Organizing a Bike Tour Experiment: Variables and Tables

PROBLEM 1.1

At a Glance

This problem asks students to think about the physical fitness challenge of riding a bicycle for long distances. It uses that context to develop basic ideas of data representation and interpretation using tables. In the Initial Challenge, students collect data in a table while doing jumping jacks for 2 minutes. The What If . . .? situation has students matching descriptions of others doing the jumping jack experiment with tables of data.

Arc of Learning™
Introduction

NOW WHAT DO YOU KNOW?

How does a table help you make sense of the relationship between two variables in a situation?

Key Terms	Materials	
variables relationships between variables algebra	*For each student* • **Learning Aid 1.1A:** Jumping Jack Experiment Table *For each group of 3–4 students* • **Learning Aid 1.1B:** Matching Descriptions and Tables (Part 1, Descriptions) • **Learning Aid 1.1B:** Matching Descriptions and Tables (Part 2, Tables) • timer (1 per group) • tape or glue • clothespin or clip (*optional accommodation*)	**Pacing** 1 day **Groups** 3–4 students **A** 1–2 **C** 11–13 **E** 18

Note: If you have a Grade 6 Classroom Materials Kit, please refer to *A Guide to Connected Mathematics*® 4 for a detailed list of materials included or items you will need to prepare ahead of time.

For more on the Teacher Moves listed here, refer to the General Pedagogical Strategies and the Attending to Individual Learning Needs Framework in *A Guide to Connected Mathematics*® 4.

	Facilitating Discourse	Teacher Moves
LAUNCH	CONNECTING TO PRIOR KNOWLEDGE Tell the class about bicycles and the yearly bicycle tour across Iowa. Encourage students to share other facts about organized bicycle tours they might know. Then continue reading about the bicycle trip that the five college students are planning. PRESENTING THE CHALLENGE Connect the bike tour and the jumping jack experiment by pointing out that both activities involve physical exertion over a period of time. This experiment works nicely if students are divided into groups of four. Within the group, each student has a job: • performing jumping jacks • counting jumps out loud • calling time when 10 seconds have passed • recording the number of jumping jacks completed at the end of every 10 seconds for the 2-minute time period	Since this is the first problem of the year, you may want to do a short summary after the Initial Challenge.

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	Facilitating Discourse	Teacher Moves
EXPLORE	PROVIDING FOR INDIVIDUAL NEEDS **Suggested Questions** • What was the pattern of your group's jumping jacks? • How did that pattern look when the person was jumping? • How do you see that pattern in the table? • Have students read the descriptions of the six jumpers in Ms. Park's class. Compared to Ms. Park's students, does your data have the same relationship between the variables? • Who seemed to be the most consistent jumper? How do you determine a consistent jumper?	For the What If . . . ? situation, you can assign one or two of the cards to each group of students.
	PLANNING FOR THE SUMMARY As you are circulating, listen for how students are describing the patterns in the data. How are they describing how the table shows when a jumper was jumping fast/slow, stopped, or jumped consistently? Students should be talking about the change in the number of jumping jacks for each interval of 10 seconds.	Problem-Solving Environment
SUMMARIZE	DISCUSSING SOLUTIONS AND STRATEGIES The scientific issue in this problem is how performance can change over time. The mathematical issue is how that performance pattern between the variables is shown by data expressed in tables. You can give focus to the Summarize discussion by asking students what their experiment told them about each issue. **Suggested Questions** • What was the pattern of the relationship between the variables of your group's jumping jacks? • How did that pattern look when the person was jumping? • How do you see that pattern in the table?	
	MAKING THE MATHEMATICS EXPLICIT Help students visualize the patterns of change relationships by imagining someone jumping and how that would influence the data in the table. These questions can help students make sense of how the physical activity is represented in a table of data. **Suggested Questions** • Compared to Ms. Park's students, does your data have the same relationship between the variables? • Did anyone in the class have steady or consistent jumping? How do you determine a consistent jumper? • What would a consistent jumper's table of data look like? • What would you see if you watched them do the jumping jacks? • Can you be slow but still be consistent? • What if a jumper started off really fast then got slower over the jumping time? What would the table of data look like? What would you see if you watched them do the jumping jacks? As you finish the mathematical discussions, have students reflect on the Now What Do You Know? question(s).	Portrayal Implementation Note: Have students keep their data from the jumping jacks to use in Problem 1.2.

