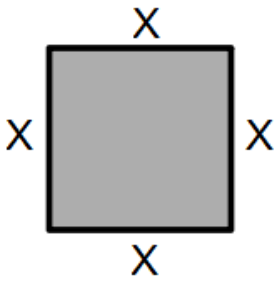
Task: Family Math Night **3rd Grade**

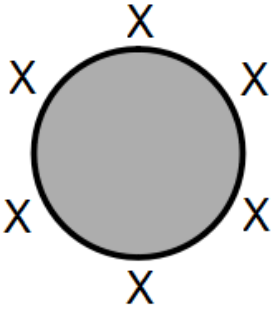
The 3rd grade at East Lake Elementary School is having a Family Math Night. The table shows the number of people in each class planning to attend the Family Math Night. Students were asked to find ways to seat all the people in all 3 classes.

	Total Number of People
Ms. John's Class	18
Mr. Page's Class	21
Ms. Evan's Class	19

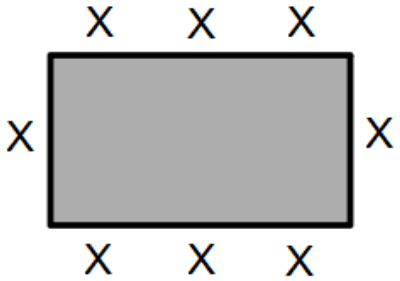
The school has 10 square tables.



The school has 7 round tables.



The school has 6 rectangular tables.



X = 1 seat

Find 3 different combinations of tables that could be used to seat all the people without leaving any empty seats. Draw a picture and write multiplication equations that show how you solved the problem.

Teacher Notes

Models used in solution paths show different interpretations of multiplication and division. It is possible for a student to use any combination of models shown below. There are more than 10 solution paths to this problem.

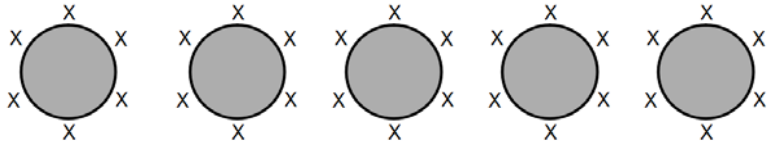
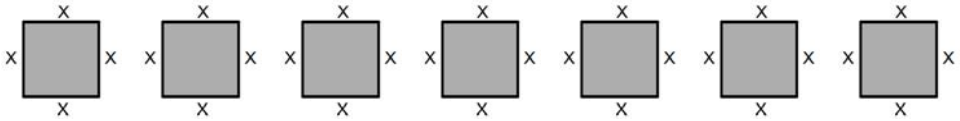
Common Core State Standards for Mathematical Content	Common Core State Standards for Mathematical Practice
3.OA.A.1 Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as 5 × 7.* 3.OA.A.3 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. 3.OA.B.6 Understand division as an unknown-factor problem. For	1. Make sense of problems and persevere in solving them 2. Reason abstractly and quantitatively 3. Construct viable arguments and critique the reasoning of others 4. Model with mathematics. 5. Use appropriate tools strategically 6. Attend to precision 7. Look for and make use of structure 8. Look for and express regularity in repeated reasoning

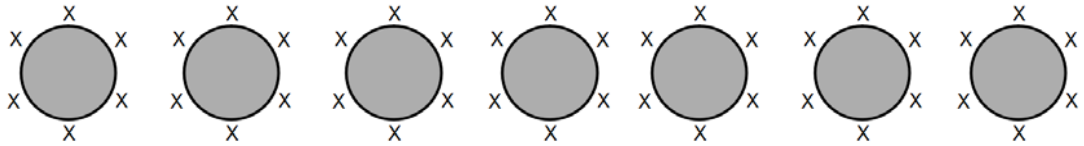
example, find 32 ÷ *8 by finding the number that makes 32 when multiplied by 8.*

Essential Understandings

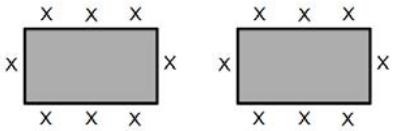
- Multiplication can be used to find the total number of objects when there are a specific number of groups with the same number of objects.
- Multiplication and division have an inverse relationship and can be used to find division or multiplication facts
- Division can be used to find how many equal groups (measurement - repeated subtraction) or how many are in each group (partitive - sharing)

Explore Phase

Possible Solution Paths	**Assessing and Advancing Questions**
<u>Equal Groups – Using only 2 table combinations</u> Students may find the total number of people attending the Family Math Night by adding 18 + 21 +19 = 58. Then realize that it is not possible to seat 58 people by using only one kind of table. ***<u>Example 1</u>***  5 groups of 6 or 5 round tables x 6 seats = 30 seats  7 groups of 4 or 7 square tables x 4 seats = 28 seats (5 x 6) + (7 x 4) = 58 seats Therefore ***5 round tables and 7 square tables*** will provide 58 seats. --- ***<u>Example 2</u>***	<u>Assessing Questions:</u> - How did you decide how many tables were needed? - How did you decide which tables were needed? - What does each number represent in your equation? (Ask students to relate numbers back to the model.) <u>Advancing Questions:</u> - Why did you decide to write these equations? - What do you notice about these two examples? How are these alike and different? - How many solutions are possible using 2 table combinations?



