Activity 1: Walk This Way

Objective: The student will be able to:

- Complete a table including determining the process.
- Plot points on a graph.
- Use a graph to find information.
- Write a sentence and function rule from a table.
- Create a table on a graphing calculator.

Materials: Copies and transparencies of activities, CBR, overhead calculator

Procedure:

1. Work as a whole group to complete the table for Exercise 1 on Activity 1.1 using the description. Usually, students will find it easier to fill in the distance column first. When the number of seconds jumps from 5 to 10, many students will put 15 feet as the distance after 10 seconds. They are continuing the process of adding 2 even though the time increased by more than one second. Point out that the time increased by five seconds and ask them to develop a process for finding the first six distances. Then they can use the same process to find the distance after ten seconds.

2. Next plot the walk on the grid. Begin by asking students what the axes were labeled on the CBR graph. Have them label the axes on their grid. The vertical axis is distance in feet, and the horizontal axis is time in seconds. Lead students to plot the point. Possible questions:
   - What is the starting point? (3)
   - Where should I put the starting point? (3 feet up at time 0)
   - At one second, how far away should the walker be? (5 feet away)
   - How can I show this on the graph? (Go over to one second and up to 5 feet.)

   Continue explaining and demonstrating the process for plotting the rest of the points.

3. Discuss and use the graph. Possible questions:
   - Does it make sense to connect the points? (The answer is yes, but do not tell students yet. Let them explore with the next question.)
   - For example, does 1.5 seconds make sense as a time in this situation? (Yes, so we can connect the points.)
   - Where is the walker after 1.5 seconds? (Find the distance using the graph first. Then use the process from the table to confirm the distance after 1.5 seconds: $3 + 2 \bullet 1.5 = 3 + 3 = 6$.)

- Where is the walker after 3.5 seconds? (Again use the graph and the process to determine the distance: $3 + 2 \bullet 3.5 = 3 + 7 = 10$.)

An important connection to make is that the process column in the table is usually the same as a person's thought process. Asking students what their thought process is may help them connect to the process column. This is also a good time to point out that different people will have slightly different process columns because people think differently.

4. Now have students complete the table for Exercise 2 on Activity 1.1 in small groups. The tutors and teacher can circulate and ask students guiding questions such as the following.
   - What is the starting point? (2 feet at time 0)
   - How far away from the CBR is the walker when he or she starts? (2 feet)
   - What is the rate? (3 feet per second)
   - How many feet should he or she go in one second? (3 feet)
   - How far from the CBR will the walker be after 1 second? (5 feet)
   - How far from the CBR will the walker be after 2 seconds? (7 feet)
   - How will you write the process?

5. After ample time, have groups participate in discussing Exercise 2. One or more groups can share their table. Another can plot the points. Another can explain why the points can be connected. Continue to discuss the exercise with the following problems.
   - How much is the distance increasing with each second? (3 feet)
   - Where do you see that in the process? (Three is multiplying the number of seconds.)
   - What is the starting point? (2 feet)
   - Where do you see that in the process? (Two is added to every amount.)
   - How far from the CBR will the walker be at 3.5 seconds? (Using the graph, one can find the distance is 12.5 feet.)
   - What is the process to find the walker's distance from the CBR at 3.5 seconds? $(2 + 3 \bullet 3.5 = 2 + 10.5 = 12.5)$

6. The next part of the activity involves abstracting the process and writing a sentence and function rule. This is a very important skill for students to develop. Take time to let them think and work. Have students write a sentence for each exercise on Transparency 1 first. Ask them to start the sentence, "The distance is _____." Solicit ideas from students and

combine and adapt those to get a complete sentence. For example, one student might say, "three feet and two feet times the number of seconds." Another might say, "start at three feet and go away 2 feet each second." Together one can get the sentence "The distance is starting at 3 feet and adding 2 feet times the number of seconds." For the second exercise, the sentence is "The distance is starting at 2 feet and adding 3 feet times the number of seconds."

7. Show students how to write the sentences developed above in shortened form or as function rules.
   Exercise 1: $D = 3 + 2S$
   Exercise 2: $D = 2 + 3S$

8. Show students how to build a table on their calculators to confirm the rule. See the instructions for creating a table in the calculator section if you need help. Ask students questions that can be answered form the table like:
   - How far from the CBR is the walker after ___ seconds?
   - How long does it take to get ___ feet from the CBR?

