

TASK 1.1.3: AREA PATTERNS**Solutions**

Using 3 x 5 note cards or 3 x 5 Post-It[®] notes create the following pattern on chart paper.

- Attach 1 card to the chart paper.
- In a new space, create a rectangle having twice the dimensions of the original note card. Fill this area with 3 x 5 note cards. How many note cards did this take?
- In a new space on the chart paper, create a rectangle with dimensions three times the dimensions of the original note card. Fill this area with 3 x 5 note cards. How many note cards did this take?
- In a new space on the chart paper, create a rectangle with dimensions four times the dimensions of the original note card. Fill this area with 3 x 5 note cards. How many note cards did this take?
- Use these rectangles and predict how many 3 x 5 note cards it would take to create a rectangle with dimensions 5 times the original 3 x 5 note card.

Using this information, complete the table below.

Rectangle #	Dimensions (inches)	Area (in ²)	Process	Number of 3 x 5 note cards needed to fill the total area
1	3" x 5"	15 in ²	1 ² (3 x 5)	1
2	6" x 10"	60 in ²	2 ² (3 x 5)	4
3	9" x 15"	135 in ²	3 ² (3 x 5)	9
4	12" x 20"	240 in ²	4 ² (3 x 5)	16
5	15" x 25"	375 in ²	5 ² (3 x 5)	25
7	21" x 35"	735 in ²	7 ² (3 x 5)	49
9	27" x 45"	1215 in ²	9 ² (3 x 5)	81
r	3r" x 5r"		r ² (3 x 5)	r ²

Suppose you are given a package of 100 note cards:

1. Using your graphing calculator create a scatter plot of number of note cards vs. the rectangle number. What is the domain for this data? The range? Explain.

The domain is the set of whole numbers 0 to 10 since you are using whole note cards. The range is the square of the whole numbers of the domain, that is, $\{0, 1, 4, \dots, 81, 100\}$.

2. What scale factor is used to change rectangle #1 to rectangle #3? How does this relate to the number of 3 x 5 note cards needed to fill the total area?

The scale factor for the dimensions in rectangle #3 is 3. The total number of note cards is 3^2 or 9. or the scale factor of the dimensions squared.

3. What scale factor is used to change rectangle #1 to rectangle #4? How does this relate to the number of 3 x 5 note cards needed to fill the total area?

The scale factor of the dimensions in rectangle #4 is 4 and the total number of note cards is 4^2 or 16 or the square of the scale factor.

4. Explain the relationship between the scale factor and the number of 3x5 note cards needed to fill the total area.

The total number of note cards is the scale factor squared.

5. If the number of 3x5 note cards needed to fill the total area was 225, what is the scale factor?

The scale factor would be 15.

6. Explain why the scale factor is squared to get the total number of note cards needed to fill the total area. Show this relationship in at least 2 different ways.

There are several ways to demonstrate why the scale factor is squared. Make sure students see the relationship between the symbolic, numerical, and pictorial.

Math notes

Students experience problems in dealing with the symbolic manipulation of dimensions changing and the resulting effect on the area. Students may need to have more manipulative experiences with this concept.

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- In a new space on the chart paper, create a rectangle having three times the dimensions of the original note card. Fill this area with 3 x 5 note cards. How many note cards did this take?
- In a new space on the chart paper, create a rectangle having four times the linear dimensions of the original note card. Fill this area with 3 x 5 note cards. How many note cards did this take?
- Use these rectangles and predict how many 3 x 5 note cards it would take to create a rectangle with dimensions 5 times the original 3 x 5 note card.

Using this information, complete the table below.

Rectangle #	Dimensions	Process	Number of 3 x 5 note cards needed to fill the total area
1	3 x 5	1(3 x 5)	1
2			
3			
4			
5			
7			
9			
r			

Suppose you are given a package of 100 note cards:

1. Using your graphing calculator, create a scatter plot of number of note cards vs. the rectangle number. What is the domain for this data? The range? Explain.
2. What scale factor is used to change rectangle #1 to rectangle #3? How does this relate to the number of 3 x 5 note cards needed to fill the total area?
3. What scale factor is used to change rectangle #1 to rectangle #4? How does this relate to the number of 3 x 5 note cards needed to fill the total area?
4. Explain the relationship between the scale factor and the number of 3x5 note cards needed to fill the total area.
5. If the number of 3x5 note cards needed to fill the total area was 225, what is the scale factor?
6. Explain why the scale factor is squared to get the total number of note cards needed to fill the total area. Show this relationship in at least 2 different ways.