

Solve Math Problems

Objective Solve problems using function tables.

4

30 minutes



Teach this lesson:

- **After** completing lessons on functions in the grade-level math textbook
- **Before** students complete the activities on page 120 of the student worktext

You need these materials:

- blank paper
- problem about functions from the grade-level math textbook
- play money

A Introduce

Review the concepts of number patterns and function tables with students. Call on a volunteer to tell you a number pattern. Write it on the board. Have volunteers describe what the pattern is. Help them convert the pattern to an equation and write the equation on the board. Then ask for a volunteer to draw a function table that fits the pattern.

Arrange students in groups of six (groups of three will also work, but will provide less interaction). Within the groups of six, have students work with a partner. Provide a sheet of paper for each pair and ask each pair to decide on a number pattern and write it down. Then have pairs pass their papers to the pair on their left. With the new paper, each pair will decide what the number pattern is, write an equation for it, and again pass the paper to the pair on their left. With this second new paper, each pair will draw a function table to match the equation.

- **As students work, encourage them to refer to the example on the board if they need to.** Circulate and provide assistance, as necessary.

Ask students when they could use a function table. Encourage them to think of situations where one number is related to another, such as earning a certain amount of money for each hour they work, or paying a certain amount for each movie ticket they buy. Write on the board the situations they suggest.

Tell students that in this lesson they will learn how to use function tables to solve problems. Then read the Lesson Objective aloud with students.

LESSON 4

Solve Math Problems

Objective Solve problems using function tables.

Learn to Solve Problems

Problem Jack's Kennel charges \$5 a day to keep a dog, plus a \$25 registration fee. Mary's Kennel charges \$10 per day, plus a registration fee of \$10. Marco needs to put his dog in a kennel for 5 days. Which kennel will charge less money?

	Think	Write																																				
Step 1:	Read the problem. Underline the question. Tell what you have to do.	I have to compare the costs for the 2 kennels. The costs are related to the number of days, so I can use function tables.																																				
Step 2:	Circle the facts. Write expressions.	Jack's Kennel charges \$5 a day plus \$25. The total cost is \$5 times the number of days, plus \$25. So $c = 5d + 25$. Mary's Kennel charges \$10 per day plus \$10. The total cost is \$10 times the number of days, plus \$10. So $c = 10d + 10$.																																				
Step 3:	Make function tables.	<table border="1" style="display: inline-table; margin-right: 20px;"> <thead> <tr><th colspan="6">Jack's Kennel</th></tr> <tr><th>input (d)</th><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> <tr><th>output (c)</th><td>30</td><td>35</td><td>40</td><td>45</td><td>50</td></tr> </thead> </table> <table border="1" style="display: inline-table;"> <thead> <tr><th colspan="6">Mary's Kennel</th></tr> <tr><th>input (d)</th><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> <tr><th>output (c)</th><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td></tr> </thead> </table>	Jack's Kennel						input (d)	1	2	3	4	5	output (c)	30	35	40	45	50	Mary's Kennel						input (d)	1	2	3	4	5	output (c)	20	30	40	50	60
Jack's Kennel																																						
input (d)	1	2	3	4	5																																	
output (c)	30	35	40	45	50																																	
Mary's Kennel																																						
input (d)	1	2	3	4	5																																	
output (c)	20	30	40	50	60																																	
Step 4:	Solve the problem.	When $d = 5$, $c = 50$ for Jack's Kennel and 60 for Mary's Kennel. Jack's Kennel will charge less money for 5 days.																																				



Practice Solving Math Problems

Directions Follow steps 1 to 4 above to solve the problems below. On a separate sheet of paper, write expressions, draw function tables, and answer in complete sentences.

- 1 Stefan has a savings account. He puts \$125 in the account to start. Then he deposits \$30 at the end of every month. How much money will be in the account after 6 months? $125 + 30m$; There will be \$305 after 6 months.
- 2 Five friends want to see a show. Tickets to the show cost \$7 and parking costs \$2 per car. If the friends all ride in the same car, how much money will they spend? $7n + 2$; They will spend \$37.
- 3 Soje charges \$8 an hour to help people set up their computers. Ashin charges \$7 an hour, plus bus fare of \$5 each day. Ms. Gibbs wants to hire someone for 8 hours. Who charges less? $8h$ for Soje; $7h + 5$ for Ashin; Ashin charges less for 8 hours.

Highlighted words and phrases may affect student comprehension.

B Teach and Learn

Have students open their student work-texts to page 120. Read the problem aloud.