   Have students make a graphing calculator table for the second exercise, write a question, and answer it. Then the student can question his or her group members.

9. Have students complete Activity 1.2 individually by writing their own walk directions, completing the table and graph, and writing a sentence and function rule. Students should try to come up with a different set of directions than their neighbors. Also, they can not use the same directions as Activity 1.1, and most of their data should fit on the graph. Select two or three students to present their problems. Have other students enter the function rules in their calculator to check the presenters.

10. Next, choose a student to start at the CBR and walk at a constant rate away from it. Collect data for 3 seconds. Then write a function rule for the walk. Ask the following questions:
    - What information do we need? (starting point and rate)
    - How can we find the starting point? (Use trace.)
    - What is the starting point? (Example: 1.75)
    - What do you think the rate is? (Encourage the students to guess reasonable rates. Try different rates until one matches the line. Additionally, trace to where time is 1 and read the distance. Determine how much the distance has changed. Example: 2 feet per second)

- What is the function rule? (D=1.75+2S)

11. In groups, have students do Activity 1.3: walk away from the CBR collecting data for 3 seconds and write a function rule. Circulate and help students use the CBR and write the function rule. After about ten minutes or so, have groups present their walks and rules. They should explain what the starting point and rate are as well as how they determined what they are. If the graph of their function rule does not fit the graph of their walk, help them correct it.

12. As a whole group, do Activity 1.4, Exercise 1. Have a tutor demonstrate the walk without the CBR first. As he or she walks, lead students to fill in the distance column of the table. Then fill in the process column together. Next plot the points on the grid. Use the language "go over _____ and up _____," so students begin to internalize the process of plotting a point.

13. Discuss and use the graph. Possible questions include:
    - Should we connect the dots or not? Why? (Yes, the data is continuous.)
    - For example, does 2.5 seconds make sense as a time in this situation? (Yes.)
    - Where is the walker after 2.5 seconds? (Find the distance using the graph first. Then use the process from the table to confirm the distance after 2.5 seconds: $10 - 2 \bullet 2.5 = 10 - 5 = 5$.)
    - Where is the walker after 3.5 seconds? (Again use the graph and the process to determine the distance: $10 - 2 \bullet 3.5 = 10 - 7 = 3$.)
    - What sentence can you write for the process? (The distance is starting at 10 feet and subtracting 2 times the number of seconds.)
    - What function rule would that be? ($D = 10 - 2S$ or $y = 10 - 2x$)

14. Enter the table and function rule in the calculator to check. Ask the students what a good window is. Discuss how to decide what window to use.

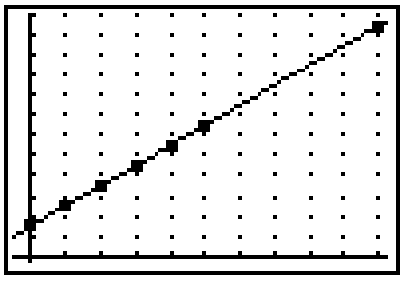
15. Have students complete Activity 1.4, Exercise 2 in small groups. Choose a group to fill in the table, another to plot the graph, another to write the sentence and function rule, and another to check the function rule on the calculator.

16. Assign Activity 1.5 for homework. If there is time in class, allow students to begin working on it.

Build a table and graph for each situation.

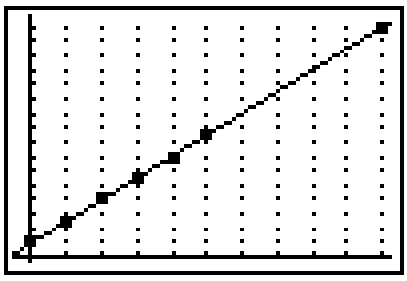
1. Start at 3 feet and go 2 feet per second away from the CBR.