Problem Overview

This problem asks students to think about the physical-fitness challenge of riding a bicycle for long distances. It uses that context to develop basic ideas of data representation and interpretation using tables.

Comment: The main activity is a jumping jack experiment. Doing jumping jacks for 2 minutes is hardly the same as riding a bike for 6–8 hours. However, students can do the jumping jack experiment in the classroom, and experience has shown that it does give students a personal sense of the physical demands of a bike tour. This makes it easier for them to interpret bike-tour data that are given in subsequent problems. So as not to embarrass any student who might not be physically up to jumping jacks, use volunteers. Sometimes, all students want to try doing the jumping jacks. It is a nice way to encourage participation at the beginning of the year. For students who are not able to jump, an alternative would be to use a clothespin or clip. (Portrayal) Opening and closing the clip can count in place of one jumping jack.

Implementation Note: Since this is the first problem of the year, you may want to do a short summary after the Initial Challenge.

Launch (Getting Started)

Connecting to Prior Knowledge

Tell the class about bicycles and the yearly bicycle tour across Iowa. Encourage students to share other facts about organized bicycle tours they might know. Then continue reading about the bicycle trip that the five college students are planning. Have students share their ideas about the questions in the introduction. Students should justify their guesses about the distance they think they could ride in a day and consider ways in which their speed might vary throughout the day.

Suggested Questions

- How far do you think you could ride in a day? (Answers will vary.)
- How do you think the speed of your ride would change during the course of the day? (Most students will indicate that their speed would slow down over the course of the day as they grew fatigued. Others might say that they could get surges of energy, especially toward the end.)

- What conditions would affect the speed and distance you could ride? (Answers might include the type of terrain [rocky or smooth]; how much of the ride is uphill, downhill, or flat; weather conditions and temperature; and how much gear you carry.)
- How are the cyclists' speed and distance likely to change throughout a day? (Answers will vary.)

Presenting the Challenge

After a short class discussion, move on to the jumping jacks stamina experiment. This problem begins the discussion of patterns that describe the relationship between two variables. Students will use the experiment data to describe the way the number of jumping jacks changes as time increases in 10-second intervals. The experiment provides a physical model to give students a sense of the relationship. The connection between the physical movement and the pattern in the table helps students interpret the data. (Portrayal)

Connect the bike tour and the jumping jack experiment by pointing out that both activities involve physical exertion during a period of time. This experiment works nicely if students are divided into groups of four. Within the group, each student has a job:

- performing jumping jacks
- counting jumps out loud
- calling time when 10 seconds have passed
- recording the number of jumping jacks completed at the end of every 10 seconds for the 2-minute time period

The directions suggest that students do jumping jacks for 2 minutes. Two minutes has worked well in many classes. We suggest that you tell students to talk to you if they are not physically able to do the experiment. Inform everyone that if they get tired, they should stop. Every student does not need to jump. Many students like to volunteer. This is a nice way to encourage participation in the classroom activities in the beginning of the year.

Emphasize the following points:

- The *jumper* performs a complete jumping jack when they complete these three steps:
  1. Start with feet together and hands at sides.
  2. Jump, landing with legs apart and hands touching above the head.
  3. Jump again, returning to the starting position with feet together and hands at sides.

- The *counter* counts out loud, adding an additional jump to the total each time the jumper returns to the starting position.
- The *timer* calls out "time" when each 10 seconds passes.
- The *recorder* listens for the timer to call "time" and then writes the last number the counter called into the table.

After the demonstration, give students copies of **Learning Aid 1.1A: Jumping Jack Experiment Tables** and a timer. Have students perform the experiment in groups of four and then complete Problem 1.1. Have as many students as possible take a turn at each task. Remind them that they need to count and record the total number of jumping jacks their teammates complete by the end of each time interval. After collecting and reflecting on their own jumping jack data, students match tables of data to descriptions of the relationships between variables from **Learning Aid 1.1B: Matching Descriptions and Tables (Part 1, Descriptions)** and **Learning Aid 1.1B: Matching Descriptions and Tables (Part 2, Tables)**.

