Student Guide

Stencilrama (SG p. 212)
Questions 1–11

1.* The main variables: Number of Stencils (N) and Length of Border (L)

2.* Size and shape of the stencil must stay the same, how the stencils are spaced with no space between the stencils, and the orientation of the stencil must be the same.

3.* The girls used the stencil five times to make a border and then they measured the length of one, two, four and five stencils.

4.* They need to measure the length of the blackboard and then use their measurements to figure out the number of stencils in a border the length of the blackboard.

5.* 15 stencils; Possible strategy: I skip counted by 2 to 30 because each stencil adds 2 inches to the border length.

6.* 7 stencils; Possible strategy: The number of stencils is half the length of the border. So a 14-inch border would need 7 stencils.

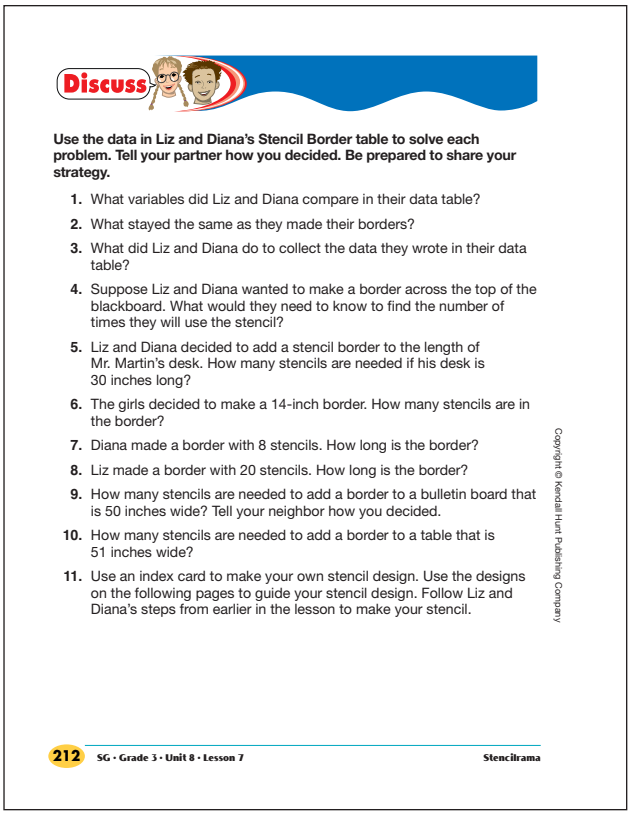
7.* 16 inches; Possible strategy: According to the table 4 stencils is 8 inches. A 16-inch border is twice as long and will need twice as many stencils $4 \times 2 = 8$ and $8 \times 2 = 16$.

8.* 40 inches; Possible strategy: I extended the table. 5 stencils are 10 inches; 10 stencils are 20 inches; 20 stencils are 40 inches.

9. 25 stencils; Possible strategy: There are 5 stencils in a 10-inch border. Five 10-inch borders are needed to make a 50-inch border. 5 stencils x 5 10-inch borders = 25 stencils for a 50 inch border.

10.* 25 ½ stencils; Possible strategy: If I add one more stencil to the 50-inch border the border is 52 inches. One more is too many. Half of a border is 1 inch. So 25 stencils plus $\frac{1}{2}$ of one stencil will make a border that is 51 inches.

11.* Stencil designs will vary.



Discuss

Use the data in Liz and Diana's Stencil Border table to solve each problem. Tell your partner how you decided. Be prepared to share your strategy.

1. What variables did Liz and Diana compare in their data table?
2. What stayed the same as they made their borders?
3. What did Liz and Diana do to collect the data they wrote in their data table?
4. Suppose Liz and Diana wanted to make a border across the top of the blackboard. What would they need to know to find the number of times they will use the stencil?
5. Liz and Diana decided to add a stencil border to the length of Mr. Martin's desk. How many stencils are needed if his desk is 30 inches long?
6. The girls decided to make a 14-inch border. How many stencils are in the border?
7. Diana made a border with 8 stencils. How long is the border?
8. Liz made a border with 20 stencils. How long is the border?
9. How many stencils are needed to add a border to a bulletin board that is 50 inches wide? Tell your neighbor how you decided.
10. How many stencils are needed to add a border to a table that is 51 inches wide?
11. Use an index card to make your own stencil design. Use the designs on the following pages to guide your stencil design. Follow Liz and Diana's steps from earlier in the lesson to make your stencil.

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

Name _____ Date _____

Collect

Work with your partner to collect data. The data will help you solve problems about the length of a border and the number of times you used your stencil.

N Number of Stencils	*L* Length of Border (in inches)

Explore

Use the stencil border you made with your stencil and your data table to answer the following questions.

1. Measure the length of six stencils to the nearest inch.

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2. Show how to use the length of one stencil to predict the length of a border with six stencils.

