

4.4

Solve Problems Using a Table of Values

You will need
• a calculator

GOAL

Use a table of values to solve patterning problems.

Learn about the Math

Sarah is setting up a display at her family’s convenience store. She wants to stack cases of soft drinks in a triangle arrangement with 10 rows. There will be 1 case at the top, 2 cases in the 2nd row, 3 cases in the 3rd row, and so on. Sarah wants to know the number of cases she needs to get from the storeroom to set up her display.

? **How many cases does Sarah need to make 10 rows?**




1 Understand the Problem

Sarah knows that each row has one more case than the row above it. She also knows how many cases are in the top three rows. She has to figure out how many cases are in 10 rows.

2 Make a Plan

Sarah decides to sketch the top three rows of the display. Then she will use her sketch to make a table of values and look for a number pattern.

3 Carry Out the Plan

Row number	Picture	Cases in row	Total cases used
1		1	1
2		2	3
3		3	6

Sarah notices that the number of cases in each row matches the row number. This means the 10th row will have 10 cases in it, the 9th row will have 9 cases in it, and so on.

Sarah also notices another pattern. When you add the number of cases in the top row to the number of cases in the bottom row, you get a total of 11 cases. The same thing happens when you add the number of cases in the second row and the second last row.

Using this pattern, Sarah calculates the total number of cases:

$$\begin{aligned}\text{Total number of cases} &= (10 + 1) + (9 + 2) + (8 + 3) + (7 + 4) + (6 + 5) \\ &= 11 + 11 + 11 + 11 + 11 \\ &= 55\end{aligned}$$

4 Look Back

To make sure that she is right, Sarah checks by extending her table of values.

Row number	Cases in row	Total cases used
1	1	1
2	2	3
3	3	6
4	4	10
5	5	15
6	6	21
7	7	28
8	8	36
9	9	45
10	10	55

Reflecting

- How did using a table of values help Sarah solve her problem by looking at a similar, but simpler, problem?
- How many cases of soft drinks would Sarah need for the 11th row of her display?
- How can you use a table of values to calculate the total number of cases Sarah would need for a display with 15 rows?
- What other strategies could Sarah have used to solve her problem?
 - How are these other strategies similar to using a table of values? How are they different?



Work with the Math

Example: Using a table of values to solve a patterning problem

Rana is the coordinator of a regional volleyball league. Eight teams must play each team once. How many games must Rana schedule for the volleyball season?

Rana's Solution



1 Understand the Problem

I know that the teams play in twos and that each of the eight teams has to play each of the other seven teams once. I want to figure out the least number of games that I need to schedule.

2 Make a Plan

I will sketch what would happen with fewer numbers of teams. Then I can use my sketches to make a table of values. This will help me see if there is a pattern.

3 Carry Out the Plan



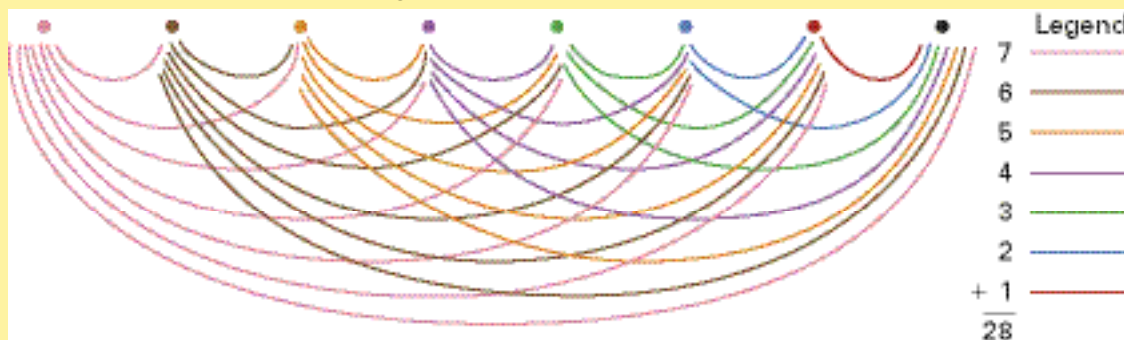
I see a possible pattern rule. For each new row in the table of values, I have to add one more game than I added the time before. So I'll need to schedule 28 games for the eight teams.

Number of teams	Number of games required
1	0
2	1
3	3
4	6
5	10
6	15
7	21
8	28

+ 1
+ 2
+ 3
+ 4
+ 5
+ 6
+ 7

4 Look Back

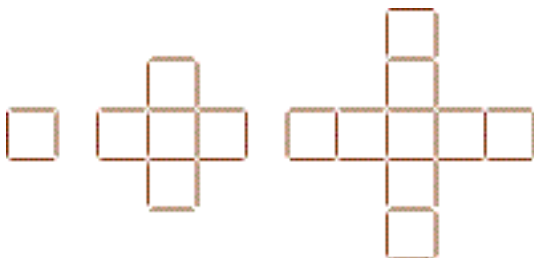
I can sketch the picture for 8 teams and use different colours to help me keep track of the number of games.



The numbers for the colours follow a pattern, so I think my solution is correct.

A Checking

5. Use a table of values to find the number of toothpicks you would need to build the 7th figure. Explain your thinking.



B Practising

6. How many volleyball games would Rana have had to schedule if there were 10 teams in the league and each team played each other twice?
7. During a canned food drive, the number of students who donate food doubles each day. Three students donate food on day 1. On which day will 96 students donate food? Show your thinking.
8. There are 14 people at a meeting, and they all shake hands with each other. Use a table of values to find the total number of handshakes.
9. A fire has destroyed 200 trees in a nearby forest. Your school's Environmental Club has volunteered to do the replanting. Each member of the club is given four seedlings. Two members plant their seedlings on the first day. They are followed by four members on the second day and six members on the third day. If this pattern continues, on which day will the replanting be complete?
10. Heather wants to make 250 origami peace cranes for a school display. She makes 12 cranes the first day, 15 cranes the second day, 18 cranes the third day, and so on. If she continues this pattern for 10 days, will she reach her goal of 250 peace cranes?
11. The school office staff has organized a telephone tree system to use in case of emergency. The first caller phones three parents. These parents, in turn, each call three more parents, and so on.
- How many parents will receive a call on the third round of calls?
 - How many parents in total will receive calls by the end of the third round of calls?
 - If there are 363 parents to be called, how many rounds of calls will be needed?
12. The students challenge the teachers to a basketball shootout, with the money from ticket sales going to charity. The goal is to raise \$175. On the first day, 16 tickets are sold. On the following days, the number of tickets sold increases by three tickets per day.
- How many tickets in total are sold by the end of the 5th day?
 - Each ticket costs \$2. On which day of ticket sales will the students reach their goal?
13. Create a problem you can solve by making a table of values. Show how to solve your problem.