You can assign one or two of the jumpers (Group cards) to each group of students in your class. (Problem-Solving Environment)

Explore (Digging In)

Providing for Individual Needs

When students have collected their jumping jack data, have them examine their own data and compare it to the students in the What If . . . ? questions.

Suggested Questions

- What was the pattern of your group's jumping jacks? (Answers will vary.)
- How did that pattern look when the person was jumping? (Descriptions should include if the jumper sped up, slowed down, or kept a steady pace.)
- How do you see that pattern in the table? (Descriptions should include changes in the way the number of total jumps changes. If the jumper sped up, there will be a larger increase in jumps. If the jumper slowed down, there will be less increase in jumps. If the jumper kept a steady pace, the increase in jumps is consistent.)
- Have students read the descriptions of the six jumpers in Ms. Park's class. Compared to Ms. Park's students, does your data have the same relationship between the variables? (Answers will vary.)
- What do you have to know to fill in the data for Lashawn's group? (You need to consider the variables, how they are changing, and any patterns between the variables.)

While this unit is focused on algebraic reasoning, the unit also informally begins proportional reasoning for grade 6. The vocabulary is first introduced to students in Problem 3.3. By looking at the pattern of relationships between two variables, some situations provide opportunities for students to intuitively develop understandings of ratio and unit rate. Students describe many of the patterns as "consistent" or "steady" when proportional reasoning is involved. You may hear phrases like "for every" or "each time." The formal language and more explicit reasoning will be developed in later grades 6 and 7 units. It is important to encourage this reasoning.

Suggested Questions

- Who seemed to be the most consistent jumper? How do you determine a consistent jumper? (Lashawn was consistent. He did 8 jumps every 10 seconds. [Ratio Reasoning] Paula was consistent. She did 1 jump a second. [Unit Rate Reasoning])

Planning for the Summary

Since this is the first problem of the school year, you may want to move to a class discussion to do the What If . . . ? questions.

What evidence will you use in the summary to clarify and deepen understanding of the Now What Do You Know?

NOW WHAT DO YOU KNOW?

How does a table help you make sense of the relationship between two variables in a situation?

(As you are circulating, listen for how students are describing the patterns in the data. How are they describing how the table shows when a jumper was jumping fast/slow, stopped, jumped consistently, and so on? Students should be talking about the change in the number of jumping jacks for each interval of 10 seconds.)

Summarize (Orchestrating the Discussion)

Discussing Solutions and Strategies

The scientific issue in this problem is how performance can change over time. The mathematical issue is how that performance pattern between the variables is shown by data expressed in tables. You can give focus to the Summarize discussion by asking students what their experiment told them about each issue.

Suggested Questions

- What was the pattern of the relationship between the variables of your group's jumping jacks? (Answers will vary.)

- How did that pattern look when the person was jumping? (Descriptions should include if the jumper sped up, slowed down, or kept a steady pace.)
- How do you see that pattern in the table? (Descriptions should include changes in the way the number of total jumps changes. If the jumper sped up, there will be a larger increase in jumps. If the jumper slowed down, there will be less increase in jumps. If the jumper kept a steady pace, the increase in jumps is consistent.)
- The instructions told you to use 10-second intervals. Could you have chosen a different time interval for recording data in your table? (Yes.)
- Would your choice have affected your table of data? If so, in what way? (For smaller intervals, the number of jumping jacks is lesser, and conversely, for larger intervals, the number of jumping jacks is greater. However, in either case, the number of jumps in a time interval tends to decrease over time.)
- What does the jumping jack experiment suggest about bicycle-riding speed over time? (Usually, the distance in a time interval decreases as time passes.)

Making the Mathematics Explicit

Help students visualize the patterns of change relationships by imagining someone jumping and how that would influence the data in the table. These questions can help students make sense of how the physical activity is represented in a table of data. (Portrayal) This can help students abstract information from a table without a physical representation in later problems.