3. Show how to use the length of two stencils to predict the length of a border with six stencils.

4. Compare your answers to Questions 2 and 3. Are they the same? Why or why not?

5. Show how to use the length of six stencils to predict the length of a border with 60 stencils.

6. How many stencils are needed to make a border that is 30 inches long? Show or tell how you know.

7. How many stencils are needed to make a border that is 15 inches?

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Student Activity Book

Stencilrama Lab (SAB pp. 292–297) Questions 1–13

* See Figures 5 and 6 in the lesson for a sample picture and data table. Strategies and measurements will vary based on the orientation of the stencil and student's actual measurements.

1. Measurements will vary. If the stencil is placed horizontally, six-stencil border will be about 30 inches long. If the stencil is placed vertically, a six-stencil border will be about 18 inches long.
2. Possible responses: If 1 stencil is 3 inches long, I need to add 3 inches six times. 3 + 3 + 3 + 3 + 3 + 3 = 18 inches. If 1 stencil is 5 inches long, 5 inches x 6 stencils = 30 inches.
3. Possible responses: Since a two-stencil border is 6 inches I drew a picture to predict the length of 6 stencils.

6 in		6 in		6 in	
1	2	3	4	5	6

6 + 6 + 6 = 18 inches or

Since a two-stencil border is 10 inches I drew a picture to predict the length of 6 stencils.

10 in		10 in		10 in	
1	2	3	4	5	6

10 + 10 + 10 = 30 inches

4. The predicted length of the border is the same but in Question 2 the strategy is based on the length of one stencil. In Question 3 the strategy is based on the length of two stencils.
5. Possible response: The 60-stencil border is 10 times as long as the 6-stencil border. If the 6-stencil border is 18 inches the 60-stencil border is 180 inches long. If the 6-stencil border is 30 inches, the 60-stencil border is 300 inches long.
6. 10 stencils or 6 stencils; Possible strategy for ten 3-inch stencils: I skip counted by 3 until I reached 30 because each stencil is 3 inches. It took 10 skips; Possible strategy for six 5-inch stencils: I used my data table. A border 30 inches long was made with 6 stencils.

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

7. Five 3-inch stencils: I used my data table. A 15-inch border is made with 5 stencils that are 3 inches long; Or three 5-inch stencils: I extended my data table. A 15-inch border is made with 3 stencils that are 5 inches long.

My 5-Inch Stencil

N Number of Stencils	*L* Length of Border (in inches)
1	5
2	10
4	20
5	25
3	15

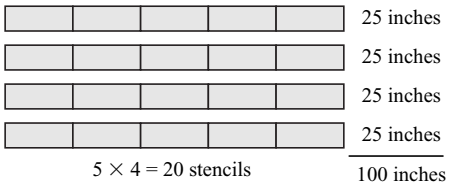
8. Seven 3-inch: I extended my data table; or a little more than four 5-inch stencils: There are four 5 inch stencils in a border that is 20 inches long. A 5-stencil border is 25 inches long. So a border that is 21 inches long is made with part of a fifth stencil.

My 3-Inch Stencil

N Number of Stencils	*L* Length of Border (in inches)
1	3
2	6
4	12
5	15
6	18
7	21

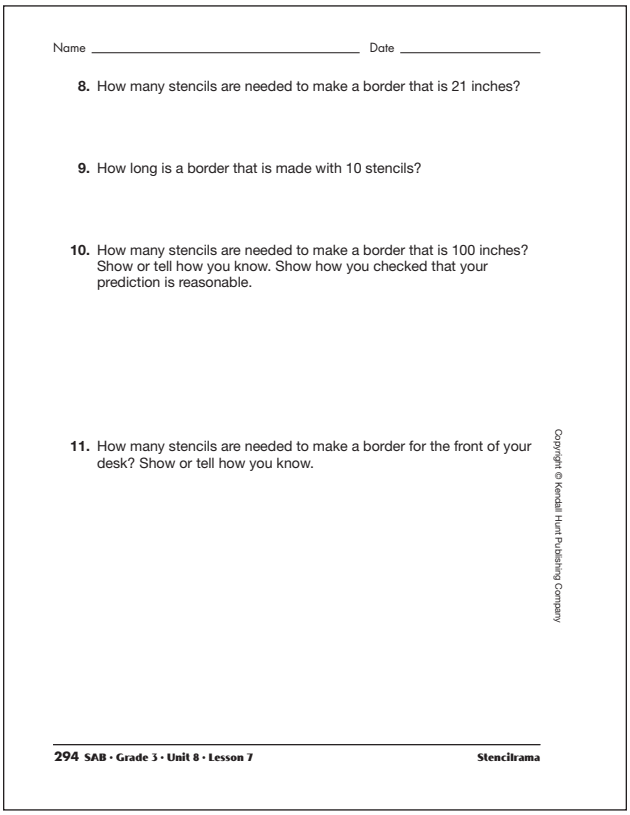
9. 30 inches: A 10-stencil border will be double the length of a 5-stencil border. If a 5-stencil border is 15 inches a 10-stencil border is 30 inches; Or 50 inches: If a 5-stencil border is 25 inches a 10-stencil border is 50 inches.