7 groups of 6 or 7 round tables x 6 seats = 42 seats



2 groups of 8 or 2 rectangular tables x 8 seats = 16 seats

(7 x 6) + (2 x 8) = 58 seats

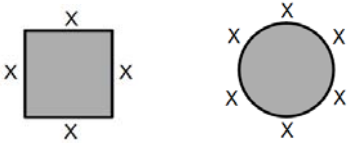
Therefore ***7 round tables and 2 rectangluar tables*** will provide 58 seats

Equal Groups – Using all 3 table combinations

Students may find the total number of people attending the Family Math Night by adding all three classes together, 18 + 21 +19 = 58. Then work with 3 different tables to make 58.

Example 1

Students may recognize that 1 square table (4 seats) and 1 round table (6 seats) provide 10 seats. Therefore, they may see that 5 square tables and 5 round tables provide 50 seats. Then add 1 rectangular table (8 seats) in order to provide 58 seats.



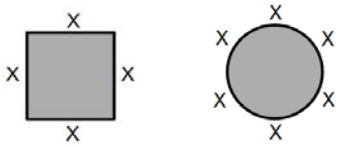
(1 x 4) + (1 x 6) = 10 seats

Assessing Questions:

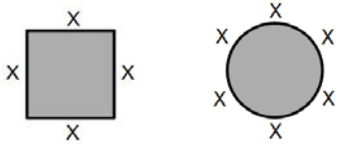
- How did you choose square and round tables?
- How did you choose all three tables (example 2)?
- What does each number represent in your equation? (Ask students to relate numbers back to the model.)

Advancing Questions:

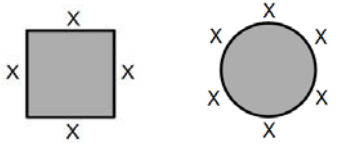
- Why did you decide to write these equations?
- How are the two examples alike and different?
- How many solutions are possible using all 3 table combinations?



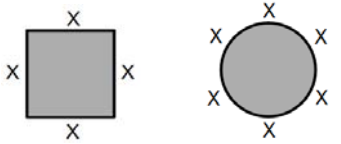
(1 x 4) + (1 x 6) = 10 seats



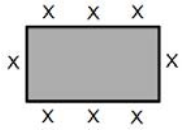
(1 x 4) + (1 x 6) = 10 seats



(1 x 4) + (1 x 6) = 10 seats



(1 x 4) + (1 x 6) = 10 seats



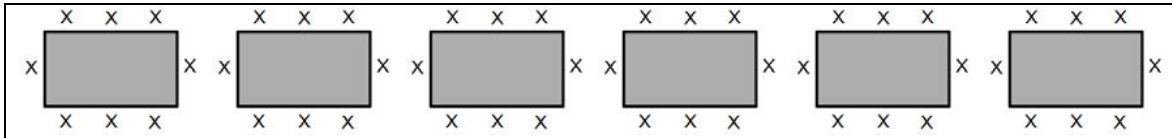
1 x 8 = 8 seats

50 seats + 8 seats = 58 seats or (5 x 4) + (5 x 6) + (1 x 8) = 58

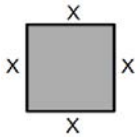
Therefore ***5 square tables, 5 round tables, and 1 rectangular table*** will provide 58 seats

<u>Example 2</u>

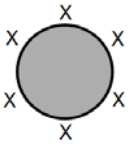
Students may start with the rectangular table that provides the most number of seats (6 rectangular tables x 8 = 48 seats). Then recognize that 1 square table (4 seats) and 1 round table (6 seats) will provide 10 seats. Therefore, 48 + 4 + 6 = 58 seats.



6 groups of 8 or 6 rectangular tables x 8 seats = 48 seats



1 group of 4 or
1 square table x 4 seats = 4 seats



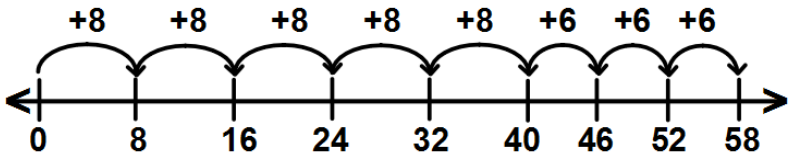
1 group of 6 or
1 round table x 6 seats = 6 seats

48 seats + 4 seats + 6 seats = 58 seats or (6 x 8) + (1 x 4) + (1 x 6) = 58

Therefore ***6 rectangular tables, 1 square table, and 1 round table*** will provide 58 seats

Repeated Addition and Subtraction

Students may use ***repeated addition*** to find the number of tables needed to seat 58 people.

