Fractions
Off the Geoboard
6th Grade

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Mathematics Consultant

Name _____

Constance

Content

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Dear Students

These investigations will give you an opportunity to delve further into fractions, proportions, problem solving, and collaborative group work.

To help you get started, geoboard models are given for you to refer to. But, you are expected to decide how to put together the geoboard models. Some problems require that to compare and contrast two different models. It is, therefore important for you **to work in a group** so that you have access to several geoboards. Remember to *RECORD* your work in your **Toolbox (when you have discovered something new)**. Remember, you must be prepared to discuss your work and findings with your classmates.

Enjoy,

Dr. Mason IV

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Problem 1

Use two geoboards for this activity.

STEP 1 Put together this rectangle on two separate geoboards	
RECORD A. Multiply to determine the area of the rectangle in square units	
STEP 2 Divide one rectangle into thirds. Divide the second rectangle into sixths	
RECORD Shade 2/3 of one whole rectangle and 4/6 of the second whole rectangle.	
B. Determine the area of the shaded 2/3. Determine the area of the 4/6. Use the shaded models to justify the equations 2/3=4/6.	
C. Write as fraction for the parts of each square that are not shaded. Determine the area for each and compare the fractions. Justify the equations 1-2/3 = 2/6 and 4/6 + 1/3 = 1.	

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Worksheet
Problem 1

Use for problems that require two geoboards

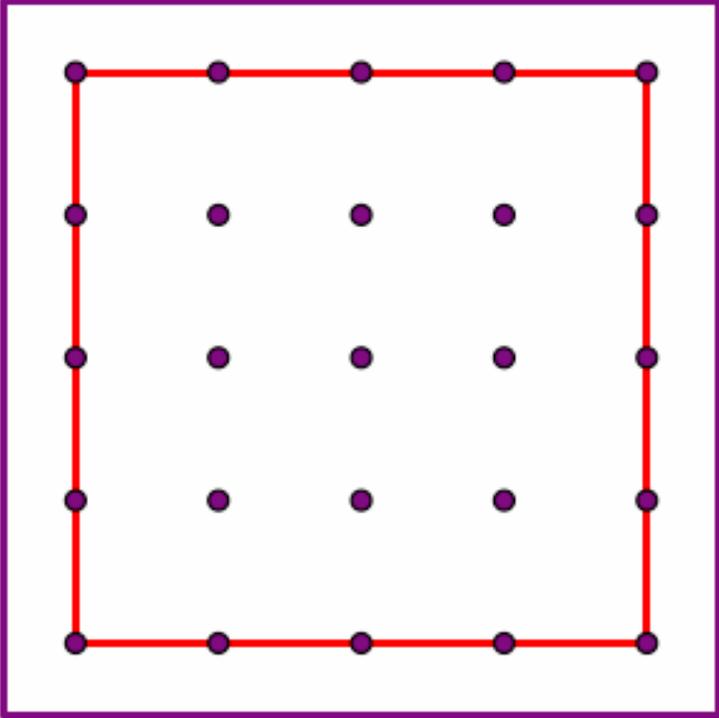| Step 1	Step 2
A	B

C
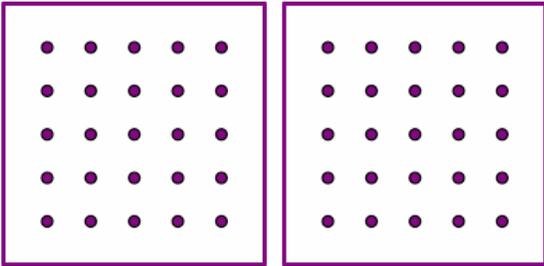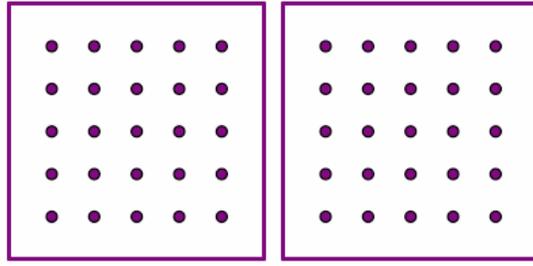
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Problem 2

Use two geoboards for this activity.