Suggested Questions

- Compared to Ms. Park's students, does your data have the same relationship between the variables? (Answers will vary. There may be some "consistent" jumpers in the classroom like Paula or Li Wei.)
- Did anyone in the class have steady or consistent jumping? How do you determine a consistent jumper? (It may be someone from their group, someone from the class, or one of the characters in the What If . . . ? A consistent jumper has the same number of jumping jacks for every 10 seconds. Or some students might say the jumper did 1 jump for every 1 second.)
- What would a consistent jumper's table of data look like? What would you see if you watched them do the jumping jacks? (The table would increase by the same amount or almost the same amount for each 10-second interval. The jumper would move in a steady way.)

- Can you be slow but still be consistent? (Yes.) What would the table of data look like? What would you see if you watched them do the jumping jacks? (The table still increases by the same amount or almost the same amount for each 10-second interval. However, the amount for each 10 seconds would be less. The jumper would move in a slower but still steady way.)
- Were any of Ms. Park's students consistent jumpers? How did their data compare? (Yes. Paula's group and Li Wei's groups were consistent. Paula did more jumps in a 10-second interval.)
- Who was the least consistent? How do you know? What would the table of data look like? What would you see if you watched them do the jumping jacks? (It may be someone from their group, someone from the class, or one of the characters in the What If . . . ? The number of jumping jacks done in a 10-second interval will be very different each time. So how the table grows will vary. The number of jumps may increase a lot in 10 seconds, may increase only some, or may not increase at all. This jumper would be very inconsistent, sometimes going slow, going fast, maybe stopping, or doing any other varying jumping pattern. In Ms. Park's class, Ana—Table 6 was the most inconsistent.)
- What if someone stopped and started again? How would that change their table of data? What would you see if you watched them do the jumping jacks? (As time increases in the table, there would be no increase in the number of jumps when the jumper is stopped. When the jumper starts again, the number of jumps will begin to increase again as time continues. In Ms. Park's class, Tori—Table 2 stopped, but she did not start again.)
- What if a jumper started off really fast then got slower over the jumping time? What would the table of data look like? What would you see if you watched them do the jumping jacks? (For every 10 seconds, the table would increase quickly at the beginning, and the increase would be less and less as time continued. The student would jump quickly at first and slow down as time passes. In Ms. Park's class, Sam—Table 3 started by her table increasing by many jumps in the beginning, about 15 jumps every 10 seconds. As she continued to jump, she did fewer jumps in an interval. At about 50 seconds, she was doing 5 jumps for every 10 seconds. Near the end of the 120 seconds, she was jumping about 2 jumps for every 10 seconds.)
- What if a jumper started off slow then got really fast over the jumping time? What would the table of data look like? What would you see if you watched them do the jumping jacks? (For every 10 seconds, the table would increase slowly at the beginning,

and the increase would be more and more as time continued. The student would jump slowly at first and increase speed as time passes. In Ms. Park's class, Jackson—Table 5 started a steady pace of about 5 jumps for every 10 seconds. By the end of the 120 seconds, he was doing about 12–13 jumps in 10 seconds.)

Connecting the actions of the jumper to the change in data on the table will help students make sense of the patterns of change. (Portrayal) You may want to have student volunteers demonstrate the actions of a jumper and what the table of data will look like for those jumpers when you ask the previous questions.

Briefly discuss filling in the data for Lashawn's group in What If . . . ? Situation B. The pattern of change between the variables is consistent. This situation gives you the opportunity to informally discuss proportional relationships and ratios with your students. In *Comparing Quantities*, students will use "for every" statements to learn more formally about ratios.

- What do you have to know to fill in the data for Lashawn's group? (You need to consider the variables, how they are changing, and any patterns between the variables.)
- What is the pattern of Lashawn's data? (The jumper in the group did 8 jumping jacks for every 10 seconds.)
- How can we use the pattern of 8 jumping jacks for every 10 seconds to find other amounts of jumping jacks that the group did? (We can keep counting 8 more jumps every time 10 more seconds pass.) Note that this informally builds on students' understanding of multiples that will be further developed in the next unit, *Number Connections: Expressing Factors and Multiples Algebraically*.

Now What Do Students Know?