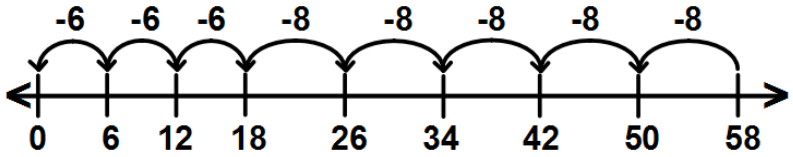


5 rectangular tables: 8 + 8 + 8 + 8 + 8 = 40 = 5 x 8 = 40 seats
3 round tables: 6 + 6 + 6 = 18 = 3 x 6 = 28 seats
40 + 18 = 58 seats
Therefore, ***5 rectangular tables and 3 round tables*** are needed to seat 58 people.

Students may use ***repeated subtraction*** to find the number of tables needed to seat 58 people.

Assessing Questions:
- Why did you choose to add and/or subtract?
- How many times did you add and subtract? Why?
- What does each hop on the number line stand for?
- How does adding and subtracting help you to solve the problem?

Advancing Questions:
- What is the relationship between addition and multiplication?
- How can you write a multiplication equation for the addition/subtraction sentence?
- How are these two number lines alike and different?



58 – 8 = 50 1 rectangular table
50 – 8 = 42 1 rectangular table
42 – 8 = 34 1 rectangular table
34 – 8 = 26 1 rectangular table
26 – 8 = 18 1 rectangular table
18 – 6 = 12 1 round table
12 – 6 = 6 1 round table
6 – 6 = 0 1 round table

5 rectangular tables: 8 + 8 + 8 + 8 + 8 = 40 = 5 x 8 = 40 seats
3 round tables: 6 + 6 + 6 = 18 = 3 x 6 = 28 seats
40 + 18 = 58 seats
Therefore, ***5 rectangular tables and 3 round tables*** are needed to seat 58 people.

Possible Student Misconceptions

Students may try to use only one kind of table to get close to 58 seats or go over 58 seats. Examples: 7 rectangular tables x 8 = 56 seats not recognizing that the school only has 6 rectangular tables. 10 round tables x 6 = 60 seats	<u>Assessing Questions:</u> - How many seats are needed for the Family Math Night? - How many square, round, and rectangular tables are at the school? <u>Advancing Questions:</u> - Does your answer make sense? - What do you need to do after you find the total number of people attending the Family Math Night?
Students may try to figure out the number of tables for each class. This strategy will only work for Ms. John's class. Example: Ms. John's Class: 1 square table, 1 round table, 1 rectangular table 4 + 6 + 8 = 18 seats Mr. Page's Class: Need 21 seats Ms. Evan's Class: Need 19 seats	<u>Assessing Questions:</u> - How many seats are needed for Mr. Page's class and Ms. Evan's class? - If you can't find the correct number of tables for Mrs. Page's class by itself, what else you can do? <u>Advancing Questions:</u> -Why is it impossible to find the correct number of tables for Mr. Page's class or Ms. Evan's class separately?

Students may make calculation errors and do not find table combinations for 58 seats. Students may not realize this is a multi-step problem and only find the total number of seats needed.	<u>Assessing Questions:</u> - What is the question you are trying to answer? - How many seats are needed for the Family Math Night? <u>Advancing Questions:</u> - Does your answer make sense? - What do you need to do after you find the total number of seats needed for the Family Math Night?
Entry/Extensions	**Assessing and Advancing Questions**
If students can't get started….	<u>Assessing Questions:</u> - How can you state the problem in your own words? - What are you trying to find or do? - What information do you need to solve the problem? - What model could you draw to help you solve the problem? - How many seats are at the Square table? Round table? Rectangular table? <u>Advancing Questions:</u> - How many people will be attending the Family Math Night? - If you had 2 square tables, what multiplication sentence will give you the total number of seats?
If students finish early….	<u>Assessing Questions:</u> - Does your solution make sense when you look at the original problem? - Is it reasonable? Explain your thinking. <u>Advancing Questions:</u> - Is there another way of finding the solution? - How many solutions are possible? - How do you know you have found all possible solutions?
Discuss/Analyze	
Whole Group Questions	
Select and sequence refers to when a teacher anticipates possible student strategies ahead of time and then selects and determines the order in which the math ideas/strategies that students will share during the whole group discussion. The purpose of this is to determine which ideas will be most likely to leverage and advance student thinking about the core math idea(s) of the lesson.	

During a whole group discussion, students are sharing their strategies that have been pre-selected and sequenced by the teacher. Strategies to consider sharing: Equal Groups with 2 table combinations, Equal Groups with all 3 table combinations, Multiplication Equations, and Repeated Addition/Subtraction. Although it is not possible to have only 1 type of table, it may be worth sharing this strategy as well.

- How are these strategies similar and different? (Use Accountable Talk to ask students to compare strategies.)

- One student started with determining the number of tables for each class. Does this strategy work for the other two classes? Explain your thinking.

- What does each number represent in your equation? (Relate numbers back to the model.)

- When do you use multiplication to solve a problem? When do you use division to solve a problem?

- What is the relationship between multiplication and division?