

Mass vs. Number

Yolanda bakes wonderful oat bran bars. She decided to start her own business selling them. When customers send her an order, she sends them the bars by mail. The mailing cost depends on the mass of each package. Her customers order different numbers of bars. Yolanda thought, "How can I find the mass for any number of bars?"



Yolanda found the total mass of 1, 2, 4, and 8 bars. Here is her data.

Mass of Yolanda's Bars

N Number of Oat Bran Bars	M Mass (in g)
1	18
2	39
4	82
8	160

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1. What patterns do you see in the data table?

 - A. What patterns do you see if you look down the columns?
 - B. What patterns do you see if you look across the rows? (Hint: Use friendly numbers.)
2. A. What happens to the mass of the bars if the number of oat bran bars goes up by 2 bars?

B. What happens to the mass of the bars if the number of oat bran bars doubles?

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Mass vs. Number (SG pp. 354–357)

Questions 1–7

1. A.* Looking down the columns, the number of bars doubles and the mass almost doubles.

B.* Looking across the rows, the mass of the bars is about 20 times the number of bars.
2. A. The mass goes up by about 40 grams.

B.* If the number of bars doubles, the mass approximately doubles.
3. A.* About 60 grams; $3 \times 20 = 60$.

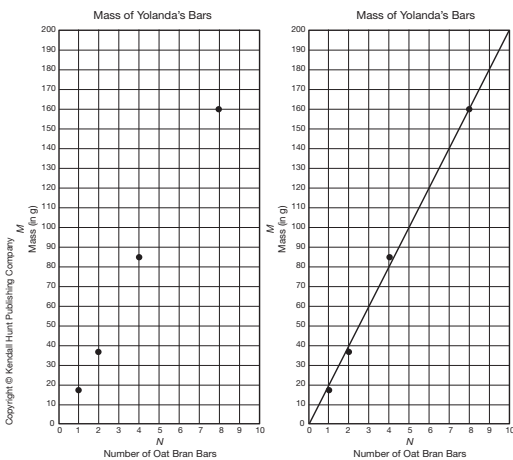
B.* About 200 grams; 8 bars are 160 grams and 2 bars are 39 grams. $160 + 39 = 199$, which is close to 200.
- 4.* If you know the number of bars, you can estimate the mass by multiplying the number by 20 grams.

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- Predict the mass of 3 bars. Explain your thinking.
 - Predict the mass of 10 bars. Explain your thinking.
4. If you know the number of bars, how can you estimate the mass?

Yolanda's Graph

Yolanda made a graph of her data. "I see a pattern," she said. "It looks like the data points are on a straight line." Yolanda tried to draw a straight line through her data points. She could not get a line to go through all the points. She tried to fit the points as best she could. Scientists and mathematicians call that a **best-fit line**.



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*Answers and/or discussion are included in the lesson.

5. Yolanda can predict the mass of three bars by starting at 3 on the horizontal axis and going up to the line and then moving across to the vertical axis. 3 bars will have a mass of about 60 grams.
6. **A.** 200 grams
B. The predictions should be close.
7. **A.*** Michael's data table is the one on the right. All his pencils are unused. It's highly likely that each of Michael's pencils will have the same mass. Michael's data shows a consistent increase of 11 grams for each additional pencil he adds to the balance.
B.* Michael's graph is on the left. His points lie on a line perfectly.

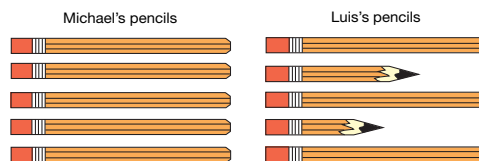
"Well," says Yolanda, "I know the mass of one, two, four, and eight bars. I should be able to predict the mass of any number of bars."

5. How can she predict the mass of three bars using the graph?
6. **A.** Use the graph to predict the mass of 10 bars.
B. Does your prediction from the graph match your prediction from the data table?

Complete the *Investigating Mass vs. Number* pages in the *Student Activity Book* to see if you get the same kind of pattern as Yolanda. You will be finding the mass of a number of objects your teacher gives you. Later you can use this information to help Yolanda find the weight of her oat bran bar packages.

Luis's and Michael's Pencils

Luis and Michael did the *Investigating Mass vs. Number* activity with these pencils.