Ask students to reflect on the discussion and answer the Now What Do You Know? questions. Since this is the first problem of the year, model thinking about the questions, reflecting back to the problem work, and answering the questions. You may want to have a class discussion, ask prompting questions, and write answers together. (Problem-Solving Environment)

- How is this relationship between the two variables described in words? (At this time, many students will express this in 10-second intervals. For example, if their jumper slowed down over the 2 minutes, they might say: *As we jumped a longer amount of time, the number of jumping jacks that we did in 10 seconds was less.*)

- How is this relationship between the two variables shown in a table? (Answer will vary depending how they jumped. For example, if their jumper slowed down over the 2 minutes, they might say: *As the time increases, the number of jumping jacks increases, but it increases more slowly.*)

Implementation Note: Have students keep their data from the jumping jacks to use in Problem 1.2.

› REFLECTING ON STUDENT LEARNING

Use the following questions to assess student understanding at the end of the lesson.

- What evidence do I have that students understand the Now What Do You Know? question?
  - Where did my students get stuck?
  - What strategies did they use?
  - What breakthroughs did my students have today?
- How will I use this to plan for tomorrow? For the next time I teach this lesson?
- Where will I have the opportunity to reinforce these ideas as I continue through this unit? The next unit?

Answers Embedded in Student Edition Problems

Answers PROBLEM 1.1

Organizing a Bike Tour Experiment: Variables and Tables

INITIAL CHALLENGE

Suppose you and your classmates did jumping jacks as fast as possible for a 2-minute test period.

Make a Prediction

- How many jumping jacks do you think you could do in 2 minutes?

  Student predictions will vary.

Conduct the Experiment

Equipment

- timer, such as a clock or smartphone
- paper to record the results in a table

Jumping Jack Experiment

Time (seconds)	0	10	20	30	40	50	60	70	. . .
Total Number of Jumping Jacks									

Directions

There are four roles:

- A *jumper* to do the jumping jacks
- A *timer* to keep track of time in seconds
- A *counter* to count the jumping jacks
- A *recorder* to write down the number of jumping jacks in a table

Collecting the Data

- The timer says "go," and the jumper begins jumping.
- The jumper continues jumping for 2 minutes.
- The counter counts the jumping jacks out loud.
- Every 10 seconds, the timer says "time," and the recorder records the number of jumping jacks the jumper has done.

Analyze the Data

- For the jumper in your group, how did the number of jumping jacks change as time passed? How is this shown in your table?

  Students' experiment data will vary. One possible table:

  Jumping Jack Experiment

Time (seconds)	0	10	20	30	40	50	60	70	80	90	100	110	120
Total Number of Jumping Jacks	0	14	26	38	49	58	70	80	93	102	112	123	134

  Student answers will vary.

  Many students make general statements like "The number of jumping jacks increased over time." Some students may need help looking at how the number of jumping jacks increases from one cell on the table to the next one. For example, in the table shown here, we can see that the jumper did 12 jumping jacks between 10 and 20 seconds. You may need to model how to look specifically at the amount of change between adjacent cells.

  Students may discuss the experiment rather than the table. For example, students might say, "Our jumper was really fast" or "Our jumper got faster at the end." Help them connect how that pattern shows up in the table.

  Make sure that students are discussing both variables (not just the number of jumping jacks) so they are looking at the pattern of change between the variables.

- What does this pattern of jumping jacks per second suggest about how bike-riding speed would change over a day's time on the bicycle tour?

  Student answers will vary. It seems likely that students will find that their rate of jumping jacks slows near the end of the experimental time period. Or their rate of jumping jacks might slow if the experiment lasted for a longer amount of time. This pattern of jumping jacks would suggest that the speed of riding a bicycle will also decrease over a day's time.

› WHAT IF . . . ?

Situation A. Matching Descriptions and Tables

Ms. Park's class collected some interesting jumping jack data. The following are descriptions and tables from several groups. These describe the story told by the pattern of change from their experiments.

1. Match each group's description with the correct table.
2. Describe how you decided that the table matches the story about the variables.

