



National Center and State Collaborative

NCSC Math Activities with Scripted Systematic Instruction (MASSI): Elementary Measurement and Geometry

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MASSI: Math Activities with Scripted Systematic Instruction

Activity: Creating a Scrapbook Page

Grade Band: Grades 3-5

Concept: Measurement/Geometry

| Florida Standard | Access Points | MASSI OBJECTIVES |
|---|--|--|
| MAFS.3.MD.3.6 Measure areas by counting unit squares (square cm, square m, square in, square ft and improvised units). | 3rd MAFS.3.MD.3.AP.6a Measure area of rectangles by counting unit squares. | Use tiling squares to find area of a rectangle. Use formula to calculate area of a rectangle. |
| MAFS.4.MD.1.3 Apply the area and perimeter formulas for rectangles in real-world and mathematical problems. For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor. | 4th MAFS.4.MD.1.AP.3a Solve word problems involving perimeter and area of rectangles using specific visualizations/drawings and numbers. | Solve for changes in perimeter. |
| MAFS.5.MD.1.1 Convert among different-sized standard measurement units (i.e., km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec) within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems. | 5th MAFS.5.MD.1.AP.1b Convert standard measurements of length to solve real-world problems. | Convert units of measurement to solve for area. |

Be sure to provide specific practice to students on the skills that correspond to their grade level.

Teaching Materials: area and perimeter equations (laminated), difference equation (laminated), conversion chart (feet to inches), photos, calculators

Other Materials: wrapping paper with package labeled with width in inches and length in feet; extra photos of various sizes, see chart on next page (if possible have parents submit digital photos that can be printed in the appropriate sizes); a completed scrapbook to show students (or use video clip); one inch tiling squares; clearly labeled ruler; scrapbook paper, construction paper, or cardstock cut to appropriate sizes with height and weight labeled, see chart on next page; ribbon; scissors

Worksheets: There are student worksheets to review each component of the lesson.

Assessments: Progress Monitoring for taking data during the lesson; Skills Test

TEACHING OVERVIEW: The first section of the MASSI provides remedial practice on perimeter, area, length, and width. Third graders will find area two ways: tiling and using a formula. This is a good review for your 4th and 5th graders. The 4th graders will be solving for changes in perimeter. This is useful for your 3rd and 5th graders to gain fluency with measurement, calculating and identifying perimeter, and practicing numeracy skills. The 5th graders have to convert units of measure to solve for area. While the 5th graders work on conversions, you can let the 3rd and 4th graders practice solving for area and perimeter using equations.

Before teaching this lesson, ensure that you have acquired a photo of an appropriate size for your student to tile. If your student is still working on counting to numbers 1-10, use a small photograph (e.g., 2.5 x 3.5) so that students can reasonably count the tiling squares. For students who are visually impaired, you may use quilt squares of different textures and create a small quilt. Additional suggested photo/paper sizes include (use for quilt squares also):

| Photo Size | Scrapbook Paper Sizes (same area, different dimensions) | Paper Area |
|-------------------|--|---|
| 3 x 5 | 2 x 18, 3 x 12, 4 x 9, 6 x 6 | 36 in ² or .25 ft ² |
| 5 x 7 | 4 x 18, 6 x 12, 8 x 9 | 72 in ² or .5 ft ² |
| 8 ½ x 11 | 8 x 18, 9 x 16, 12 x 12 | 144 in ² or 1ft ² |

SCRIPT FOR LESSON

BUILDING ESSENTIAL UNDERSTANDING: CONCEPT AND SYMBOLS: Perimeter, Area, Length, and Width

(Skip this section for students who understand these relationships and can identify these concepts).

INTRODUCE THE ACTIVITY: It's always a lot of fun to make a scrapbook. A scrapbook is a book we put photos in to remember happy times. Show a scrapbook or watch video of completed scrapbook (or quilt), *My Grandma and Me*, http://www.youtube.com/watch?v=_5_DL25VFeA&feature=related (you can watch a portion of the video if students don't have the attending skills to watch the entire video). Give each student a photo (or quilt square).

INTRODUCE PROBLEM: Before we get started, we need to review some vocabulary.

MODEL THE PROCESS: Hold up a single photograph. Use your finger to trace the outside edge of the photo. **The perimeter is the edge that goes along the outside of the photo.**



STUDENT PRACTICE: Give student photo. Use LEAST INTRUSIVE PROMPTS script as needed to help students with each step.

CHECK AND SCORE

| Step | Teacher Says/Does | Student Response |
|------|---|--|
| 1. | Now let's practice with your photo. Show me the perimeter of your photograph. | Student uses finger to trace the outside edges of the photo. |

MODEL THE PROCESS: Now let's review area. Use the scrapbook paper to indicate area with hand showing the full area. **Area is the space inside the perimeter.**



STUDENT PRACTICE: Give student photo. Use LEAST INTRUSIVE PROMPTS script as needed to help students with each step.

CHECK AND SCORE

| Step | Teacher Says/Does | Student Response |
|------|--|--|
| 2. | Now let's practice with your photo. Show me the area of your photograph. | Student uses hand to indicate the area of the photo. |

MODEL THE PROCESS: Hold up a single photograph. **One way to find out the area of a photo is to find the length and width. Length is longest side of a parallelogram. This is the length of the photo** (point to the entire length of the longest side of your photo). Vary the size of the photograph daily, so the length runs horizontally and vertically.



STUDENT PRACTICE: Give student photo. Use LEAST INTRUSIVE PROMPTS script as needed to help students with each step.

CHECK AND SCORE

| Step | Teacher Says/Does | Student Response |
|------|--|--|
| 3. | Now let's practice with your photo. Show me the length of your photograph. | Student uses finger to point to the length of their photo. |

MODEL THE PROCESS: Hold up a single photograph. **Width is shortest side of a parallelogram. This is the width of the photo** (point to the entire width of the shortest side of your photo). Vary the size of the photograph daily, so the length runs horizontally and vertically.



STUDENT PRACTICE: Give student photo. Use LEAST INTRUSIVE PROMPTS script as needed to help students with each step.

CHECK AND SCORE

| Step | Teacher Says/Does | Student Response |
|------|---|---|
| 4. | Now let's practice with your photo. Show me the width of your photograph. | Student uses finger to point to the width of their photo. |

GENERALIZATION: Good. You are ready to work on making a scrapbook. Before we begin, let's make sure you know the math vocabulary really well! Let's practice with some other things we might find in our school. Use other objects/pictures (e.g., construction paper, index cards, desk/table tops, posters, computer screens, etc.). **NOTE:** Each day use NEW items so student does not memorize the correct answer.

CHECK AND SCORE

| Step | Teacher Says/Does | Student Response |
|------|-------------------------------------|---|
| 5. | Show me the perimeter of the _____. | Student uses finger to trace the outside edges of the item. |
| 6. | Show me the area of the _____. | Student uses hand to indicate the area of the item. |
| 7. | Show me the length of the _____. | Student uses finger to point to the length of the item. |
| 8. | Show me the width of the _____. | Student uses finger to point to the width of the item. |

3rd GRADE BUILD A GRADE ALIGNED COMPONENT: Tiling to find area

4th and 5th GRADE BUILD ESSENTIAL UNDERSTANDING: CONCEPT: Tiling to find area

INTRODUCE ACTIVITY/PROBLEM: One way that we can find out the area of a picture is to use one-inch tiling squares to cover the top of the picture.

MODEL THE PROCESS: This is a tiling square. Hold up the tiling square for the students to see. **First, I will line up the tiling squares to cover the area of the picture. Watch me.** Teacher covers the top of his/her picture with the tiling squares while the students watch. **Then, we count how**

many tiles we used. Let's count together, 1, 2, 3... Teacher should point to each of the tiles as the students count aloud. We counted (insert number) square units or (insert number) units squared.



STUDENT PRACTICE: Give student photo and tiles (more than needed). Use LEAST INTRUSIVE PROMPTS script as needed to help students with each step.