STEP 1 Construct the square to the right on two separate geoboards.	
RECORD A. Multiply to determine the area of each whole square in square units	
STEP 2 Divide one square into fourths and the other square into sixteenths.	
RECORD Shade 2/4 of one whole square and 12/16 of the second whole square	

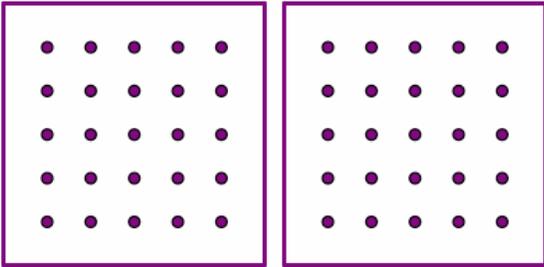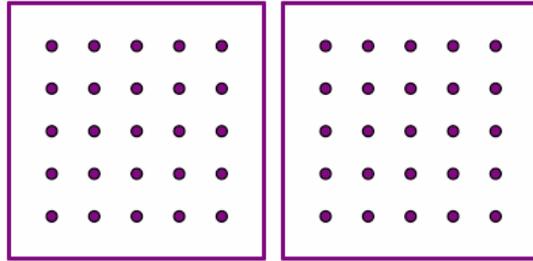| |
|---|
| B. Determine the area of the shades 2/4. Determine the area of the shaded 12/16. |
| C. Write are fraction for the parts of each square that are not shaded. Determine the area for each and compare the fractions. Justify the equations 4/16 < 2/4 and 1 - 12/16 = 4/16. |

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Worksheet
Problem 2

Use for problems that require two geoboards

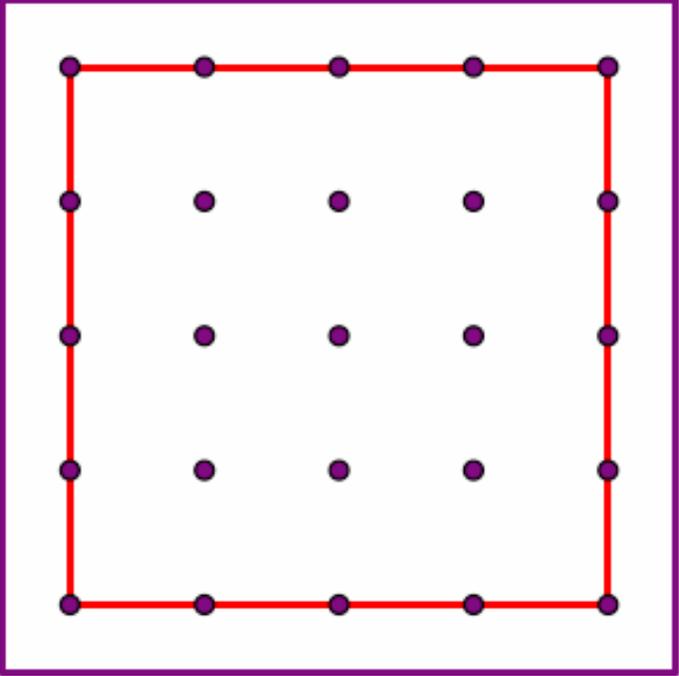| Step 1	Step 2
A	B
C	

Constance

Problem 3

Use two geoboards for this activity.

STEP 1 Construct the square to the right on two separate geoboards.	
RECORD A. Multiply to determine the area of each whole square in square units	
STEP 2 Divide one square into four equal squares and the other into eight equal rectangles.	
RECORD Shade ¾ of the first square and 6/8 of the second square.	
B. Determine the area of the shaded part of each square. Use the shaded models to justify the statement ¾ =6/8.	
C. Justify the equations 1 - 2/8 = 3/4 and 1 < (3/4+6/8) < 2.	

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Worksheet
Problem 3

Use for problems that require two geoboards

Step 1	Step 2
A	B

C
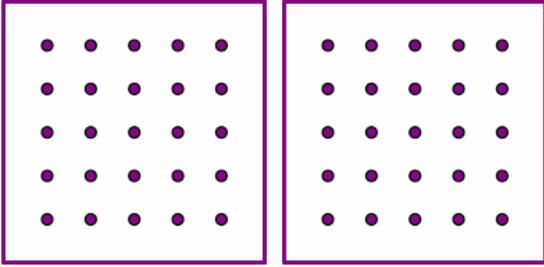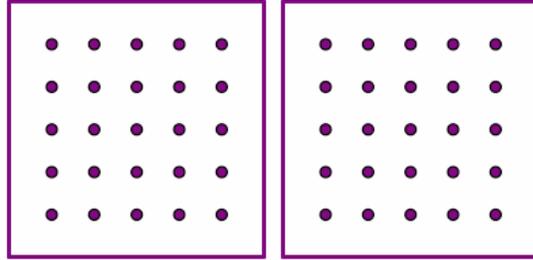
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Problem 4