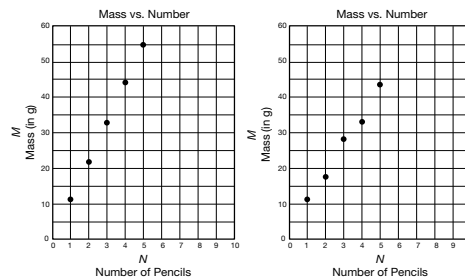
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7. **A.** Which data table below is Luis's and which is Michael's? Explain.

Mass vs. Number		Mass vs. Number	
<i>N</i> Number of Pencils	<i>M</i> Mass (in g)	<i>N</i> Number of Pencils	<i>M</i> Mass (in g)
1	11	1	11
2	17	2	22
3	28	3	33
4	33	4	44
5	44	5	55

- B.** Which graph below looks like Luis's? Which looks like Michael's? Explain how you know.



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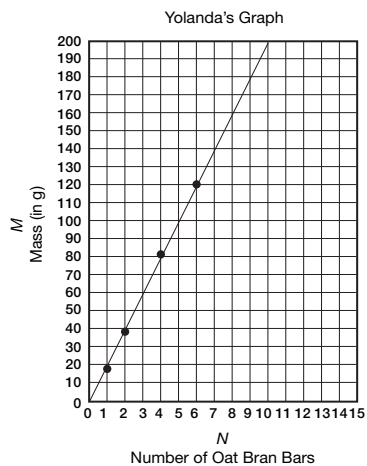
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Yolanda's Oat Bran Bars

Orders for Yolanda's oat bran bars have arrived! Yolanda needs to use her best-fit line to make predictions.



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Homework (SG pp. 358–359)

Yolanda's best-fit line was used to complete the data table.

Mass of Yolanda's Bars

<i>N</i> Number of Oat Bran Bars	<i>M</i> Mass (in g)
1	18
2	39
3	about 57
4	82
5	about 98
6	120
8	about 157
10	200
12	about 240

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Make some predictions from Yolanda's best-fit line. Use her graph to complete a data table like the one below. Copy and complete Yolanda's table.

Mass of Yolanda's Bars

<i>N</i> Number of Oat Bran Bars	<i>M</i> Mass (in g)
1	18
2	39
3	
4	82
5	
6	120
8	
	200
12	



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Investigating Mass vs. Number
(SAB pp. 495–499)

Questions 1–14

- 1.* See Figure 2 in the lesson for a sample drawing.
- 2.* See Figure 3 in the lesson for a sample data table.
3. **A.** Answers will vary based on the data.
B. Answers will vary based on the data.

Name _____ Date _____

Investigating Mass vs. Number



✓ **Check-In: Questions 1-2**


1. Draw a picture of what you are going to do in this experiment. Label the variables in your picture.

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Name _____ Date _____



2. You will mass ten objects that look the same. Discuss with your class the values of N you will put in the table. Make your measurements and record your data in the table.

Mass vs. Number

<i>N</i> Number of _____	<i>M</i> Mass (in _____ unit)
1	
2	
3	
4	
6	
10	

3. Look for patterns in the data table.
 - A. What patterns do you see if you look down the column?
 - B. What patterns do you see if you look across the rows? (Hint: Use friendly numbers.)

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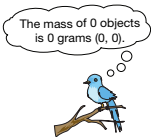
Name _____ Date _____

- If you triple the number of objects, what happens to the mass? Show or tell how you found your answer.
- If the number of objects goes up by 2, does the mass go up by two grams? Explain what happens.



Check-In: Question 6

- Use a piece of *Centimeter Graph Paper* to make a point graph.
 - Put Number of _____ (N) on the horizontal axis.
 - Put Mass in Grams (M) on the vertical axis.
 - Remember to title the graph, number the axes, and include units.
 - Be sure to start numbering with 0.



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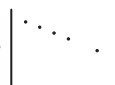
Name _____ Date _____

Use your Mass vs. Number graph and data table to answer the following questions.


- Think about the patterns you see in your data points. Which of the following looks most like your graph? Circle A, B, or C.




A



B



C
- Use a ruler to draw a **best-fit line** for your data points. Since 0 objects have 0 mass, remember to start the line at 0, 0.