10. About 33 3-inch stencils: I skip counted and landed on 99. That is 33 skips to 99. It will take a little bit more than 33 stencils to make a border 100 inches long; Or 20 5-inch stencils: If a 5-stencil border is 25 inches it will take four 5-stencil borders to make a 100-inch border.



11. Responses are based on the length of the desk measurements.

12.* Responses will depend on objects selected and measurements.



Name _____ Date _____

8. How many stencils are needed to make a border that is 21 inches?

9. How long is a border that is made with 10 stencils?

10. How many stencils are needed to make a border that is 100 inches? Show or tell how you know. Show how you checked that your prediction is reasonable.

11. How many stencils are needed to make a border for the front of your desk? Show or tell how you know.

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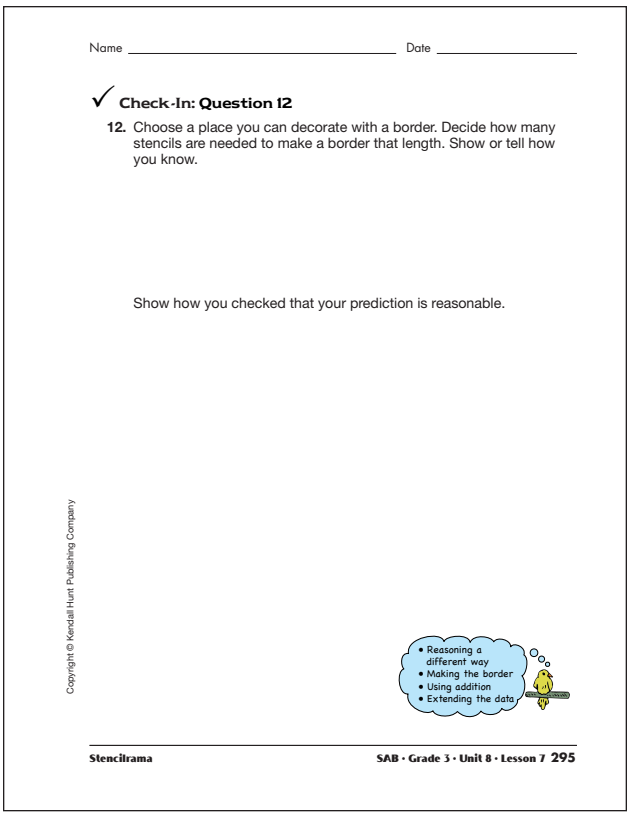

Name _____ Date _____

✓ **Check-In: Question 12**

12. Choose a place you can decorate with a border. Decide how many stencils are needed to make a border that length. Show or tell how you know.

Show how you checked that your prediction is reasonable.

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Professor Peabody's Stencil Border

✓ **Check-In: Question 13**

13. Professor Peabody made a stencil and a border. He organized his data into a table.

A. Help Professor Peabody complete his table.

Professor Peabody's Stencil Border

N Number of Stencils	*L* Length of Border (in inches)
1	
2	20
3	30
5	
8	80
10	100

B. Show how to use the length of two stencils to predict the length of a border with 6 stencils.

C. How many stencils are needed to make a border that is 70 inches long? Show or tell how you know.

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Name _____ Date _____

D. How many stencils are needed to make a border that is 200 inches long? Show or tell how you know.

E. Show how to use the length of three stencils to predict the length of a border with 12 stencils.

F. After Professor Peabody looked at his data table he wrote the following number sentence.

$0 \times 10 = 10$

What would you tell Professor Peabody to help him see his error?

Stencilrama Lab Check-In: Question 13 Feedback Box	Expectation	Check In	Comments
Use patterns in data tables to make predictions and solve problems. [A–F]	E8		
Use strategies to solve multiplication and division problems (e.g., skip counting, repeated addition, repeated subtraction, reasoning from known facts, and invented). [B–F]	E2		
Use the multiplication properties of 0 and 1 to solve multiplication problems. [F]	E3		

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13. A. Professor Peabody's Stencil Border

N Number of Stencils	*L* Length of Border (in inches)
1	**10**
2	20
3	30
5	**50**
8	80
10	100

B. 60 inches; Strategies may vary. A 6-stencil border is 3 times the length of a 2-stencil border. If a 2-stencil border is 20 inches, then a 6-stencil is border is 3 times as long as 20 inches or $3 \times 20 = 60$ inches.

C. 7 stencils; If 1 stencil is 10 inches then there are 7 stencils in 70 inches.

D. 20 stencils; If a 10-stencil border is 100 inches then a 200-inch border has 20 stencils. I just thought about doubles. If the length is doubled the number of stencils is doubled.

E. 120 inches;

1	2	3	30 inches
4	5	6	60 inches
7	8	9	90 inches
10	11	12	120 inches

12 stencils is 120 inches

F. He could be thinking about this number sentence two ways. Either way $0 \times 10 = 0$ not 10. If there are 10 stencils and each is 0 inches long $0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 = 0$. If there are 0 stencils each 10 inches long the length of the border is still 0 inches.