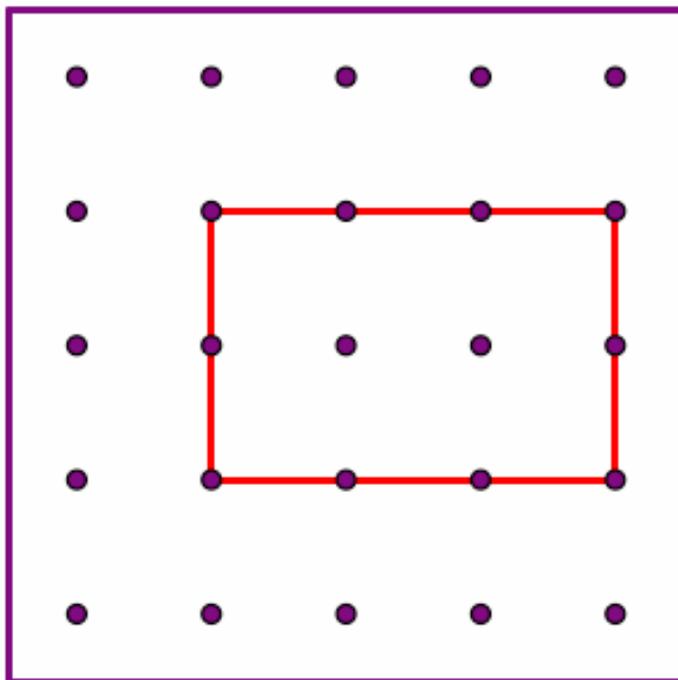|	
STEP 1 Construct the rectangle on the right on your geoboard and divide it into thirds.	
RECORD A. Determine the area of each third in square units. Write an equation for determining the area of the whole rectangle.	
STEP 2 Divide the whole rectangle into six equal parts	
RECORD B. Divide the geoboard model to represent the equation $6 \div 2 = n$ and use your model to justify the solution. Write a multiplication equation for the geoboard model.	

c. On a separate sheet of paper construct a model to represent $6 \div 4 = n$ and use your model to justify the solution.
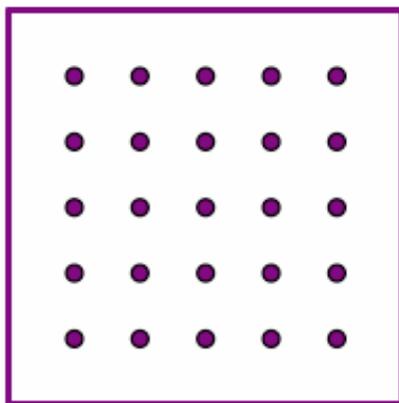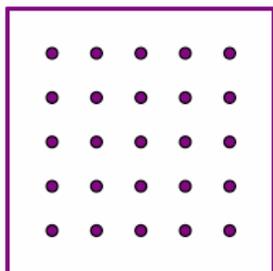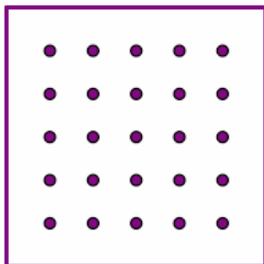
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Worksheet
Problem 5

Step 1

A

B.

C.

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Problem 5

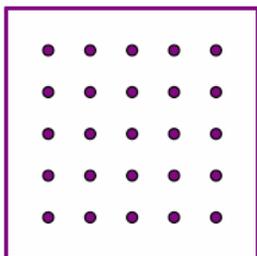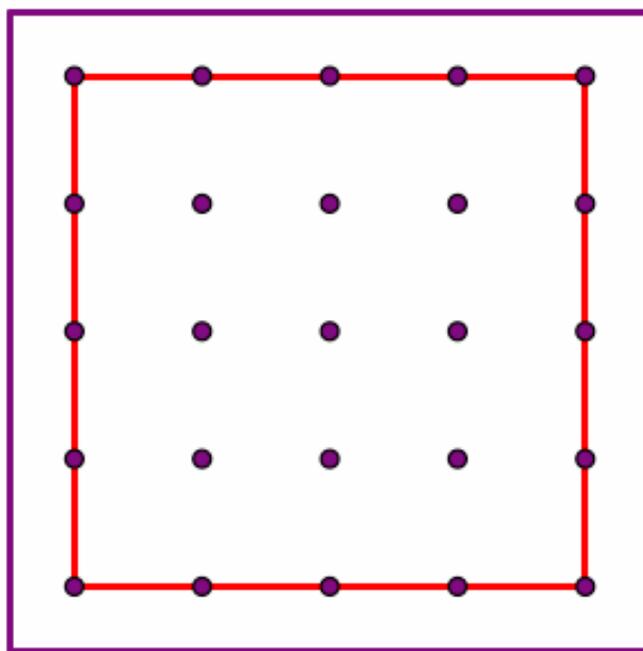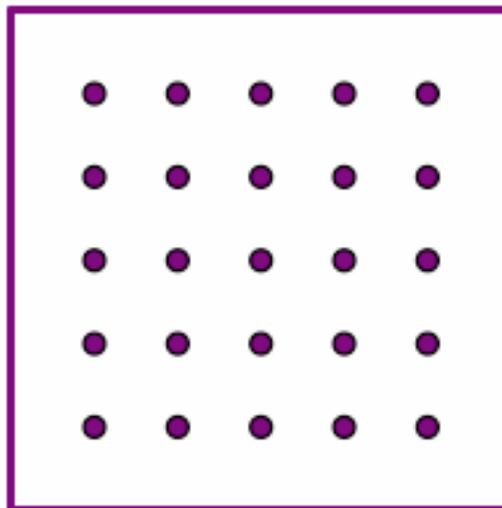| STEP 1 Construct the square on the right on your geoboard and divide it eight equal rectangles.	
RECORD A. Determine the area of each eighth in square units. Write an equation for determining the area of the whole square.	
STEP 2 Divide the geoboard into sixteenths.	
RECORD B. Divide your geoboard model to show the equation $16 \div 2 = n$ and use your model to justify the solution. Write a multiplication equation for the geoboard model.	
c. On a separate sheet of paper construct a model to represent $16 \div 4 = n$ and use your model to justify the solution.	

