Content

Which One Doesn't Belong?
Objective: Determine and justify differences and similarities between numbers, shapes, or measurements.
Description: These math talks encourage students to closely examine attributes of numbers, shapes, and measurements to determine which one doesn't belong to a group. There are many different reasons for why a number, shape, or measurement does not belong. Students need to support their choice with valid mathematical reasoning. These math talks span multiple concepts and domains, such as place value, addition, subtraction, multiplication, division, time, shape attributes, etc.

Suggested Math Talks:
Question/Prompt: *Which one doesn't belong? Why?*



Anticipated Student Responses: These are just a few of the many reasons why a number may not belong to this group. Pay close attention to the reasoning that students are using to determine which number doesn't belong to the group.



The 4 doesn't belong because:
- It is the only single digit number
- It is the only even number.
- It is the only number evenly divisible by 2.
- It is the only number that has even factors.

The 25 doesn't belong because:
- It is the only number evenly divisible by 5.
- It is the only number between 20 and 30.
- It is the only number that can be the value of a coin.
- It is the only number that can be multiplied to make 100.

The 49 doesn't belong because:
- It is the only multiple of 7.
- When you add the digits together, it's the only number greater than 10.

The 37 doesn't belong because:
- You can't multiply the same numbers together to get 37 (all other numbers are square numbers).
- You can't multiply any numbers together to get 37 except for 1 x 37 (prime)

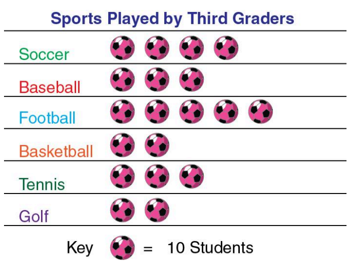
Resources: Math Talk Visuals - WODB BLM

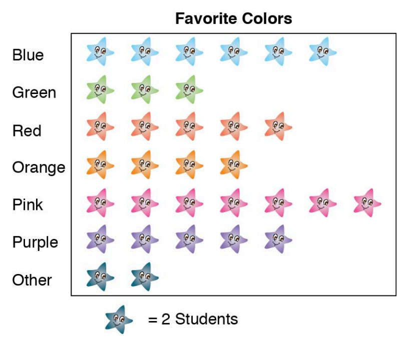
Credits: Several puzzles adapted from www.wodb.ca and used with permission of Mary Bourassa and Andrew Gael.

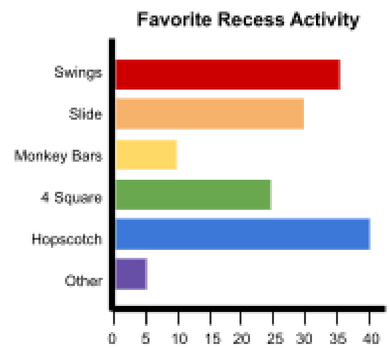
Engage with Current Content

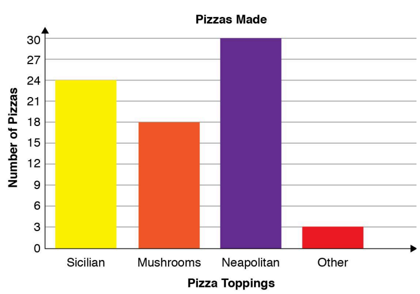
<u>Graph Talks</u>
Objective: Analyze data and ask questions that can be represented using multi-step equations with a letter for the unknown.
Description: These math talks allow students to engage with the core math of this unit related to solving and representing two-step equations, while also providing an opportunity to re-engage with the Measurement and Data standards on scaled bar and picture graphs. Students analyze data, and generate questions. They solve them with a multi-step equations using a letter for the unknown quantity. The focus may be on combining two equations into one. See *Anticipated Student Response* below.

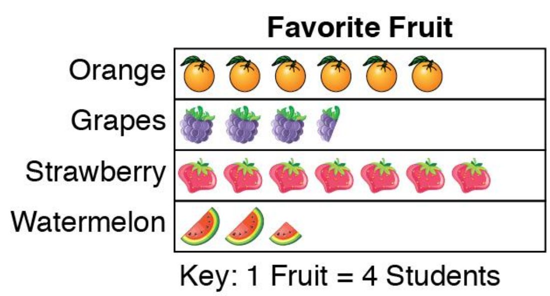
Suggested Math Talks:
Question/Prompt: *What do you notice? What do you wonder?*
Generate a Question you could answer from this graph. Can you express the answer as an equation with an unknown?











Record some of the questions that students come up with and ask them to decide what the unknown is and how to represent the problem with an equation using a letter for the unknown.

Anticipated Student Response: Favorite Colors

Student generated question: How many more students like blue than pink?
What is the unknown? The unknown is the difference between students who like blue and students who like pink. Students may choose to use the letter d for difference.
How many students like pink? 2 x 2 = 4
How many students like blue? 5 x 2
What is the difference? (5 x 2) - 4 = d

Resources: Math Talk Visuals - Graphs BLM S C