# CONSTRUCTION TASK: Family Reunion

**1 Day**

## STANDARDS FOR MATHEMATCIAL CONTENT

**Understand properties of multiplication and the relationship between multiplication and division.**

**MCC.3.OA.5**. Apply properties of operations as strategies to multiply and divide. Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.) 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.) Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)
Use arrays, area models, and manipulatives to develop understanding of properties.

**MCC.3.OA.6.** Understand division as an unknown-factor problem. For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.
Conversations should also include connections between division and subtraction.

## STANDARDS FOR MATHEMATCIAL PRACTICE

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.

*****Mathematical Practices 1 and 6 should be evident in EVERY lesson. *****

## BACKGROUND KNOWLEDGE

(Information from Van de Walle and Lovin, Teaching Student-Centered Mathematics: Grades 3-5, page 61)

Students need a good understanding of how to manipulate pattern blocks in order to solve tasks. Students should have had prior experiences with the manipulatives; they should be aware of how to use the blocks as a tool for problem solving. Emphasize the connection between multiplication and division in these tasks. Students should also have an understanding of what to do with remainders. Sometimes remainders can be discarded, could force the number to the next highest whole, or rounded to the next whole for an approximate answer. In this activity they may experience someone being left out. Students need to understand how the remainder will be handled. In the case of seating, the students will have to force the number to the next whole.

## ESSENTIAL QUESTIONS

- How is the associative property of multiplication used in solving a problem?
- How can multiplication and division be used to solve real world problems?
- How can we use patterns to solve problems?

## MATERIALS

- Item cards for Part I (printed on three different color paper or write them on three different colors of index cards)
- "Family Reunion" recording sheet
- Pattern Blocks

## GROUPING

Individual/Partner Task

## TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

This task will be in two parts: Part I Introducing and scaffolding the Associative Property and then in Part II will be constructing the associative property.

Part I task, students will be giving the three integers and asked to find the product. Students will be able to determine that the arrangement of the integers do not affect the product.

**Task Directions**
Students will be given an item card containing one type of food they will need to pack for the family reunion.
1. They have to determine how much of each item is needed and how to pack the coolers.
2. Distribute the item cards (one per student)
3. Challenge the students to find out how much of each type of food to pack. There will be 36 people at the family reunion.
4. Create a three columned chart where students can record their findings, label each column: Over the Amount, Close to the Amount, Not Enough.

| Over the Amount Needed | Close to the Amount Needed | Not Enough |
|---|---|---|
| Ex. (5 packages x 8 hot dogs) x 2 coolers = (2 coolers x 5 packages) x 8 hot dogs = 80 hot dogs | Ex. (3 packages x 8 hot dogs) x 2 coolers = (2 coolers x 3 packages) x 8 hotdogs = 48 hotdogs | Ex. (2 packages x 8 hot dogs) x 2 coolers = (2 coolers x 2 packages) x 8 hotdogs = 32 hot dogs |

If needed, just distribute the card for hot dogs and work on solving this problem independently, then distribute the other food item cards and separate into groups. (This may be used for remedial groups.)

5. Ask students to get in groups of three. Each student must have a different type of card (one food, one package and one cooler card in each group.)
6. If they multiply their items, will they have enough, not enough or just the right amount of everything for everyone to have one of each item.
7. Challenge the groups of three to see if they can get a different product by switching places. Ask them if it matters what position they are in?
8. Students can record the number sentences and products either on chart paper, smart board or math notebook.
9. Allow time for the students to determine what the best equation will be for each food group.
10. Discuss the findings and how they figured out the different amounts.
11. Discuss the associative property and how it will affect the product when multiplying three integers.
12. Challenge: find how the equations would change if everyone at the family reunion would take two of each item, three… etc.

Part II task, students will use models of tables to decide how many tables must be used to seat a given number of guests.

**Task Directions**
Students will follow the directions below from the "Family Reunion" recording sheet.

1. Help set up tables for your upcoming family reunion. Thirty-six relatives need a place at a table to sit and enjoy their food and drinks. You may use the following table styles:
    - Square tables that seat one person to a side for a total of four people at a square table.
    - Circular bistro tables that seat exactly three people.
    - Hexagonal tables that seat one person to a side for a total of 6 people.
    - Rectangular tables that seat twelve people.
    - Pentagonal tables that seat one person to a side for a total of five people.
2. Which table would you need the most? Show how you figured out how many of those tables you would need.
3. Which table would you need the least? Show how you know.
4. Choose two types of tables and draw your method for seating all 36 relatives for the family reunion. Write a number sentence to describe what you've drawn.
5. Suppose the only tables you had were pentagonal. Explain how you would seat all of your relatives.