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Worksheet
Problem 5

Step 1

A.

B.

C.

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Problem 6

STEP 1 Construct the rectangle to the right on your geoboard and divide it into fourths.	
RECORD A. Determine the area of each fourth in square units. Write an equation for determining the area of the whole square.	
STEP 2 Divide the rectangle to represent the equation $\dfrac{1}{4} \div 2 = \dfrac{a}{b}$.	
RECORD B. Shade the rectangle to represent the solution. Use the shaded geoboard model to justify the solution. Determine the area of the solution in square units.	

C. In the work area below construct a 16sq. unit square and shade to represent $\dfrac{1}{8} \div 2 = \dfrac{a}{b}$. Construct the same model and shade to represent $\dfrac{1}{8} \div 4 = \dfrac{a}{b}$. Based on the conclusions predict the solution to $\dfrac{1}{8} \div 8 =$. Explain.

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Worksheet
Problem 6

A.

B.

C.
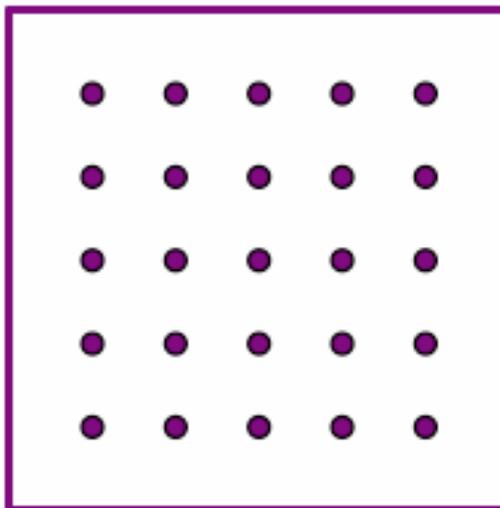
Constance

Problem 7

|	
STEP 1 Construct the square to the right and divide it into two equal rectangles.	
RECORD A. Determine the area of each half in square units. Write an equation for determining the area of the whole square.	
STEP 2 Divide one rectangle to represent the equation $\frac{1}{2} \div 2 = \frac{a}{b}$.	
RECORD B. Shade the rectangle to represent the solution. Use the shaded geoboard model to justify the solution. Determine the area of the solution in square units.	
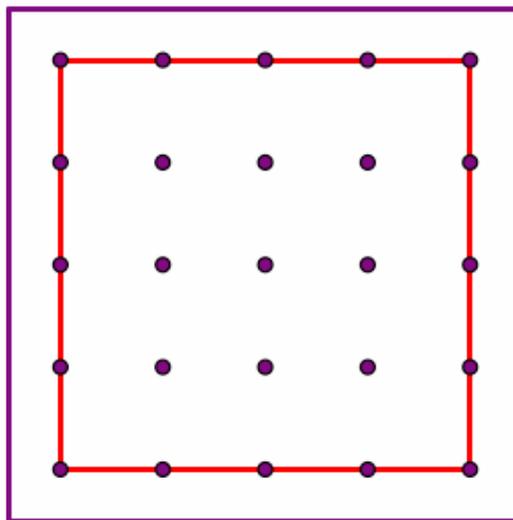
On a new sheet of paper, construct two 16sq. unit models. Shade one to represent $\frac{1}{2} \div 4 = \frac{a}{b}$ and the other to represent $\frac{1}{2} \div 8 = \frac{a}{b}$. Use the shaded models to justify the solutions. Determine the square units for each solution. Based on these conclusions and the conclusions in 2B predict the solution to $\frac{1}{2} \div 16 = \frac{a}{b}$. Explain.