****Note:** When students are counting: If the student is nonverbal, counting may be done using an assistive technology device or with a response board (containing the numbers 1-10 or higher when appropriate). The student should “count” by pointing to the tile, then pointing to the corresponding number. For example, the student points to the first tile and points to the number one, then points to the second tile and points to the number two, etc. Students may also tap as the teacher counts or move hands/AT scanner from number to number as teacher counts. Look for an action that the student can perform independently and encourage this action as the tiles are counted. Some examples are: a tap, a head nod, blink, leg movement, finger movement.

CHECK AND SCORE

| Step | Teacher Says/Does | Student Response |
|------|---|---|
| 9. | Put your tiles on your photo and count to find the area. | Student places and counts the number of tiles on the photo (stopping when the photo is covered in tiles). |
| 10. | Give each student a second picture. Now let's try it with another photo to add to our scrapbook. Use the tiling squares to find the area of this photo. | Student places and counts the number of tiles on the photo (stopping when the photo is covered in tiles). |

INTRODUCE THE PROBLEM: Remove 1 photo from student. Give the student scrapbook paper that has the same area but different dimensions as the remaining photo (see chart at beginning of lesson). [We are intentionally sabotaging the scrapbook page so that students have to calculate a change later in the lesson.] The scrapbook paper should have the length and width written on it. **There is an easier way to calculate the area of a rectangle. Instead of counting all these tiles, we can use a formula. The formula for area equals length times width.** Show them the equation for area or write it on the board and point to each part as you read it. **We need to calculate the area of this scrapbook paper to see if our photo will fit on it.**

MODEL THE PROCESS. I am going to use a ruler to measure the length of my paper. Use a ruler and show how to measure the length of the paper. The length is ____, so I'll write it in my equation. Now I will use the ruler to measure the width of my paper. Use a ruler and show how to measure the width of the paper. The width is ____, so I'll write that in my equation. Now I will use a calculator to calculate the area. Remember, area equals length times width. First I type in the length, (say number), then push the times button, then I type in the width (say number), and push the equals button. Look, the area of my paper is ____ square inches. Remember, the area of my photo was... My photo (will/will not) fit on my scrapbook paper.



STUDENT PRACTICE: Look at your scrapbook paper, the length and width are already written on it. All we need to do is calculate the area using a calculator. Display/write on board blank area equation with the words “length,” “width,” and “area” written below corresponding spaces. Use LEAST INTRUSIVE PROMPTS script as needed to help students with each step.

CHECK AND SCORE

| Step | Teacher Says/Does | Student Response |
|------|---|--|
| 11. | What is the length of your scrapbook paper? | Student writes/stamps/uses Velcro numbers/points to/eye gazes to the length. |
| 12. | Now we need to find the width. What is the width of your scrapbook paper? | Student writes/stamps/uses Velcro numbers/points to/eye gazes to the width. |

Now I will enter the formula into the calculator to solve for area. Solve for area and show students. Look at the calculator. The area of the paper is _____. Let’s look at your worksheet. Remember, the area of the picture was _____. You just found that the area of the scrapbook paper is _____. Which number is bigger? Wait for students to indicate which number is bigger. If incorrect, prompt them to the correct number. If the picture is bigger than the scrapbook paper can we use it or should we get another piece of scrapbook paper?



This may be a good stopping point. Let students use the photos to decorate a scrapbook page. There is a worksheet with this level. You can use this for additional guided practice or to send home as homework.

| INDEPENDENT PRACTICE: Measurement/Geometry Skill Test | Teacher Says/Does | Student Response | Error Correction |
|---|--|---|---|
| | Give each student the <i>Measurement/Geometry Skills Test 1: Concepts and Symbols</i> . Read directions for each problem and have student select response. Record whether response is correct or incorrect. | Only provide praise for completing assessment (if student needs encouragement). Do not provide specific praise for correct answers while student is testing. | Once the student has completed the test, review missed problems with the student. |
| NOW <i>Stop the lesson here and repeat tomorrow if student is not yet getting at least 7 independent correct responses. Score responses 1-12 on the Measurement/Geometry Progress Monitoring Sheet if you did not do so while teaching.</i> | | NEXT <i>Remember the goal is for students to be able to perform the target Access Point for their grade level. Be sure to provide some practice for students at their specific grade level concept even if they have not achieved mastery of previous concepts. You can skip this Conceptual Foundation section to move on.</i> | |

4th BUILD A GRADE ALIGNED COMPONENT: Calculating perimeter and changes in perimeter

INTRODUCE THE ACTIVITY/PROBLEM: You will need to set up this section of the lesson so that the first scrapbook page used to find the perimeter is too small for the photo, and the second scrapbook paper fits. Present the scrapbook page from earlier. **Remember how we were talking about decorating a scrapbook page? One thing we are going to do is put ribbon all around the perimeter. Remember, the perimeter is the edge around a shape. We need to find out how much ribbon we need to decorate the perimeter of our paper.**

MODEL THE PROCESS: There is a formula we can use to find the perimeter. We need to add all the sides together. Show students the equation for perimeter or write it on the board. **The formula for perimeter equals length plus length plus width plus width. Watch me solve for the perimeter of my paper. The length is _____, so I'll write it in my equation in both places. The width is _____ so I'll write that in my equation in both places. Now I will use a calculator to calculate the perimeter. First I type in the length, (say number), then push the plus button, then I type in the length again, (say number), then push the plus button, then I type in the width, (say number), then push plus, then I type in the width again, (say number), then push the equals button. Look, the perimeter of my paper is _____.**



STUDENT PRACTICE: Look at your scrapbook paper, the length and width are already written on it. All you need to do is calculate the perimeter using a calculator. Give student blank perimeter equation to fill in. Use LEAST INTRUSIVE PROMPTS script as needed to help students with each step.

CHECK AND SCORE

| STEP | Teacher Says/Does | Student Response |
|------|--|--|
| 13. | Look at your perimeter equation. This says length (pointing to the length space in the equation). What is the length of your scrapbook paper? | Student writes/stamps/uses Velcro numbers/points to/eye gazes to the length. |
| 14. | We need to write length again here. Tell me one more time, what was the length? | Student writes/stamps/uses Velcro numbers/points to/eye gazes to the length. |
| 15. | Now we need to find the width. What is the width of your scrapbook paper? | Student writes/stamps/uses Velcro numbers/points to/eye gazes to the width. |
| 16. | We need to write width again here. Tell me one more time, what was the width? | Student writes/stamps/uses Velcro numbers/points to/eye gazes to the width. |
| 17. | Now enter the formula into your calculator to solve for perimeter. Wait for students to independently enter the length into the calculator or say “What’s next?” | Student enters the length into the calculator. |
| 18. | Wait for students to independently enter the plus button or say “What’s next?” | Student enters the plus sign into the calculator. |
| 19. | Wait for students to independently enter the length into the calculator or say “What’s next?” | Student enters the length into the calculator |

| | | |
|-----|---|--|
| 20. | Wait for students to independently enter the plus button or say “ What’s next? ” | Student enters the plus sign into the calculator. |
| 21. | Wait for students to independently enter the width or say “ What’s next? ” | Student enters the width into the calculator. |
| 22. | Wait for students to independently enter the plus button or say “ What’s next? ” | Student enters the plus sign into the calculator. |
| 23. | Wait for students to independently enter the width or say “ What’s next? ” | Student enters the width into the calculator. |
| 24. | Wait for students to independently enter the equals button or say “ What’s next? ” | Student enters the equals button into the calculator. |
| 25. | What is the perimeter of the paper? | Student says or writes the area of the paper onto the worksheet. |

INTRODUCE THE PROBLEM: So, you need ____ inches of ribbon to decorate the perimeter of your scrapbook page. Let me hand out the ribbon. Give each student the amount of ribbon they have calculated. **Let’s double check our pictures to make sure this works.** Hold the picture up and show that that scrapbook paper is too small. **Oh no! The picture won’t fit! Let’s get a new, bigger piece of scrapbook paper to use.**



STUDENT PRACTICE: Hand out blank perimeter equation and new paper that is also labeled with length and width. **But now, we don’t have enough ribbon to cover the perimeter of our new scrapbook paper. We need more ribbon, but I wonder how much more? We need to calculate the perimeter of our new scrapbook paper.** Use LEAST INTRUSIVE PROMPTS script as needed to help students with each step.