Time (sec.)	Distance (ft.)	Process
0	3	$3+0=3+2(0)$
1	5	$3+2=3+2(1)$
2	7	$3+4=3+2(2)$
3	9	$3+6=3+2(3)$
4	11	$3+8=3+2(4)$
5	13	$3+10=3+2(5)$
10	23	$3+20=3+2(10)$



2. Start at 2 feet and go 3 feet per second away from the CBR.

Time (sec.)	Distance (ft.)	Process
0	2	$2+0=2+3(0)$
1	5	$2+3=2+3(1)$
2	8	$2+6=2+3(2)$
3	11	$2+9=2+3(3)$
4	14	$2+12=2+3(4)$
5	17	$2+15=2+3(5)$
10	32	$2+15=2+3(5)$



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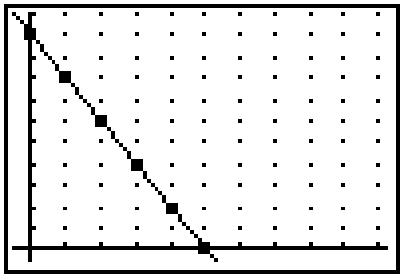
Build a table and graph for each situation.

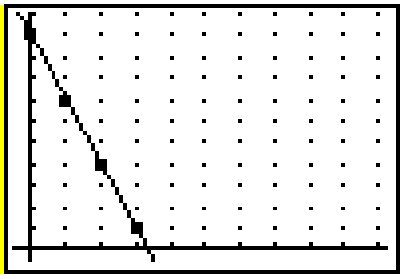
1. Start at 10 feet and go 2 feet per second toward the CBR.

Time (sec.)	Distance (ft.)	Process
0	10	$10-0=10-2(0)$
1	8	$10-2=10-2(1)$
2	6	$10-4=10-2(2)$
3	4	$10-6=10-2(3)$
4	2	$10-8=10-2(4)$
5	0	$10-10=10-2(5)$
10	-10	$10-20=10-2(10)$

2. Start at 10 feet and go 3 feet per second toward the CBR.

Time (sec.)	Distance (ft.)	Process
0	10	$10-0=10-3(0)$
1	7	$10-3=10-3(1)$
2	4	$10-6=10-3(2)$
3	1	$10-9=10-3(3)$
4	-2	$10-12=10-3(4)$
5	-5	$10-15=10-3(5)$
10	-20	$10-30=10-3(10)$





Build a table and graph for each situation.

1. Start at 3 feet and go 2 feet per second away from the CBR.

Time (sec.)	Distance (ft.)	Process
0		
1		
2		
3		
4		
5		
10		

2. Start at 2 feet and go 3 feet per second away from the CBR.

Time (sec.)	Distance (ft.)	Process
0		
1		
2		
3		
4		
5		
10		

Build a table and graph for each situation.

1. Start at ___ feet and go ___ feet per second away from the CBR.

Time (sec.)	Distance (ft.)	Process
0		
1		
2		
3		
4		
5		
10		

2. Start at ___ feet and go ___ feet per second away from the CBR.

Time (sec.)	Distance (ft.)	Process
0		
1		
2		
3		
4		
5		
10		

Walk away from the CBR collecting data for 3 seconds.

1. Sketch a graph of your walk.

2. Complete the table with your data.

Time in Seconds	Distance in Feet
0	
1	
2	
3	

3. Write a function rule for your walk.

Build a table and graph for each situation.

1. Start at 10 feet and go 2 feet per second toward the CBR.

Time (sec.)	Distance (ft.)	Process
0		
1		
2		
3		
4		
5		
10		

2. Start at 10 feet and go 3 feet per second toward the CBR.

Time (sec.)	Distance (ft.)	Process
0		
1		
2		
3		
4		
5		
10		

Build a table and graph for each situation.

1. Start at ___ feet and go ___ feet per second toward the CBR.

Time (sec.)	Distance (ft.)	Process
0		
1		
2		
3		
4		
5		
10		

2. Start at ___ feet and go ___ feet per second toward the CBR.

Time (sec.)	Distance (ft.)	Process
0		
1		
2		
3		
4		
5		
10		

Start 10 feet from the CBR and walk toward it collecting data for 3 seconds.

1. Sketch a graph of your walk.

2. Complete the table with your data.

Time in Seconds	Distance in Feet
0	
1	
2	
3	

3. Write a function rule for your walk?