Do the two models to the right have the same equations and answers? $\frac{1}{2} \div 4 = \frac{a}{b}$. Explain.
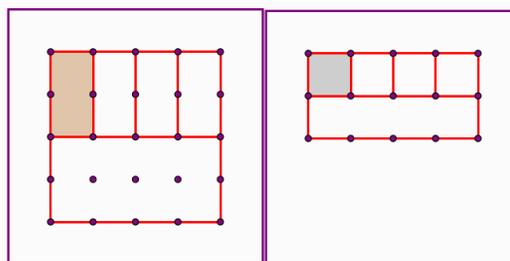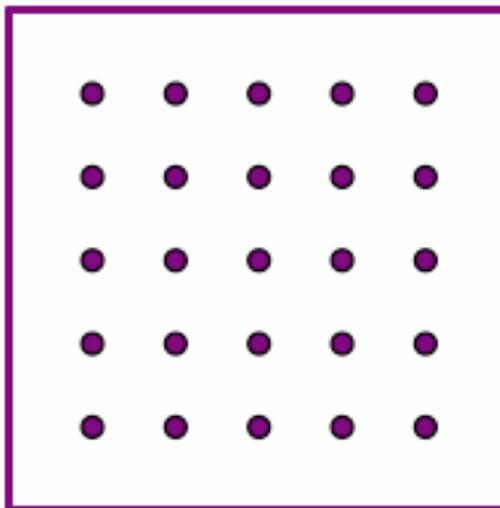
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Worksheet
Problem 7

A.

B.

C.

Constance

Problem 8

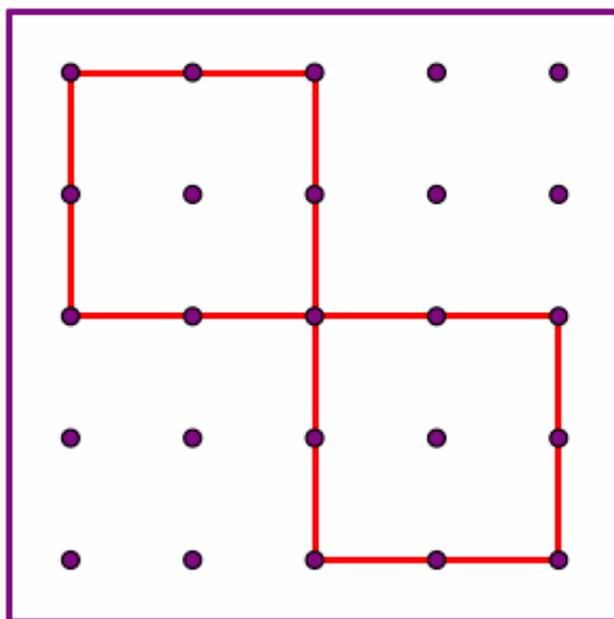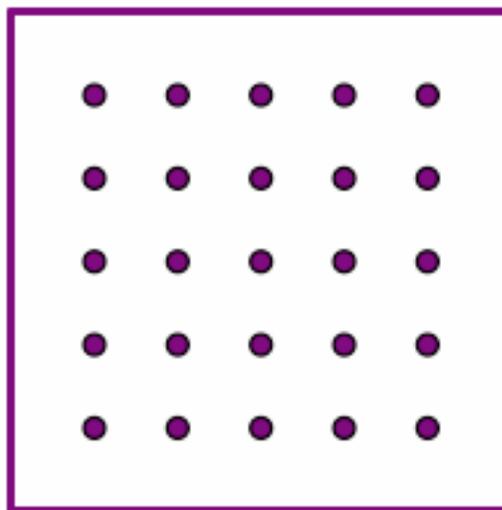| STEP 1 Construct the two squares to the right on your geoboard and divide the top square into halves and the bottom square into fourths.	
RECORD A. Lightly shade ½ of the top square and ¾ of the bottom square.	
STEP 2 Divide the top square into fourths.	

RECORD
    B. Use the shaded area model to solve the following equations: $\frac{1}{2} = \frac{a}{4}$.
 	
    C. Use the solution from the equation to solve $\dfrac{1}{a} + \dfrac{3}{4} = \dfrac{5}{4}$ Use the geoboard shaded models to justify the solution.	

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Worksheet
Problem 8

A.

B.

C.

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Problem 9

Use two geoboards for this activity.