Sam's Group

Sam started out really fast. She did lots of jumps in the first few seconds. As time went on, her number of jumps for every 10 seconds was less and less. She was almost not jumping at the end of the 120 seconds.

Paula's Group

Paula's jumping was very consistent. She did about 10 jumps in every 10 seconds. She was able to keep this pace for 2 minutes.

Li Wei's Group

Li Wei kept a consistent pace. As time increased by 10 seconds, he did 6 more jumps for each time interval.

Ana's Group

Ana had a consistent pace for the first 20 seconds. Then the pace slowed down, increased, slowed down, and finally in the last 30 seconds increased a lot.

Tori's Group

Tori started with consistent jumping. As time increased by 10 seconds, he did about 10 jumps. Near the end of the time, his shoe came untied. So he stopped jumping.

Jackson's Group

Jackson started with a consistent pace. Then, as time went on, his total number of jumps grew more and more.

Answer:

Table 1

+10 +10 +10 +10 +10 +10 +10 +10 +10 +10 +10 +10

Time (seconds)	0	10	20	30	40	50	60	70	80	90	100	110	120
Total Number of Jumping Jacks	0	10	20	30	40	50	59	69	80	90	100	110	120

+10 +10 +10 +10 +10 +9 +10 +11 +10 +10 +10 +10

Table 1—**Paula's Group**

The rates of jumping jacks for every 10 seconds: 10, 10, 10, 10, 10, 9, 10, 11, 10, 10, 10, 10. This rate change matches Paula because she kept the pace of 10 jumps per 10 seconds. Students may interpret that a steady pace means no variation in the number of jumping in an interval. They may need help in considering that 9–11 jumps every 10 seconds is considered a fairly steady pace.

Paula's Group

Paula's jumping was very consistent. She did about 10 jumps in every 10 seconds. She was able to keep this pace for 2 minutes.

Table 2

Time (seconds)	0	10	20	30	40	50	60	70	80	90	100	110	120
Total Number of Jumping Jacks	0	10	20	30	40	50	59	69	80	80	80	80	80

Table 2—**Tori's Group**

The rates of jumping jacks for every 10 seconds: 10, 10, 10, 10, 10, 9, 10, 11, 0, 0, 0, 0. This rate change matches Tori because he jumped 10 jumps per 10 seconds in the beginning then stopped at the end.

Tori's Group

Tori started with consistent jumping. As time increased by 10 seconds, he did about 10 jumps. Near the end of the time, his shoe came untied. So he stopped jumping.

Table 3

Time (seconds)	0	10	20	30	40	50	60	70	80	90	100	110	120
Total Number of Jumping Jacks	0	15	31	44	54	60	65	69	73	79	81	83	84

Table 3—**Sam's Group**

The rates of jumping jacks for every 10 seconds: 15, 16, 13, 10, 6, 5, 4, 4, 6, 2, 2, 1. This rate change matches Sam because her rate was constantly decreasing as time went on.

Sam's Group

Sam started out really fast. She did lots of jumps in the first few seconds. As time went on, her number of jumps for every 10 seconds was less and less. She was almost not jumping at the end of the 120 seconds.

Table 4

Time (seconds)	0	10	20	30	40	50	60	70	80	90	100	110	120
Total Number of Jumping Jacks	0	7	13	19	25	31	37	43	49	55	61	67	73

Table 4—**Li Wei's Group**

The rates of jumping jacks for every 10 seconds: 7, 6, 6, 6, 6, 6, 6, 6, 6, 6, 6, 6. This rate change matches Li Wei because, except for the first 10 seconds, he did 6 jumps for each time interval.

Li Wei's Group

Li Wei kept a consistent pace. As time increased by 10 seconds, he did 6 more jumps for each time interval.

Table 5

Time (seconds)	0	10	20	30	40	50	60	70	80	90	100	110	120
Total Number of Jumping Jacks	0	5	10	15	20	26	32	39	48	58	68	80	93

Table 5—**Jackson's Group**

The rates of jumping jacks for every 10 seconds: 5, 5, 5, 5, 6, 6, 7, 9, 10, 10, 12, 13. This rate change matches Jackson because he started at a steady pace and then the number went up more and more.