CHECK AND SCORE

| STEP | Teacher Says/Does | Student Response |
|------|--|--|
| 26. | Look at your perimeter equation. This says length (pointing to the length space in the equation). What is the length of your scrapbook paper? | Student writes/stamps/uses Velcro numbers/points to/eye gazes to the length. |
| 27. | We need to write length again here. Tell me one more time, what was the length? | Student writes/stamps/uses Velcro numbers/points to/eye gazes to the length. |
| 28. | Now we need to find the width. What is the width of your scrapbook paper? | Student writes/stamps/uses Velcro numbers/points to/eye gazes to the width. |
| 29. | We need to write width again here. Tell me one more time, what was the width? | Student writes/stamps/uses Velcro numbers/points to/eye gazes to the width. |
| 30. | Now enter the formula into your calculator to solve for perimeter. Wait for students to independently enter the length into the calculator or say “ What’s next? ” | Student enters the length into the calculator. |
| 31. | Wait for students to independently enter the plus button or say “ What’s next? ” | Student enters the plus sign into the calculator. |

| | | |
|-----|--|--|
| 32. | Wait for students to independently enter the length into the calculator or say “ What’s next? ” | Student enters the length into the calculator |
| 33. | Wait for students to independently enter the plus button or say “ What’s next? ” | Student enters the plus sign into the calculator. |
| 34. | Wait for students to independently enter the width or say “ What’s next? ” | Student enters the width into the calculator. |
| 35. | Wait for students to independently enter the plus button or say “ What’s next? ” | Student enters the plus sign into the calculator. |
| 36. | Wait for students to independently enter the width or say “ What’s next? ” | Student enters the width into the calculator. |
| 37. | Wait for students to independently enter the equals button or say “ What’s next? ” | Student enters the equals button into the calculator. |
| 38. | What is the perimeter of the paper? | Student says or writes the area of the paper onto the worksheet. |

INTRODUCE THE PROBLEM: Now we have one last step. We know that the perimeter of the bigger scrapbook paper is _____. Write number on blank “difference” equation. And the perimeter of the smaller scrapbook paper is _____. Write number on blank “difference” equation. Now we have to find the difference. We need to subtract the smaller number from the bigger number and that will tell us how many more inches of ribbon we need!



STUDENT PRACTICE: Now enter the formula into your calculator to solve for the change in perimeter. Use LEAST INTRUSIVE PROMPTS script as needed to help students with each step.
CHECK AND SCORE

| Step | Teacher Says/Does | Student Response |
|------|---|---|
| 39. | Wait for students to independently enter the bigger perimeter into the calculator or say “ What’s next? ” | Student enters the bigger perimeter into the calculator. |
| 40. | Wait for students to independently enter the minus button or say “ What’s next? ” | Student enters the minus sign into the calculator. |
| 41. | Wait for students to independently enter the smaller perimeter into the calculator or say “ What’s next? ” | Student enters the smaller perimeter into the calculator. |
| 42. | Wait for students to independently enter the equals button or say “ What’s next? ” | Student enters the equals button into the calculator. |
| 43. | What is the change in the perimeter of the paper? | Student says or writes the change in the perimeter of the paper onto the worksheet. |

Great job, here is _____ more inches of ribbon to use to decorate the perimeter of your scrapbook paper. Give the student the correct amount of ribbon.



This may be a good stopping point. Let students use the photos to decorate a scrapbook page. There is a worksheet with this level. You can use this for additional guided practice or to send home as homework.

| | Teacher Says/Does | Student Response | Error Correction |
|---|--|--|---|
| INDEPENDENT PRACTICE: Measurement/Geometry Skill Test | Give each student the <i>Measurement/Geometry Skills Test 2: Calculate Changes In Perimeter</i> . Read directions for each problem and have student select response. Record whether response is correct or incorrect. | Only provide praise for completing assessment (if student needs encouragement). Do not provide specific praise for correct answers while student is testing. | Once the student has completed the test, review missed problems with the student. |
| NOW <i>Stop the lesson here and repeat tomorrow if student is not yet getting at least 18 independent correct responses. Score responses 13-43 on the Measurement/Geometry Progress Monitoring Sheet if you did not do so while teaching.</i> | | NEXT <i>Remember the goal is for students to be able to perform the target CCC for their grade level. Be sure to provide some practice for students at their specific grade level concept even if they have not achieved mastery of previous concepts. You can skip this Conceptual Foundation section to move on.</i> | |

5th BUILD A GRADE ALIGNED COMPONENT: Conversion of units of measurement and area

INTRODUCE ACTIVITY/PROBLEM: We are going to decorate the back side of our scrapbook paper with wrapping paper, so that it looks nice on both sides. I have some wrapping paper from the store. We need to calculate the area of our wrapping paper to make sure it will work for our scrapbook. The wrapping paper package tells me the length of the wrapping paper in feet, but it says the width in inches! We need these to be the same unit of measure before we can calculate our area. Are inches the same as feet? Wait for students to respond “no.”

MODEL THE PROCESS: Watch me do mine first, it says my wrapping paper is 2 feet by 18 inches. I will use a conversion chart to convert from feet to inches; then, calculate the area using our formula. Remember, the formula for area is area equals length times width. The first thing I will do is look for 2 feet on the conversion chart. I put my finger on 2 feet, now I slide it over to the other side of the chart. The chart tells me that 2 feet is equal to 24 inches. Now I can enter 24 inches as the length, 18 inches as the width, and calculate the area like before. Remember, area equals length times width.



STUDENT PRACTICE: Give each student a piece of scrapbook paper with either the length or width written in feet (the other should be written in inches), conversion chart, and blank area equation. Use LEAST INTRUSIVE PROMPTS script as needed to help students with each step.

CHECK AND SCORE

| Step | Teacher Says/Does | Student Response |
|------|---|--|
| 44. | Now, use the chart to convert the square feet to square inches for your wrapping paper. | Put their finger on/eye gazes to ____ feet. |
| 45. | Wait for student to initiate next step or say “keep going.” | Move your finger/gazes across the line to the inches column. |
| 46. | Wait for student to initiate next step or say “keep going.” | Read/write the number for inches. |
| 47. | Now enter the formula into your calculator to solve for area of your wrapping paper. Wait for students to independently enter the length into the calculator or say “What’s next?” | Student enters the length into the calculator. |
| 48. | Wait for students to independently enter the times button or say “What’s next?” | Student enters the multiplication sign into the calculator. |
| 49. | Wait for students to independently enter the width or say “What’s next?” | Student enters the width into the calculator. |
| 50. | Wait for students to independently enter the equals button or say “What’s next?” | Student enters the equals button into the calculator. |
| 51. | What is the area of the photo? | Student says or writes the area of the photo onto the worksheet. |



This is the end of the lesson. Let students complete a scrapbook page. There is a worksheet with this level. You can use this for additional guided practice or to send home as homework.

| | Teacher Says/Does | Student Response | Error Correction |
|--|--|--|---|
| INDEPENDENT PRACTICE: Measurement/Geometry Skill Test | Give student the <i>Measurement/ Geometry Skills Test: Conversion of Units of Measurement and Area</i> . Read directions for each problem and have student select response. Record whether response is correct or incorrect. | Only provide praise for completing assessment (if student needs encouragement). Do not provide specific praise for correct answers while student is testing. | Once the student has completed the test, review missed problems with the student. |

Troubleshooting and Data-Based Decision Making for Measurement/Geometry Skills Test:

If student is unable to complete any items on the measurement/geometry test independently and correctly, go back and teach one problem step-by-step.

MASSI CULMINATING ACTIVITY: Have a scrapbooking day. Let students bring in pictures from home and create their own scrapbook pages. Practice having them request how much ribbon they need for the perimeter or how big the area of their pictures are.