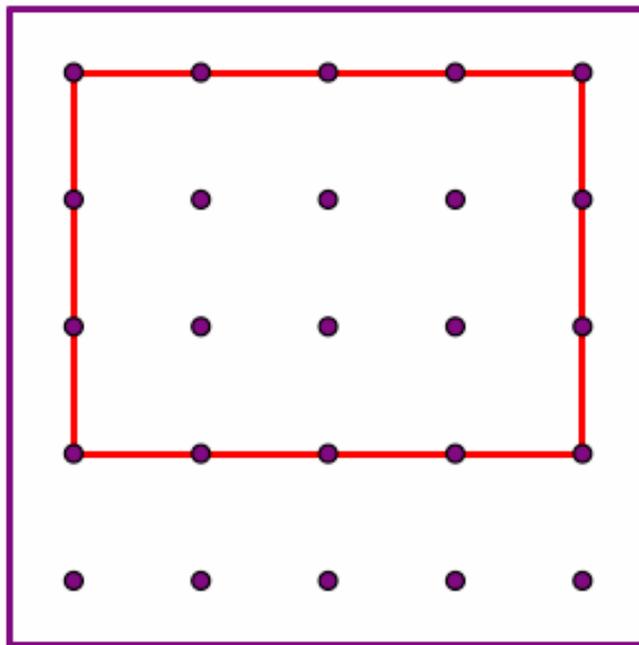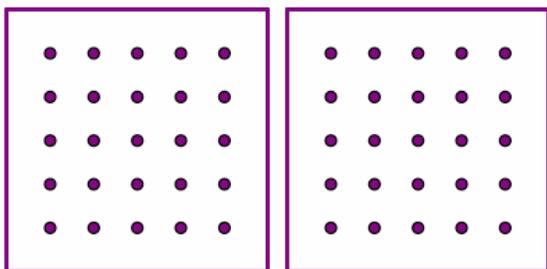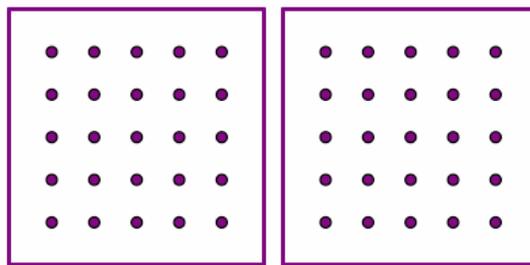| STEP 1 |
|---|
| Construct the rectangle to the right on two separate geoboards. Divide one rectangle into thirds and the second rectangle into fourths. |
| RECORD |
| A. Lightly shade 1/3 of the whole first rectangle and $\frac{3}{4}$ of the whole second rectangle. |
| STEP 2 |
| Divide each rectangle into twelve equal parts. |
| RECORD |
| B. Use the geoboard model to solve the following equations: $\frac{1}{3} = \frac{a}{12}$ and $\frac{3}{4} = \frac{a}{12}$. Use the solution from those equations to solve $\frac{1}{3} + \frac{3}{4} = \frac{a}{12}$. |
| C. Use the geoboard shaded models to justify the solution. |

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Worksheet
Problem 9

Use for problems that require two geoboards

Step 1	Step 2
A	B
C	

Constance

Problem 10

Use two geoboards for this activity.

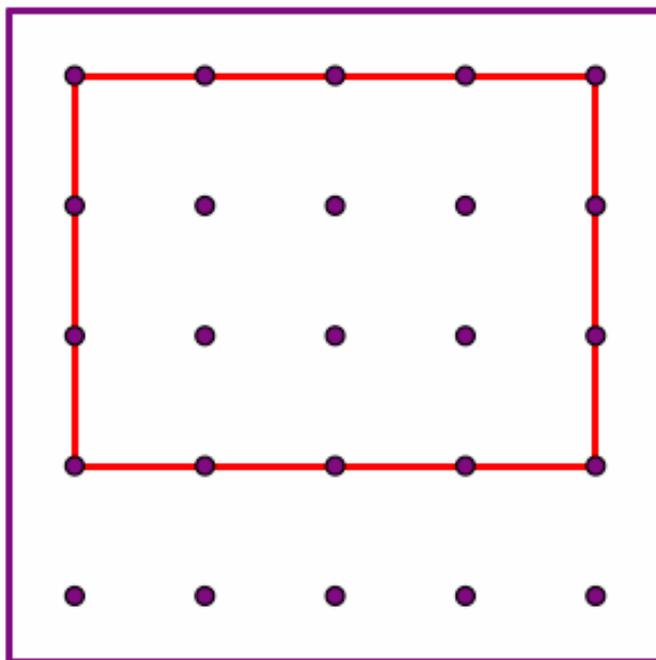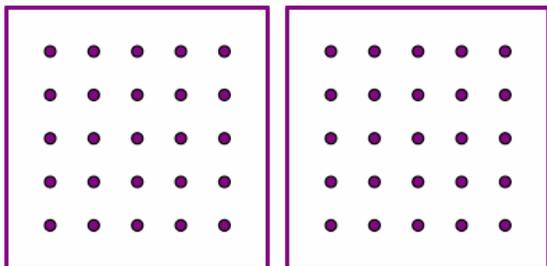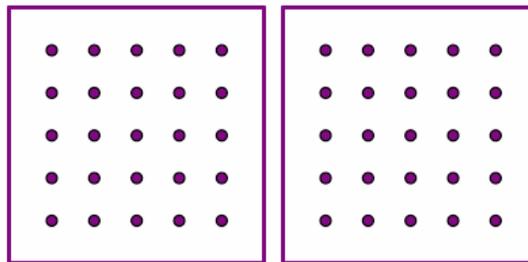| |
|---|
| **STEP 1**
 Construct the rectangle to the right on two separate geoboards. Divide one rectangle into sixths and the second rectangle into fourths. |
| **RECORD**
 A. Lightly shade 2/6 of the whole first rectangle and $\frac{3}{4}$ of the whole second rectangle. |
| **STEP 2**
 Divide each rectangle into twelve equal parts. |
| **RECORD**
 B. Use the geoboard model to solve the following equations: $\frac{2}{6} = \frac{a}{12}$ and $\frac{3}{4} = \frac{a}{12}$.