Jackson's Group

Jackson started with a consistent pace. Then, as time went on, his total number of jumps grew more and more.

Table 6

Time (seconds)	0	10	20	30	40	50	60	70	80	90	100	110	120
Total Number of Jumping Jacks	0	12	24	30	35	48	59	62	65	68	80	93	107

Table 6—**Ana's Group**

The rates of jumping jacks for every 10 seconds: 12, 12, 6, 5, 13, 11, 3, 3, 3, 12, 13, 14. This rate change matches Ana because she started out at a steady pace for the first 20 seconds, then the number decreased, then increased, and decreased again, and then she finished strong the last 30 seconds.

Ana's Group

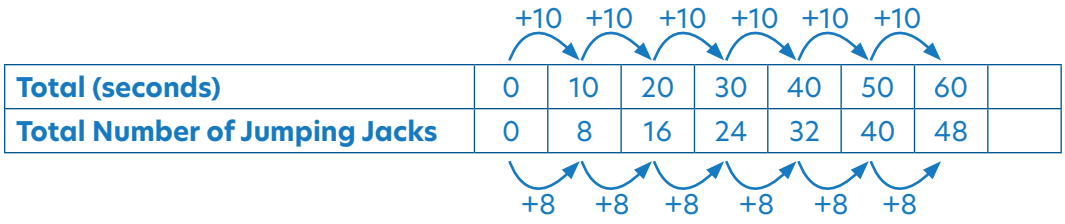
Ana had a consistent pace for the first 20 seconds. Then the pace slowed down, increased, slowed down, and finally in the last 30 seconds increased a lot.

Situation B. Lashawn's Group

The jumper in Lashawn's group did 8 jumping jacks for every 10 seconds. They used a table to represent the relationship between time and total number of jumping jacks. The lunch bell rang before they finished filling in the table.

1. Fill in the missing entries in the table for the first 60 seconds. How did you decide which numbers to use?
2. How does the relationship in this table compare to those in Situation A?

Answers:



Since the jumper did 8 jumping jacks for every 10 seconds, the total number of jumping jacks for each 10-second interval in the table is 8 more than the previous interval. To get the missing entries, you can add 8 to the number in the previous interval.

This jumper was consistent in terms of the rate of jumping jacks. Every 10 seconds, he jumped 8 times. Because the total number of jumping jacks is consistently increasing, this is like Paula's group, who did 10 jumps every 10 seconds, and like Li Wei's group, who did about 6 jumps every 10 seconds.

Note: This is an informal introduction to proportional relationships. Students will look at proportional relationships formally in a future unit, *Comparing Quantities*.

NOW WHAT DO YOU KNOW?

How does a table help you make sense of the relationship between two variables in a situation?

Possible student answers at this time:

Tables help you to quickly notice differences or changes in the number of jumping jacks for each 10 seconds (rates).

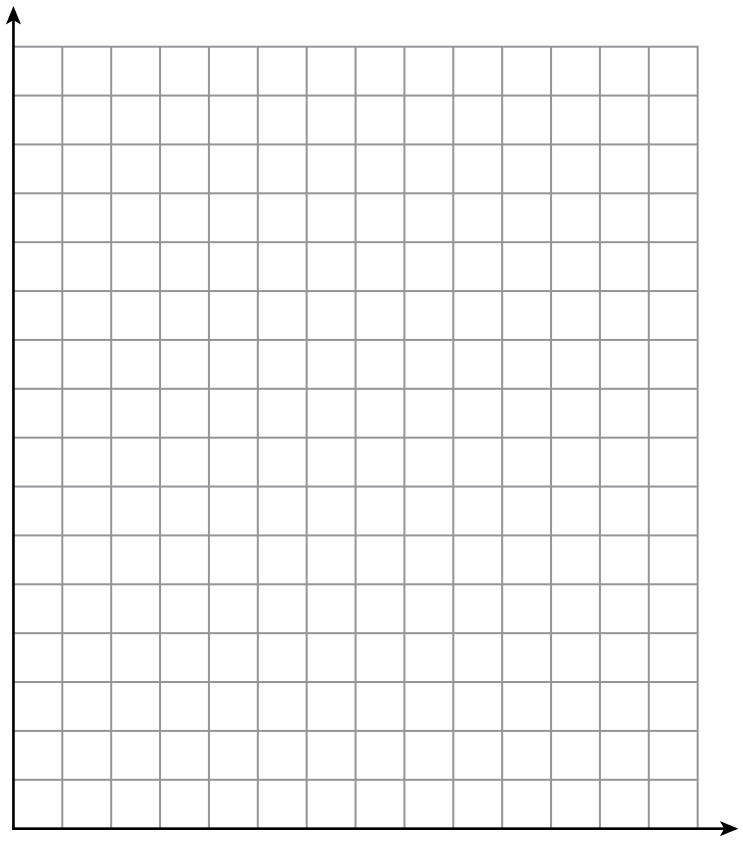
The variables in the relationship are named in the first cells of the table. So you can quickly see what the variables are.