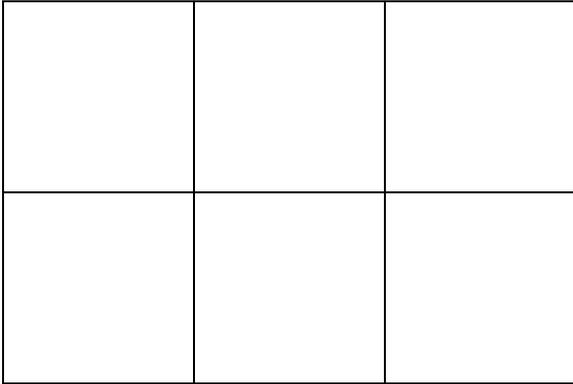
BUILDING TOWARDS FULL GRADE LEVEL COMPETENCE

Here are ideas to build towards the full grade level competence using this same activity. See the unit plan and talk with the general education teacher for more ideas.

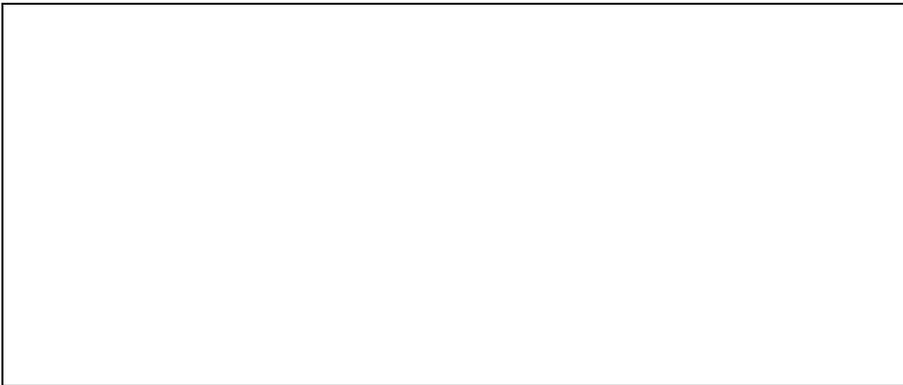
| Component | Sample Activity | What Student Does | Generalization/ Fluency |
|--|---|--|---|
| Conversion of feet to inches by multiplying or inches to feet by dividing, without using a conversion chart. | "One foot equals 12 inches. Let's use our calculator to find out how many inches are in 3 feet." | $3 \times 12 =$ | Vary the number of feet and inches you ask students to convert. Some students may be able to incorporate decimals. |
| Partitioning rectangles into equal parts with equal area. | "We need to divide this piece of scrapbook paper into two pieces. How would I divide it so that each part has the same area?" | Student draws a line or cuts the paper into equal parts. | Ask students to divide the paper into three, four, and five parts. |
| Classifying two-dimensional shapes by attributes. | "What do these shapes have in common? Can you find all the shapes with four sides?" | Students sort shapes into piles by number of sides, students identify shapes that have the same number of sides. | Use shapes with three, four, five, six, and eight sides. |
| Calculate area and perimeter without broken down task analysis. Student should be able to use formulas. Also, only provide two measurements for perimeter (length and width) so student must recognize that opposite sides are congruent and sides without written measurements must be included in the calculation. | Give students the length and width measurements for a rectangle and say, "calculate the perimeter and area." | Students use a calculator or complete the math on paper to calculate area and perimeter. | Teach how to calculate area and perimeter of shapes other than rectangles (circles, triangles, etc.). See the Curriculum Resource Guide for more information. |

Worksheet 1: Generalization (Concepts and Symbols)

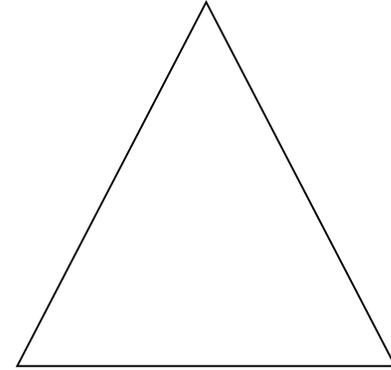
Use the tiling squares to find the area of this rectangle.



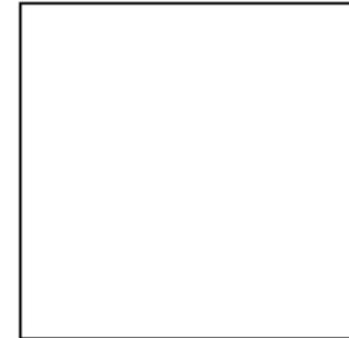
Use the tiling squares to find the area of this rectangle.



Use a marker to draw a line on the perimeter of this shape. If student is unable to use a marker, they can put stickers on the perimeter or use their finger to trace it.

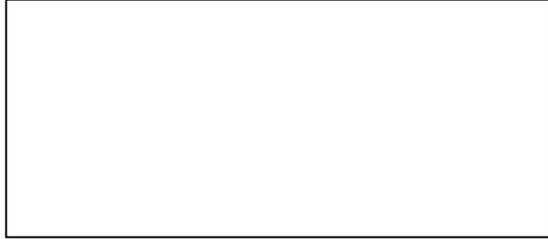


Use a marker to color the area of the shape. If student is unable to use a marker, they can put stickers in the area or use their finger to trace it.

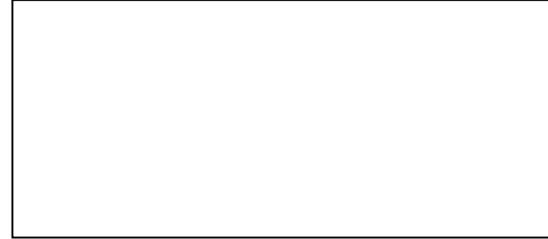


Worksheet 1: Generalization (cont.)

The length is the longest side of a rectangle. Use your marker to draw a line along the length. If student is unable to use a marker, they can put stickers along or use their finger to trace it.

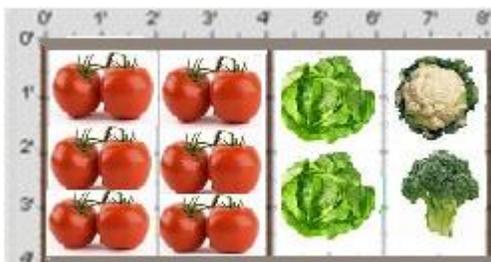


The width is the shortest side of a rectangle. Use your marker to draw a line along the width. If student is unable to use a marker, they can put stickers along or use their finger to trace it.



Worksheet 2: Generalization

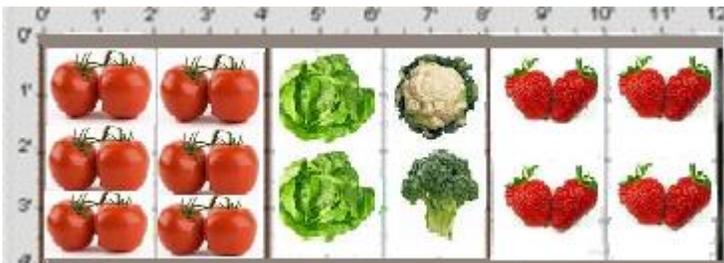
Jerry has a garden where he plants tomatoes, lettuce, cauliflower, and broccoli. His garden is 8 feet by 4 feet. How many feet of fencing does he need to buy to put up a fence that goes all the way around his garden?



$$\underline{\hspace{2cm}} + \underline{\hspace{2cm}} + \underline{\hspace{2cm}} + \underline{\hspace{2cm}} =$$

Length Length Width Width Perimeter

Next year, Jerry wants to add a new section to his garden to grow strawberries. Now his garden is 12 feet by 4 feet. He needs to know the change in perimeter to find out how much more fencing he needs to buy. First calculate the perimeter of the new, bigger garden. Then calculate the change in perimeter.



$$\underline{\hspace{2cm}} + \underline{\hspace{2cm}} + \underline{\hspace{2cm}} + \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

Length Length Width Width Perimeter

Calculating a change in perimeter:

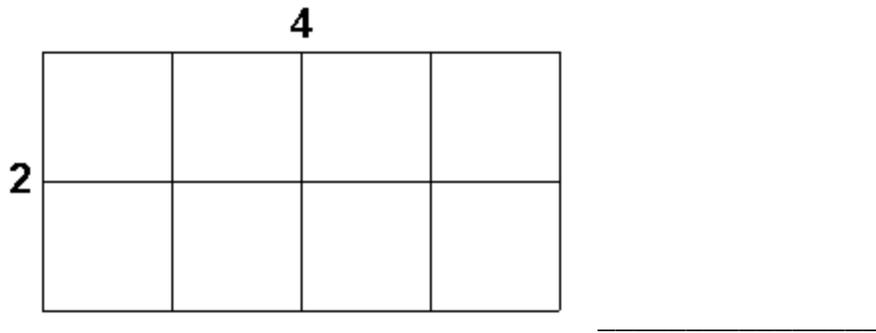
$$\underline{\hspace{2cm}} - \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