## FORMATIVE ASSESSMENT QUESTIONS

- What combinations of tables have you tried so far?
- How will you know when you find the right combination?
- Do you think there is more than one right solution for this task? Why do you think so? Do you have a way of finding out?
- How many _____ (square, circular, hexagonal, rectangular, or pentagonal) tables do you need? How do you know?

## DIFFERENTIATION

### Extension

- Use square tables that seat one person to a side, but this time push the tables together end to end and find out how many relatives can be seated. Continue adding tables this same way until you have enough tables to seat everyone. Enter the information in a table and describe any patterns you see. How many square tables pushed end to end would it take?

| # Tables | # People Seated | Sketch | Number Pattern |
|---|---|---|---|
| 1 | 4 | □ | (1 x 4) - 0 = 4<br>(1 x 2) + 2 = 4 |
| 2 | 6 | □□ | (2 x 4) – 2 = 6<br>(2 x 2) + 2 = 6 |
| 3 | 8 | □□□ | (3 x 4) – 4 = 8<br>(3 x 2) + 2 = 8 |
| 4 | 10 | □□□□ | (4 x 4) – 6 = 10<br>(4 x 2) + 2 = 10 |
| 5 | 12 | □□□□□ | (4 x 5) – 8 = 12<br>(5 x 2) + 2 = 12 |
| .<br>.<br>. | | | |
| 17 | 36 | | (17 x 2) + 2 = 36 |

Two possible number patterns are shown.
The first is the number of seats for the tables, minus the sides lost when tables are pushed together.
The second pattern is the number of seats along the top and bottom plus the seat at each end.

- Choose another pattern block shape and see if the same pattern holds as you push the tables together.
- Experiment to see if it will take more or less tables if a hole is left in the center or if all tables touch another table on all sides except the side where the guests will sit.
- Use a different number of relatives or allow students to make up additional types of tables (octagonal, rhomboidal, triangular, or trapezoidal).
- Rather than two types of tables, let students use three types that still yield seating for 36 people.

### Intervention

- Use a smaller number of relatives, such as 12 or 20.
- Guided practice that simulates the task, done ahead of time, will enable students to develop problem solving strategies, particularly if the teacher models the strategies students are developing.

## TECHNOLOGY CONNECTION

- http://www.arcytech.org/java/patterns/patterns_d.shtml Allows students to work with pattern blocks in an interactive applet and easily print their work.

Item cards for Part I

| | |
|---|---|
| 1 package | 2 packages |
| 3 packages | 4 packages |
| 5 packages | 6 packages |
| 7 packages | 8 packages |
| 9 packages | 10 packages |

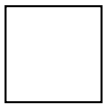
| | |
|---|---|
| 1 cooler | 2 coolers |
| 3 coolers | 4 coolers |
| 5 coolers | 6 coolers |
| 7 coolers | 8 coolers |
| 9 coolers | 10 coolers |

| | |
|---|---|
| Hamburgers<br>(8 in a package) | Hamburger Buns<br>(4 in a package) |
| Hot Dogs<br>(7 in a package) | Hog Dog Buns<br>(3 in a package) |
| Bag of Individual Chips<br>(5 in a package) | Juice Drinks<br>(10 in a package) |
| Sodas<br>(6 in a package) | Ice Pops<br>(9 in a package) |

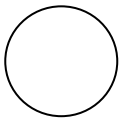
Name _____ Date _____

# Family Reunion

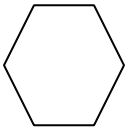
1. Help set up tables for your upcoming family reunion. Thirty-six relatives need a place at a table to sit and enjoy their food and drinks. You may use the following table styles:



Square tables that seat one person to a side for a total of four people at a square table

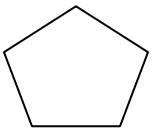


Circular bistro tables that seat exactly three people



Hexagonal tables that seat one person to a side for a total of 6 people

Rectangular tables that seat twelve people



Pentagonal tables that seat one person to a side for a total of five people

2. Of which table would you need the most? Show how you figured out how many of those tables you would need.

3. Of which table would you need the least? Show how you know.

4. Choose two types of tables and draw your method for seating all 36 relatives for the family reunion. Write a number sentence to describe what you've drawn.

5. Suppose the only tables you had were pentagonal ones that only seat five people per table. Explain how you would seat all of your relatives.