

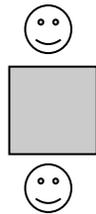
Lesson 4: Brady's Birthday Party

1. Brady's Birthday

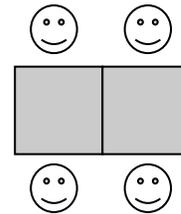
Brady is celebrating his birthday at school. He wants to make sure he has a seat for all of his friends. He has square desks for his friends, but no one can sit on the ends of the desks.

Build the following figures while children watch. Verbalize your actions.

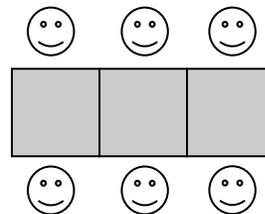
He can seat 2 friends at one desk in the following way:



If he joins another desk to the first one, he can seat 4 friends:



If he joins another desk to the second one, he can seat 6 friends:



Question: Can we find a relationship between the number of desks and the number of friends that can be seated?

A. Explore with Partner: How many friends could be seated at 10 desks? How did you figure this out?

Have students record their thinking on a handout. The choice of 10 might change depending on the class (e.g., 20 for grades 1-2). The goal is to have a relatively large number so that students can't do this mentally, but need some type of representation to model their thinking.

B. Class Discussion:

- How many friends can be seated at 1 desk?
- How many friends can be seated at 2 desks? (continue for 3, 4 and 5 desks)

Discuss students' solutions, paying attention to how they solved the problem and the different representations they used. The growing amount of information

should motivate a need for organizing it in some way. Record the information, with student help, as follows:

1	2
2	4
3	6
4	8
5	10

Discuss what the columns of numbers represent (e.g., number of desks) and whether it would be a good idea to include information about this.

Then introduce (finalize) the representation:

number of desks	number of friends
1	2
2	4
3	6
4	8
5	10

C. Explore with Partner: Do you see any patterns or relationships here? How would you describe these?

D. Class Discussion:

Take time to discuss the types of relationships students see. They will likely talk about recursive patterns. Develop a shared understanding of how to talk about recursive patterns. Introduce the terminology of “rule”.

- If Brady keeps adding desks, what will happen to the number of friends he can seat? How would you describe this?
- What happens to the number of friends every time we add one more desk? (*The goal here is to get students to think about two quantities co-varying, looking across table.*)
- How would you complete the following:

Every time the number of desk goes up by _____, the number of friends goes up by _____.

- Can we add information to our chart even without having people come up to the board? *Have students continue the chart for a few values.*
- How would I figure out the number of friends for 500 desks (or, 100 for grades K-1)? *The goal of this question is to get students to think about whether they can do this problem, or would even want to do this problem, by extending a recursive pattern. Talk about the limits of this approach as a way to motivate the next discussion on function rules. Perhaps ask: “How could we figure out how many friends can sit down if we don’t know how many desks there are?”*

3. Develop a Function Rule

Class Discussion:

*Return to the t-chart. Discuss **how** students got each total number of friends. This will be important in order for them to notice patterns. Write a number sentence that shows the relationship between each corresponding pair of values: $1 + 1 = 2$, $2 + 2 = 4$, $3 + 3 = 6$ and so on. Write the equation beside the corresponding values.*

number of desks (D)	number of friends (F)	
1	2	$1 + 1 = 2$
2	4	$2 + 2 = 4$
3	6	$3 + 3 = 6$
4	8	$4 + 4 = 8$
5	10	$5 + 5 = 10$

- Do you see any relationship between the number of desks and number of friends? How would you describe it? *The goal is for students to use information like the above to notice functional relationships. This kind of analysis also builds toward multiplicative thinking.*

Explore with Partner:

- If Brady has 20 desks, how many friends can he seat? How did you get your answer?
- If Brady wants to have 30 friends at his party, how many desks will he need? How did you get your answer?

Handout: Lesson 4

Name: _____ Date: _____

How many friends could be seated at 10 desks?

How did you figure this out?