Bigger Perimeter Smaller Perimeter Difference

Worksheet 3: Generalization (Conversion of units of measurement and area)

What is the area of this rectangle? (Student can either count the tiles or use a calculator)

$$\text{area} = \text{length} \times \text{width}$$



Conversion Chart:

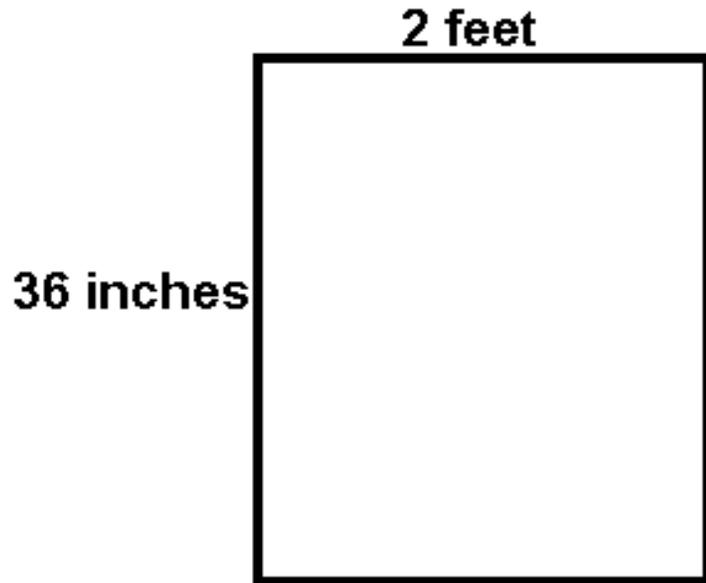
| Feet | Inches |
|------|--------|
| 1 | 12 |
| 2 | 24 |
| 3 | 36 |

Use the conversion chart to answer the remaining questions.

How many inches is my 2 foot poster?

How many feet is my 12 inch necklace?

Betty needs to cut a big piece of paper to make a poster for her science fair project. Her assignment says to use a piece of paper that is 2 feet by 36 inches. She needs to know the area so she can buy enough paint to paint the poster, but first she needs to convert feet to inches so that they are the same unit of measurement. Convert the measurement and calculate the area of the poster.



Length = _____

Width = _____

$$\text{Area} = \text{Length} \times \text{Width}$$

$$\text{Area} = \underline{\hspace{2cm}}$$

Materials:

area = length x width

$$\begin{array}{c} \underline{\hspace{2cm}} \quad \times \quad \underline{\hspace{2cm}} \quad = \quad \underline{\hspace{2cm}} \\ \text{Length} \qquad \qquad \text{Width} \qquad \qquad \qquad \qquad \text{Area} \end{array}$$

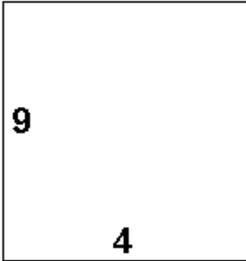
perimeter = length + length + width + width

$$\begin{array}{c} \underline{\hspace{1.5cm}} \quad + \quad \underline{\hspace{1.5cm}} \quad + \quad \underline{\hspace{1.5cm}} \quad + \quad \underline{\hspace{1.5cm}} \quad = \quad \underline{\hspace{2cm}} \\ \text{Length} \qquad \qquad \text{Length} \qquad \qquad \text{Width} \qquad \qquad \text{Width} \qquad \qquad \qquad \text{Perimeter} \end{array}$$

“Difference” equation :

$$\begin{array}{c} \underline{\hspace{2cm}} \quad - \quad \underline{\hspace{2cm}} \quad = \quad \underline{\hspace{2cm}} \\ \text{Bigger Perimeter} \qquad \qquad \text{Smaller Perimeter} \qquad \qquad \text{Difference} \end{array}$$

Example of scrapbook paper labeled with length and width:



Converting Feet to Inches

| Feet | Inches |
|------|--------|
| 1 | 12 |
| 2 | 24 |
| 3 | 36 |



National Center and State Collaborative

NCSC Math Activities with Scripted Systematic Instruction (MASSI): Elementary Measurement and Geometry Progress Monitoring and Skills Test

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January 2013

MASSI: Elementary Measurement/Geometry

Options for Progress Monitoring/Formative Assessment

1. Elem Measurement/Geometry Progress Monitoring (pg. 7-11): record student responses made during instruction on data sheet provided; teacher records each step during the lesson.
2. Elem Measurement/Geometry Skills Test (pg. 12-25) - a brief on demand performance assessment; could be given weekly to see if student has mastered this lesson; also helps student practice responding in a test format.
 - a. NOTE: The Skills Test can be used as a baseline assessment to check for any skills the student may already have prior to beginning the MASSI.
 - b. NOTE: The Skills Test can also be re-administered to check for maintenance throughout the year.

Elementary Measurement/Geometry Progress Monitoring

Directions: Score each step during instruction or as soon as the lesson is complete. Score the step as unprompted correct with a “+.” Use a system to code level of prompting required for incorrect responses (e.g., V = verbal prompt, G = gesture, P = physical). Graph the number of unprompted correct responses to monitor progress.

BUILD ESSENTIAL UNDERSTANDING: CONCEPT AND SYMBOLS: Perimeter, Area, Length, and Width

3rd GRADE BUILD A GRADE ALIGNED COMPONENT: Tiling to find area

4th and 5th GRADE BUILD ESSENTIAL UNDERSTANDING: CONCEPT: Tiling to find area

| <i>Materials and Directions for Teacher</i> | <i>Instructional Cue</i> | <i>Student Expected Response</i> <i>Date:</i> | | | | | | |
|--|---|---|--|--|--|--|--|--|
| 1. Student has a photo. | Show me the perimeter of your photograph. | Student uses finger to trace the outside edges of the photo. | | | | | | |
| 2. Student has a photo. | Show me the area of your photograph. | Student uses hand to indicate the area of the photo. | | | | | | |
| 3. Student has a photo. | Show me the length of your photograph. | Student uses finger to point to the length of their photo. | | | | | | |
| 4. Student has a photo. | Show me the width of your photograph. | Student uses finger to point to the width of their photo. | | | | | | |
| 5. Other objects/pictures (e.g., construction paper, index cards, desk/table tops, posters, computer screens, etc.). | Show me the perimeter of the _____. | Student uses finger to trace the outside edges of the item. | | | | | | |
| 6. Other objects/pictures (e.g., construction paper, index cards, desk/table tops, posters, computer screens, etc.). | Show me the area of the _____. | Student uses hand to indicate the area of the item. | | | | | | |
| 7. Other objects/pictures (e.g., construction paper, index cards, desk/table tops, posters, computer screens, etc.). | Show me the length of the _____. | Student uses finger to point to the length of their item. | | | | | | |
| 8. Other objects/pictures (e.g., construction paper, index cards, desk/table tops, posters, computer screens, etc.). | Show me the width of the _____. | Student uses finger to point to the width of their item. | | | | | | |
| 9. Each student should have a photo and more than enough tiling squares to cover the picture (don't give the exact amount, give more than needed so that students have to stop at the appropriate number). | Put your tiles on your photo and count to find the area. | Student places and counts the number of tiles on the photo (stopping when the photo is covered in tiles). | | | | | | |