 C. Use the solution from those equations to solve $\frac{2}{6} + \frac{3}{4} = \frac{a}{12}$. Use the geoboard shaded models to justify the solution. |

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Worksheet
Problem 10

Use for problems that require two geoboards

Step 1	Step 2

A

B

C

Constance

Problem 11

Use two geoboards for this activity.

|	
STEP 1 Construct the square to the right on two separate geoboards. Divide the first square into four equal rectangles. Divide the second square into eight equal rectangles.	
RECORD A. Lightly shade 3/4 of the first rectangle and 2/8 of the second rectangle.	
STEP 2 Divide each rectangle into 16 equal parts.	

RECORD
  B. Use the recorded geoboard model to solve the following equations: $\frac{3}{4} = \frac{a}{16}$ and $\frac{2}{8} = \frac{a}{16}$
  C. Use the solutions from those equations to solve $\frac{3}{4} + \frac{2}{8} = \frac{a}{16}$. Use the geoboard shaded models to justify the solutions.	
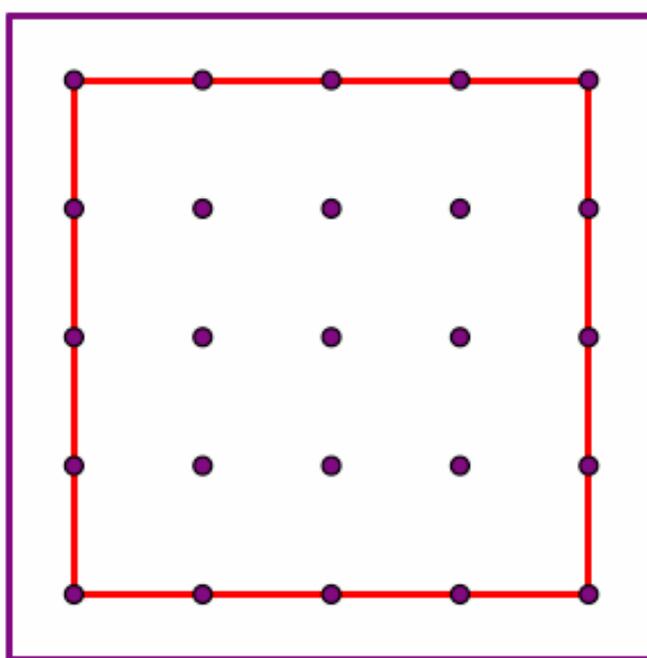
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Worksheet
Problem 11

Use for problems that require two geoboards

Step 1	Step 2
A	B
C	
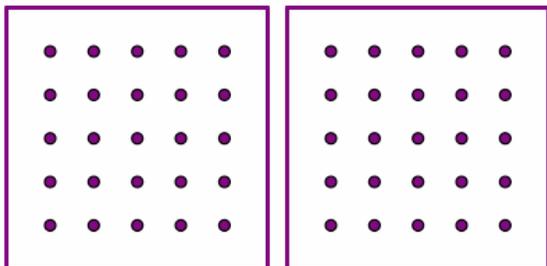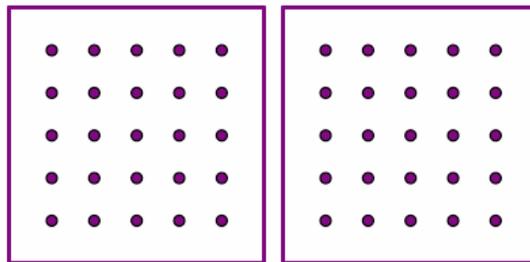
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Problem 12