Ask students to point out any words they aren't sure they know. Explain these words or have other students do it. Be sure students know that a kennel is a place where dogs can stay when their owners leave town and that a registration fee is extra money that is paid just one time.

- **Check students' understanding of the problem.** Ask how much it would cost to keep a dog in Jack's Kennel for one day. Elicit that the cost would be $\$5 + \25 , or $\$30$. Repeat for a two-day stay in Jack's Kennel ($\$35$) and for one- and two-day stays in Mary's Kennel ($\$20$ for one day, $\$30$ for two).
- **Have students act out conversations about the cost of keeping the dog in the kennel for one or two nights.** Have them play the roles of Marco, Jack, Mary, and Marco's dog. Ask students to create their own dialogue based on the information in the example.

BP 3 Say: *This problem is about functions. How do you know that it's about functions? What are the variables in the problem?* Elicit that Marco must pay a certain, predictable amount of money each day the dog stays in the kennel, so the number of days Marco's dog stays in the kennel (one variable) is related to the total cost Marco will pay (the other variable). Have pairs of students talk about ways that they have learned of solving problems with functions.

Read aloud Step 1 with students. Point out the underlined question in the student work-text and have students read it chorally.

- **Read aloud the text to the right of the step.** Explain that this part tells what you have to do to solve the problem. Explain that the cost for each kennel is the same for each day, so the cost is related to the number of days. Emphasize that students need to make two function tables for this problem because there are two different kennels.

Move on to Step 2. Ask students to identify the facts of the problem. Stress that the numbers in the problem must be accompanied by their units, if any; in this case, point out that the units are dollars. Point out that two of the facts are for Jack's Kennel and two are for Mary's Kennel.

- **BP 3 Read the information on the right in Step 2.** Go over the expressions. Have students explain to a partner why $5d + 25$ is the proper expression for the total cost of Jack's Kennel for d days. Circulate through the room, listening to students' conversations. If students have difficulty explaining this to one another, ask how they know that $8d + 25$ or $5 + 25d$ are not correct. Repeat with Mary's Kennel and the expression $10d + 10$.

Continue to Step 3. Establish that the function tables connect the number of days the dog will stay with the total cost. Ask students why the output numbers for Jack's Kennel are not 5, 10, 15, . . . Elicit that the total cost includes not just the daily charge, but also the registration fee of $\$25$.

- **BP 3 Check students' ability to read function tables.** Ask students how much Marco would spend to keep his dog in Mary's Kennel for four days ($\$50$). Repeat for Jack's Kennel for three days ($\$40$). Then have students ask a partner questions like these.

Move on to Step 4. Ask students to describe how to use the function tables to evaluate the total cost of keeping the dog in the kennels for five days. Elicit that they need to find the value that goes with $d = 5$. Have students compare the two values. Elicit that Jack's Kennel costs less for five days. Point out that this answer is written in a full sentence in the student worktext.

- **BP 3 Have students work with a partner.** Have them talk about how they could use steps 1–4 and the function tables they created to determine which kennel would cost more if Marco wanted to leave his dog for three days. Then have students solve this problem. Elicit that the two kennels would cost the same.

C Review and Practice

Choose a problem about functions in students' grade-level math textbooks. Have pairs of students use steps 1–4 to solve the problem together. Then ask them to talk with another pair about the problem and how they used the steps to solve it.

Read aloud the directions for Practice Solving Math Problems. Point out that these problems can be solved with the same series of steps students just used with their partners. Have students solve the problems independently.

D Assess and Intervene

Can students use function tables to solve problems, based on their work in Practice Solving Math Problems on page 120? Use the rubric to identify students who need extra support through additional help and the Intervention activity.

Intermediate

- Uses the appropriate steps to solve at least 2 of the 3 problems.
- Expresses all correct answers in understandable phrases or sentences; may contain some errors that make comprehension somewhat difficult.

Example of a sentence a student might write: *Will be \$305 money after the 6 months.*

Advanced

- Uses the appropriate steps to solve all 3 problems.
- Expresses all correct answers in clear, complete sentences; may contain minor errors that do not affect comprehension.

Example of a sentence a student might write: *\$305 will be after 6 months in account.*

INTERVENTION

5 minutes



If students have trouble solving numbers 1–3, have them act out or draw the situations. For number 1, for example, students might use play money to model the amount Stefan deposits to start, and then add another $\$30$ for each month until six months have been reached. Then help students use this information to write an equation. Point out that the amount Stefan adds each month is the same and that the variable is the number of months. Repeat with other examples.