Student Name: _____

| | | | | | | | | |
|--|--|---|--|--|--|--|--|--|
| 10. Give each student a second picture. | Now let's try it with another photo to add to our scrapbook. Use the tiling squares to find the area of this photo. | Student places and counts the number of tiles on the photo (stopping when the photo is covered in files). | | | | | | |
| 11. Student has area equation and scrapbook paper labeled with length and width. | This says length (pointing to the length space in the equation), What is the length of your scrapbook paper? | Student writes/stamps/uses Velcro numbers/points to/eye gazes to the length. | | | | | | |
| 12. Student has area equation and scrapbook paper labeled with length and width. | This says width (pointing to the length space in the equation), What is the width of your scrapbook paper? | Student writes/stamps/uses Velcro numbers/points to/eye gazes to the width. | | | | | | |
| | | NUMBER CORRECT: | | | | | | |
| 4th BUILD A GRADE ALIGNED COMPONENT: Calculating perimeter and changes in perimeter | | | | | | | | |
| 13. Calculator, blank perimeter equation, and scrapbook paper (too small) with length and width labeled. | Look at your worksheet. This says length (pointing to the length space in the equation), What is the length of your scrapbook paper? | Student writes/stamps/uses Velcro numbers/points to/eye gazes to the length. | | | | | | |
| 14. See above. | We need to write length again here. Tell me one more time, what was the length? | Student writes/stamps/uses Velcro numbers/points to/eye gazes to the length. | | | | | | |
| 15. See above. | Now we need to find the width. What is the width of your scrapbook paper? | Student writes/stamps/uses Velcro numbers/points to/eye gazes to the width. | | | | | | |
| 16. See above. | We need to write width again here. Tell me one more time, what was the width? | Student writes/stamps/uses Velcro numbers/points to/eye gazes to the width. | | | | | | |
| 17. See above. | Now enter the formula into your calculator to solve for perimeter. Wait for students to independently enter the length into the calculator or say "What's next?" | Student enters the length into the calculator. | | | | | | |
| 18. See above. | Wait for students to independently enter the plus button or say "What's next?" | Student enters the plus sign into the calculator. | | | | | | |
| 19. See above. | Wait for students to independently enter the length into the calculator or say "What's next?" | Student enters the length into the calculator. | | | | | | |
| 20. See above. | Wait for students to independently enter the plus button or say "What's next?" | Student enters the plus sign into the calculator. | | | | | | |
| 21. See above. | Wait for students to independently enter the width or say "What's next?" | Student enters the width into the calculator. | | | | | | |

Student Name: _____

| | | | | | | | | | |
|---|--|--|--|--|--|--|--|--|--|
| 22. See above. | Wait for students to independently enter the plus button or say “What’s next?” | Student enters the plus sign into the calculator. | | | | | | | |
| 23. See above. | Wait for students to independently enter the width or say “What’s next?” | Student enters the width into the calculator. | | | | | | | |
| 24. See above. | Wait for students to independently enter the equals button or say “What’s next?” | Student enters the equals button into the calculator. | | | | | | | |
| 25. See above. | “What is the perimeter of the paper?” | Student says or writes the perimeter of the paper onto the worksheet. | | | | | | | |
| 26. Calculator, blank perimeter equation, and new paper that is also labeled with length and width. | Look at your worksheet. This says length (pointing to the length space in the equation), What is the length of your scrapbook paper? | Student writes/stamps/uses Velcro numbers/points to/eye gazes to the length. | | | | | | | |
| 27. See above. | We need to write length again here. Tell me one more time, what was the length? | Student writes/stamps/uses Velcro numbers/points to/eye gazes to the length. | | | | | | | |
| 28. See above. | Now we need to find the width. What is the width of your scrapbook paper? | Student writes/stamps/uses Velcro numbers/points to/eye gazes to the width. | | | | | | | |
| 29. See above. | We need to write width again here. Tell me one more time, what was the width? | Student writes/stamps/uses Velcro numbers/points to/eye gazes to the width. | | | | | | | |
| 30. See above. | Now enter the formula into your calculator to solve for perimeter. Wait for students to independently enter the length into the calculator or say “What’s next?” | Student enters the length into the calculator. | | | | | | | |
| 31. See above. | Wait for students to independently enter the plus button or say “What’s next?” | Student enters the plus sign into the calculator. | | | | | | | |
| 32. See above. | Wait for students to independently enter the length into the calculator or say “What’s next?” | Student enters the length into the calculator. | | | | | | | |
| 33. See above. | Wait for students to independently enter the plus button or say “What’s next?” | Student enters the plus sign into the calculator. | | | | | | | |
| 34. See above. | Wait for students to independently enter the width or say “What’s next?” | Student enters the width into the calculator. | | | | | | | |
| 35. See above. | Wait for students to independently enter the plus button or say “What’s next?” | Student enters the plus sign into the calculator. | | | | | | | |
| 36. See above. | Wait for students to independently enter the width or say “What’s next?” | Student enters the width into the calculator. | | | | | | | |

Student Name: _____

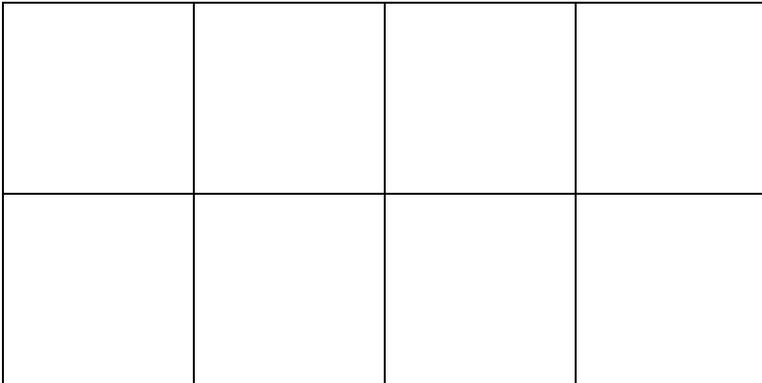
| | | | | | | | | | |
|--|--|---|-----------------|--|--|--|--|--|--|
| 37. See above. | Wait for students to independently enter the equals button or say “What’s next?” | Student enters the equals button into the calculator. | | | | | | | |
| 38. See above. | “What is the perimeter of the paper?” | Student says or writes the area of the paper onto the worksheet. | | | | | | | |
| 39. Calculator, perimeter difference equation with both perimeters written in. | Now enter the formula into your calculator to solve for the change in perimeter. Wait for students to independently enter the bigger perimeter into the calculator or say “What’s next?” | Student enters the bigger perimeter into the calculator. | | | | | | | |
| 40. See above. | Wait for students to independently enter the minus button or say “What’s next?” | Student enters the minus sign into the calculator. | | | | | | | |
| 41. See above. | Wait for students to independently enter the smaller perimeter into the calculator or say “What’s next?” | Student enters the smaller perimeter into the calculator. | | | | | | | |
| 42. See above. | Wait for students to independently enter the equals button or say “What’s next?” | Student enters the equals button into the calculator. | | | | | | | |
| 43. See above. | “What is the change in the perimeter of the paper?” | Student says or writes the change in the perimeter of the paper onto the worksheet. | | | | | | | |
| | | | NUMBER CORRECT: | | | | | | |

| 5th BUILD A GRADE ALIGNED COMPONENT: Conversion of units of measurement and area | | | | | | |
|--|--|--|--|--|--|--|
| 44. Conversion chart, worksheet 3, and wrapping paper with one measurement (either length or width) labeled in inches and the other in feet. | Use the chart to convert the square feet to square inches for your wrapping paper. | Put their finger on/eye gazes to ____ feet. | | | | |
| 45. See above. | Wait for student to initiate next step or say “keep going.” | Move your finger/gazes across the line to the inches column. | | | | |
| 46. See above. | Wait for student to initiate next step or say “keep going.” | Read/write the number for inches. | | | | |
| 47. Worksheet 3 and a calculator. | Now enter the formula into your calculator to solve for the area of your wrapping paper. Wait for students to independently enter the length into the calculator or say “What’s next?” | Student enters the length into the calculator. | | | | |
| 48. See above. | Wait for students to independently enter the times button or say “What’s next?” | Student enters the multiplication sign into the calculator. | | | | |
| 49. See above. | Wait for students to independently enter the width or say “What’s next?” | Student enters the width into the calculator. | | | | |
| 50. See above. | Wait for students to independently enter the equals button or say “What’s next?” | Student enters the equals button into the calculator. | | | | |
| 51. See above. | “What is the area of the photo?” | Student says or writes the area of the photo onto the worksheet. | | | | |
| | | NUMBER CORRECT: | | | | |

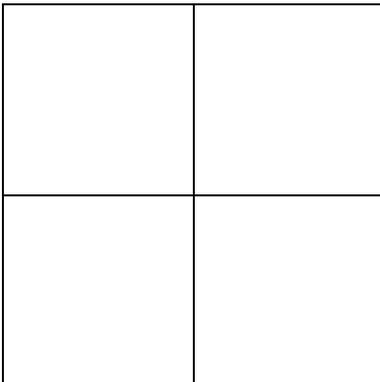
MEASUREMENT/GEOMETRY SKILL TEST 1: CONCEPT AND SYMBOLS

Note to teachers: It may be helpful to use a cover sheet of paper. Pull the cover sheet down far enough to show the model and read the text. Then, pull the sheet of paper down to show the problem and read the directions. Record “+” for an independent correct response or “-“ for incorrect response beside number in blank.