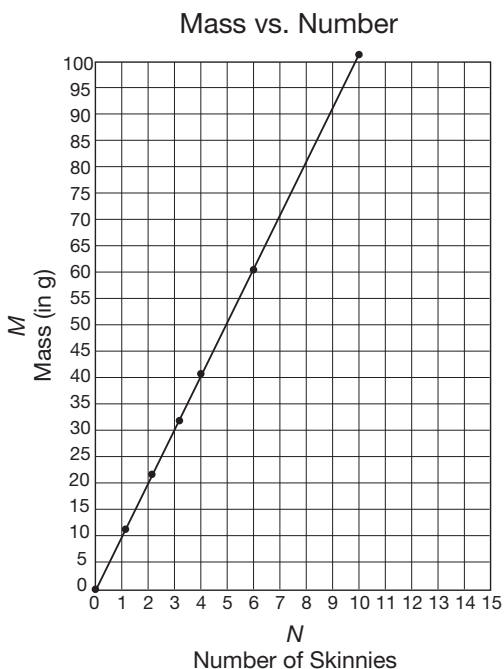
- Predict the mass of five of your objects using the pattern in your graph.
 - Check your prediction by measuring the mass of five of your objects. What is the actual mass?
 - Was your prediction close? _____ Explain why you think this.
- Find another way to predict the mass of five objects. (Do not use your graph.) Show your work. Is this new prediction better, worse, or about the same?

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- The mass triples; Using the table, 1 tripled is 3. 1 skinny is 11 grams and triple that is 3×11 grams or 33 grams. 3 skinnies are 30 grams on the table, and 30 is close to 33.
- Using the sample data in Figure 3 in the Lesson Guide: If the number of objects goes up by 2, the mass goes up by more than 2 grams because according to the data table the mass of 2 skinnies is about 20 grams.
- * Answer based on the data in Figure 3 in the lesson.



The answers to Questions 7–14 are based on the graph in Question 6. Answers will vary.

- The points fall in a straight line like graph C.
- See graph in Question 6.
- About 50 grams
 - Answers will vary.
 - Answers will vary.
- One skinny has a mass of about 10 grams. $10 \text{ grams} \times 5 = 50 \text{ grams}$. The graph usually gives a better prediction.

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*Answers and/or discussion are included in the lesson.

11. **A.** 70 grams using the graph or $7 \times 10 \text{ grams} = 70 \text{ grams}$
- B.** Answers will vary.
12. **A.** Possible response using patterns in the data table: 10 skinnies are 104 grams. If I divide that in 2 to find the mass of 5, I get 52. 1 skinny is 11 grams. If I divide that in 2 to find the mass of $\frac{1}{2}$ of a skinny, I get about 5. $52 + 5 = 57 \text{ grams}$ for $5\frac{1}{2}$ skinnies.
- B.** About 58 grams; explanations and strategies used will vary. Find $5\frac{1}{2}$ on the horizontal axis and follow the grid line up to where it intersected with the line. Then, lay your ruler horizontally, touching the point of intersection and the vertical axis. The ruler should hit the vertical axis at about 58 grams. My prediction is reasonable.
13. **A.** Predictions will vary. One possible response: $100 \text{ grams} \div 10 \text{ grams per skinny}$ is 10 skinnies.
- B.** Answer will vary. Using the graph: Between 9 and 10 skinnies would have a mass of 100 grams. I found a mass of 100 grams on the vertical axis. I followed the line on the graph to the best-fit line and then followed the line down to find the number on the horizontal axis, Number of Skinnies. It fell between 9 and 10.
- 14.* Answers will vary. Possible responses:
If you know the number of objects, you can find the mass by multiplying the number by about 10 grams. Or, you can use your graph to find the mass. Find the number of objects on the horizontal axis and find the number from the vertical axis that intersects with the best-fit line.

Name _____ Date _____

11. **A.** Predict the mass of seven of your objects. Record your prediction and explain how you made it.

B. Check your prediction by massing seven of your objects. What is the actual mass? Was your prediction close? Explain why you think this.

12. **A.** Use your data table to predict the mass of $5\frac{1}{2}$ of your objects. Tell how you used the data table.

B. Show or tell how to check your prediction with your graph. Is your prediction reasonable?

13. **A.** Predict about how many of your objects you will need to get a total mass of 100 g. Show how you made your prediction.

B. Check your prediction another way. Show your work.

14. If you know the number of objects, explain two ways to find the total mass. You may use words, pictures, your data table, your graph, or number sentences in your answer.

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