You can see if the relationship is consistent or not by looking at change in the number of jumping jacks for each interval of 10 seconds.

Name _____ Date _____ Class _____

LEARNING AID TEMPLATE

Blank Tables and Graph



Name _____ Date _____ Class _____

Jumping Jack Experiment Tables

LEARNING AID 1.1A

Experiment 1 Jumper: _____

Jumping Jack Experiment

Time (seconds)	0	10	20	30	40	50	60	70	80	90	100	110	120
Total Number of Jumping Jacks													

Experiment 2 Jumper: _____

Jumping Jack Experiment

Time (seconds)	0	10	20	30	40	50	60	70	80	90	100	110	120
Total Number of Jumping Jacks													

› WHAT IF . . . ?, SITUATION B

Experiment Jumper: Lashawn

Jumping Jack Experiment

Time (seconds)	0	10	20	30	40	50	60	...	
Total Number of Jumping Jacks	0	8	16						

Name _____ Date _____ Class _____

LEARNING AID 1.1B

Matching Descriptions and Tables (Part 1, Descriptions)

Sam's Group	Paula's Group
Sam started out really fast. She did lots of jumps in the first few seconds. As time went on, her number of jumps for every 10 seconds was less and less. She was almost not jumping at the end of the 120 seconds.	Paula's jumping was very consistent. She did about 10 jumps in every 10 seconds. She was able to keep this pace for 2 minutes.
Li Wei's Group	**Ana's Group**
Li Wei kept a consistent pace. As time increased by 10 seconds, he did 6 more jumps for each time interval.	Ana had a consistent pace for the first 20 seconds. Then the pace slowed down, increased, slowed down, and finally in the last 30 seconds increased a lot.
Tori's Group	**Jackson's Group**
Tori started with consistent jumping. As time increased by 10 seconds, he did about 10 jumps. Near the end of the time, his shoe came untied. So he stopped jumping.	Jackson started with a consistent pace. Then, as time went on, his total number of jumps grew more and more.

Name _____ Date _____ Class _____

Matching Descriptions and Tables (Part 2, Tables)

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Table 1

Time (seconds)	0	10	20	30	40	50	60	70	80	90	100	110	120
Total Number of Jumping Jacks	0	10	20	30	40	50	59	69	80	90	100	110	120

Table 2

Time (seconds)	0	10	20	30	40	50	60	70	80	90	100	110	120
Total Number of Jumping Jacks	0	10	20	30	40	50	59	69	80	80	80	80	80

Table 3

Time (seconds)	0	10	20	30	40	50	60	70	80	90	100	110	120
Total Number of Jumping Jacks	0	15	31	44	54	60	65	69	73	79	81	83	84

Table 4

Time (seconds)	0	10	20	30	40	50	60	70	80	90	100	110	120
Total Number of Jumping Jacks	0	7	13	19	25	31	37	43	49	55	61	67	73

Table 5

Time (seconds)	0	10	20	30	40	50	60	70	80	90	100	110	120
Total Number of Jumping Jacks	0	5	10	15	20	26	32	39	48	58	68	80	93

Table 6

Time (seconds)	0	10	20	30	40	50	60	70	80	90	100	110	120
Total Number of Jumping Jacks	0	12	24	30	35	48	59	62	65	68	80	93	107