___ **MODEL: Watch me as I tile this rectangle and count how many tiles I used to find the area.**

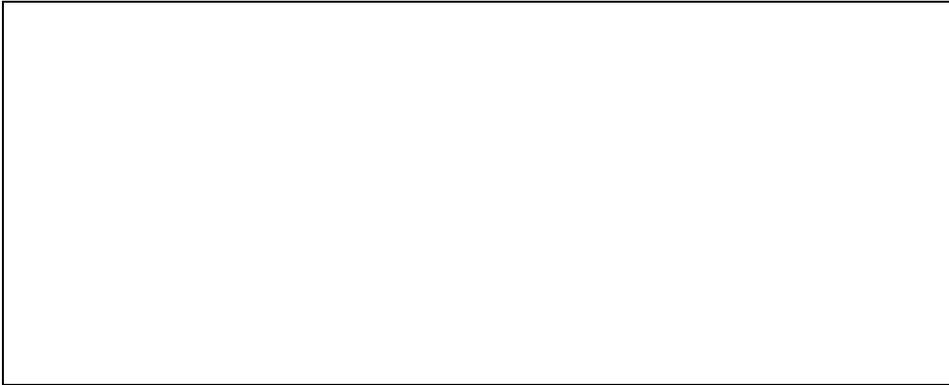


STUDENT PROBLEM: Use the tiling squares to find the area of this rectangle.

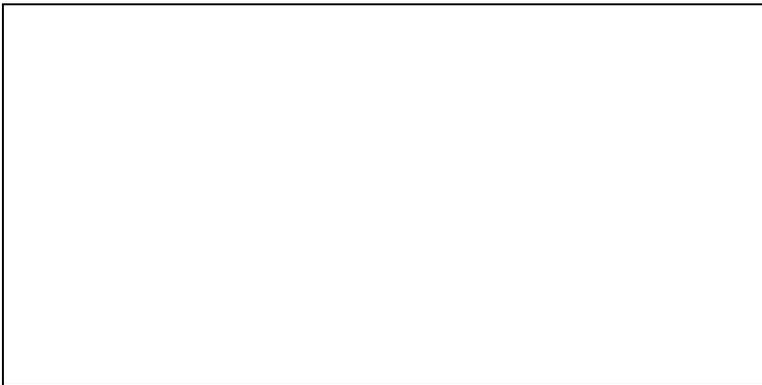


Student Name: _____

___ Watch me as I tile this rectangle and count how many tiles I used to find the area.



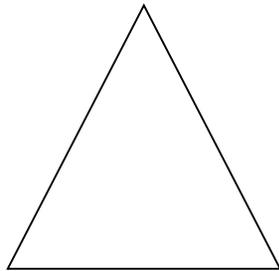
STUDENT PROBLEM: Use the tiling squares to find the area of this rectangle.



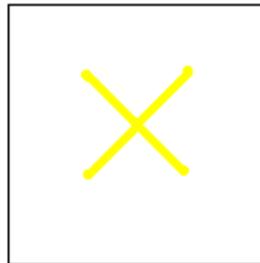
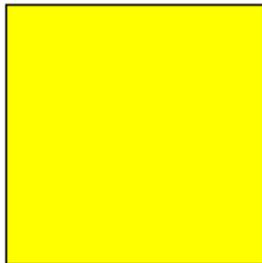
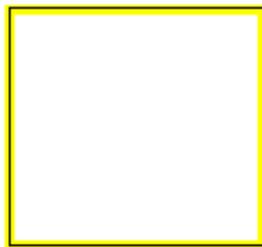
Student Name: _____

****Note:** The following sections use lines and areas highlighted in yellow... If these do not show up sufficiently on your printed version, use a highlighter marker to make them more visible.

___ **Watch me as I use my marker to draw a line on the perimeter of this shape.**

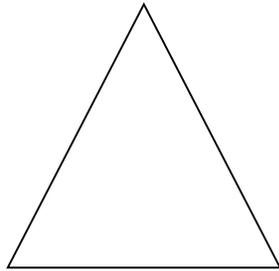


STUDENT PROBLEM: Which picture has the perimeter highlighted in yellow?

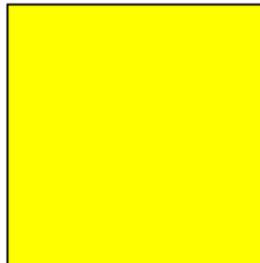
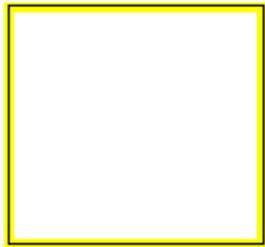


Student Name: _____

___ Watch me as I use my marker to color in the area.

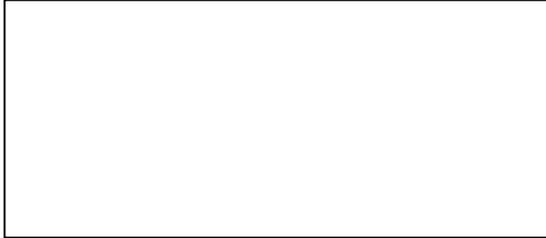


STUDENT PROBLEM: Which picture has the area colored in yellow?

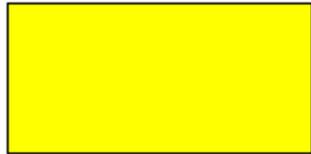


Student Name: _____

___ The length is the longest side of a rectangle. I will use my marker to draw a line along the length.

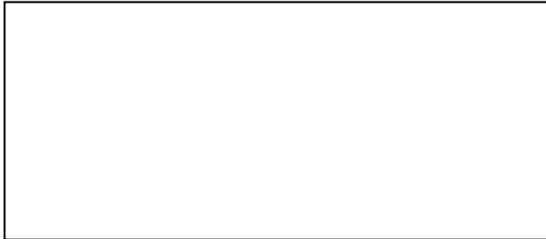


STUDENT PROBLEM: Which picture has the length in yellow?



Student Name: _____

___ The width is the shortest side of a rectangle. I will use my marker to draw a line along the width.

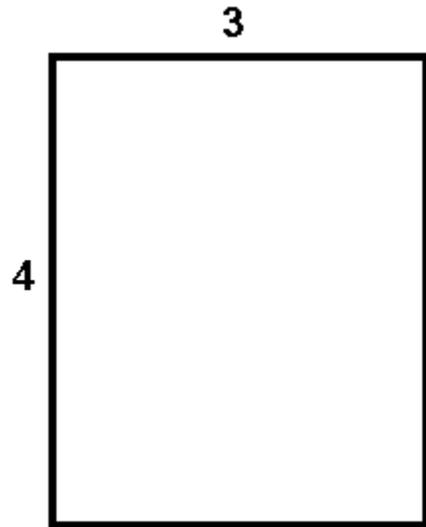


STUDENT PROBLEM: Which picture has the width in yellow?



MEASUREMENT/GEOMETRY SKILLS TEST 2: Calculate Changes in a Perimeter

What is the perimeter of this shape?