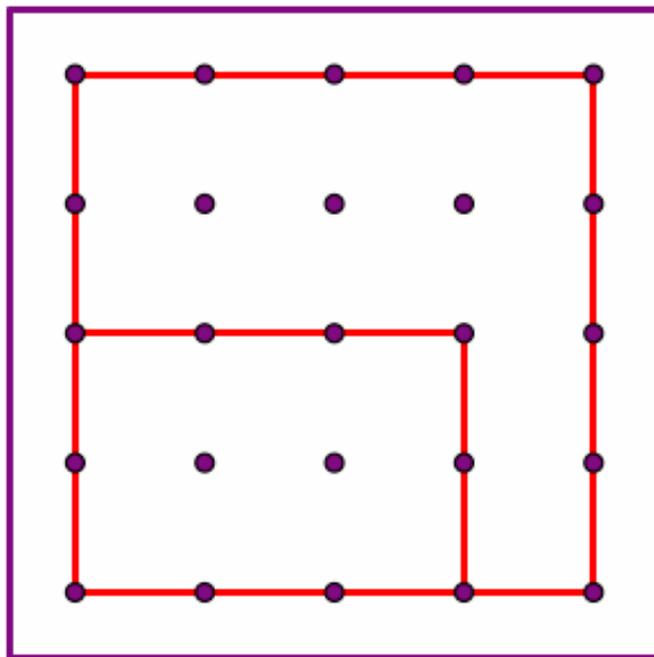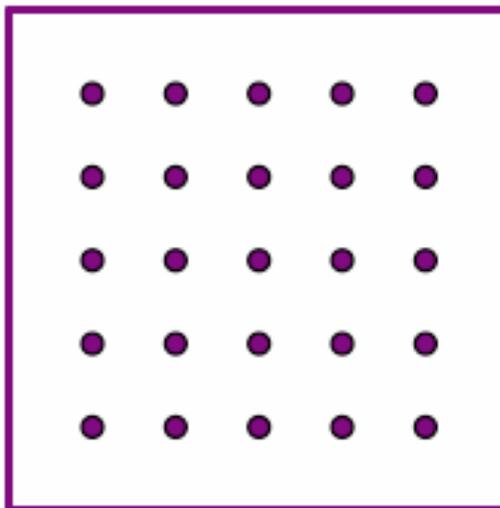|	
STEP 1 Construct these overlapping figures on your geoboard.	
RECORD A. If the large square is equal to one square foot, will the smaller rectangle be <, >, or = to ½ square foot? Explain why the equation for the area of the smaller rectangle is $A = \frac{2}{4} \times \frac{3}{4}$. Hint Area = L x W	
STEP 2 Divide the smaller rectangle into squares with each square equal to 1/16 of the whole square.	
RECORD B. Label each square in the smaller rectangle as 1/16. Use repeated addition to determine the area of the smaller rectangle. Use multiplication to determine the area of the smaller rectangle. Compare the two results. Use the recording sheet to justify the solutions.	

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Worksheet
Problem 12

A.

B.

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Problem 13

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STEP 1
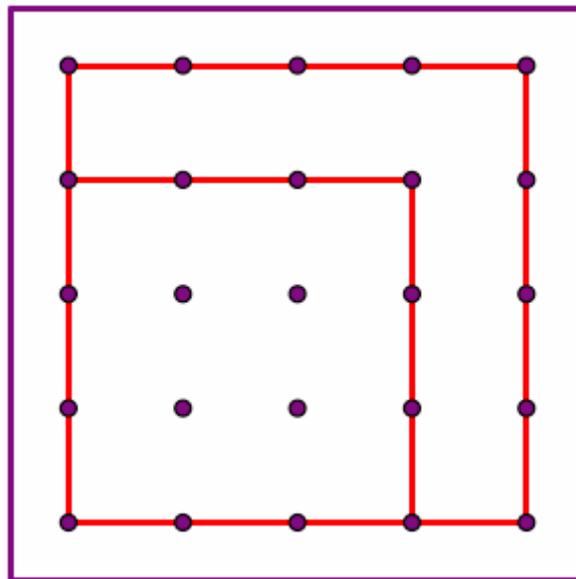
Construct these squares on your geoboard.
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<td rowspan="2">

</td>
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<tr>
<td>
RECORD

A. If the large square is equal to one square foot, will the smaller square be <, >, or = to $\frac{1}{2}$ square foot? Explain why the equation for the area of the smaller rectangle is $A = \frac{3}{4} \times \frac{3}{4}$

Hint Area = L x W
</td>
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<tr>
<td>
STEP 2

Divide the smaller square into nine squares with each square equal to 1/16 of the larger square.
</td>
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<tr>
<td>
RECORD

B. Label each square in the smaller square as 1/16. Use repeated addition to determine the area of the smaller square. Use multiplication to determine the area of the smaller square in sq. ft. Compare the results. Use your model to justify your answer.
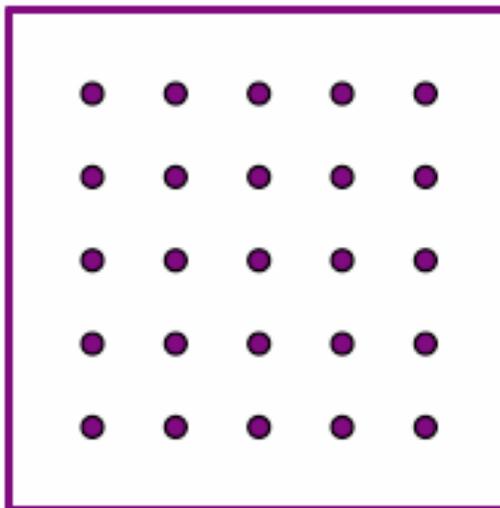</td>
<td></td>
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<tr>
<td colspan="2">
C. Explain why $\left(\frac{3}{4} \times \frac{3}{4}\right) + \frac{7}{16}$ equals the area of the large square. Write other equations for determining the area of the larger square.
</td>
</tr>
</table>

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Worksheet
Problem 13

A.

B.

C.