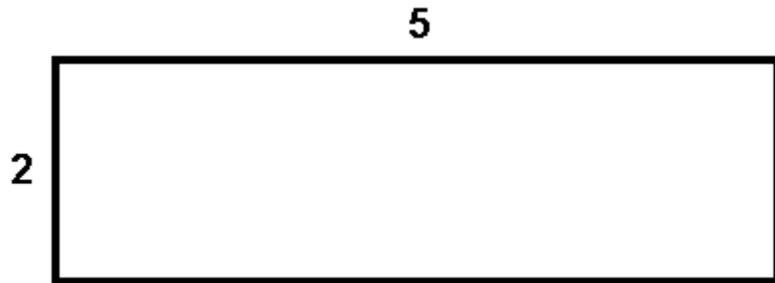
Perimeter = length + length + width + width

Perimeter = _____ + _____ + _____ + _____
length length width width

Perimeter = _____

Student Name: _____

What is the perimeter of this shape?

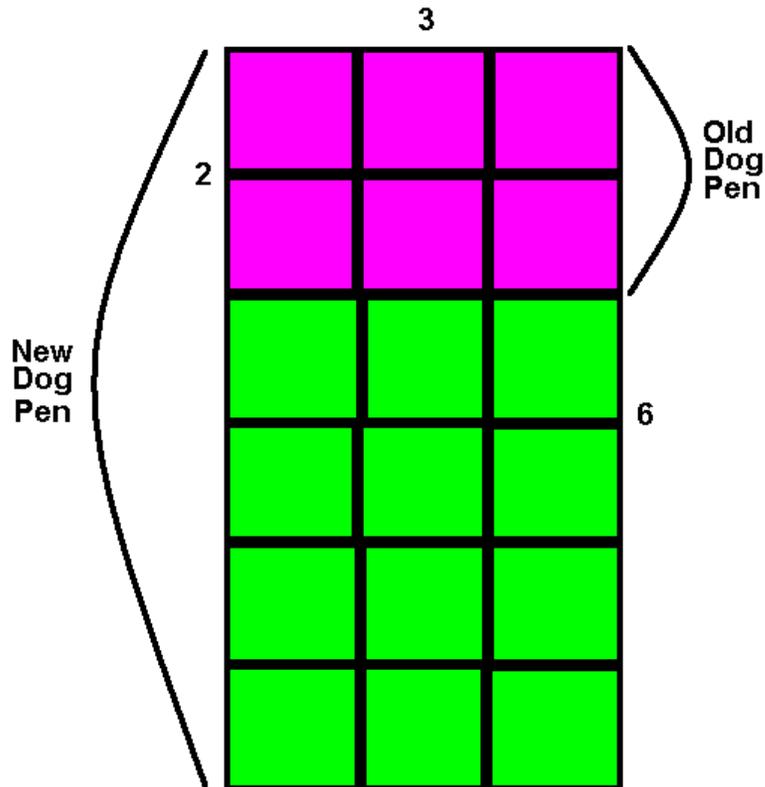


Perimeter = length + length + width + width

Perimeter = _____

Student Name: _____

Bobby has a dog named Fido. Fido has a dog pen that is 2 feet by 3 feet. But, as Fido grew bigger he got too big for the old pen, so Bobby made the pen bigger. The new dog pen is 3 feet by 6 feet. What is the change in the perimeter?



Perimeter = length + length + width + width

Perimeter Old Dog Pen = _____

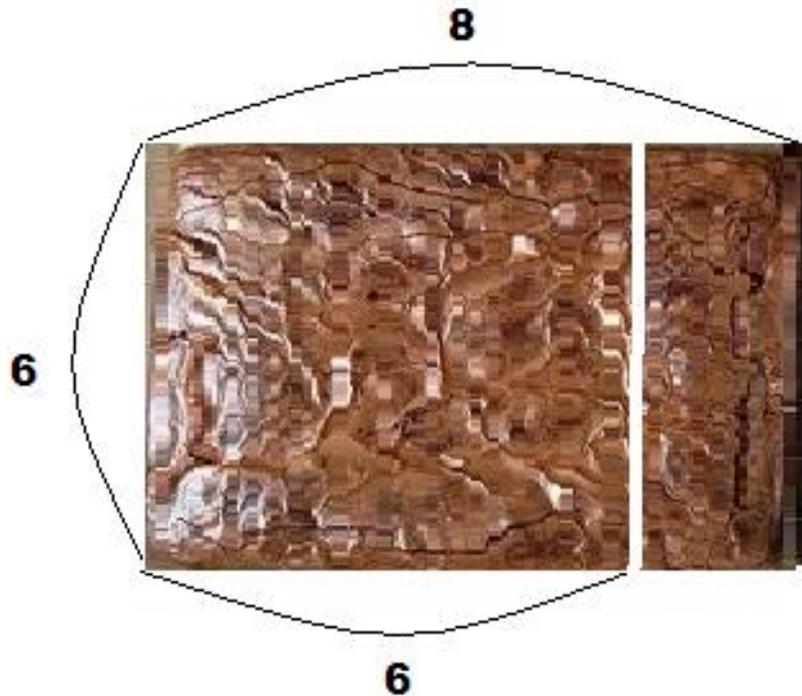
Perimeter New Dog Pen = _____

Change in perimeter = Bigger Perimeter – Smaller Perimeter

Change in Perimeter = _____

Student Name: _____

Jose made some brownies as a birthday gift for his sister. He made the brownies in a 6 inch by 8 inch pan. But then he realized that the gift box for the brownies was 6 inches by 6 inches, so he had to cut the brownies to make them fit. What is the change in the perimeter?



Perimeter = length + length + width + width

Perimeter Original Brownies = _____

Perimeter Cut Brownies = _____

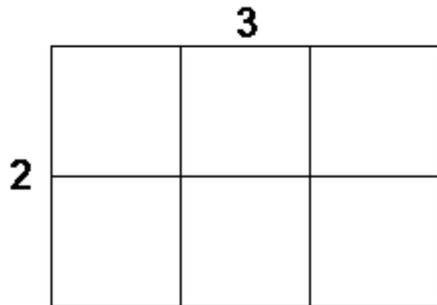
Change in perimeter = Bigger Perimeter – Smaller Perimeter

Change in Perimeter = _____

MEASUREMENT/GEOMETRY SKILLS TEST 3: Conversion of units of measurement and area

___ **What is the area of this rectangle?** (Students can either count the tiles or use a calculator)

area = length x width



Student Name: _____

___ My new poster is 3 feet long, but I want to know how many inches that is. Use the chart below to find how many inches my poster is.

| Feet | Inches |
|------|--------|
| 1 | 12 |
| 2 | 24 |
| 3 | 36 |

How many inches is my 3 foot poster? _____

Student Name: _____

___ My new necklace is 24 inches long, but I need to know how many feet that is. Use the chart below to find how many feet my poster is.

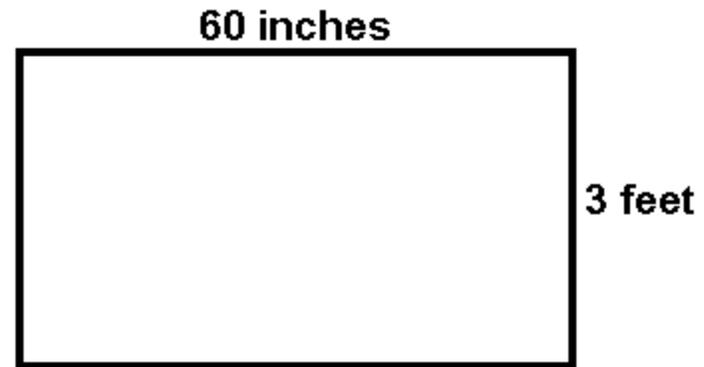
| Feet | Inches |
|------|--------|
| 1 | 12 |
| 2 | 24 |
| 3 | 36 |

How many feet is my 24 inch poster? _____

Student Name: _____

___ I want to buy a new table cloth for my table, but I need to know the area of the table cloth to make sure it is big enough. The table cloth package says that is it 60 inches by 3 feet. Convert feet to inches and solve for the area of the table cloth.

| Feet | Inches |
|------|--------|
| 1 | 12 |
| 2 | 24 |
| 3 | 36 |



Length = _____

Width = _____

Area = length x width

Area = _____