Pentominos
Class: 6th Grade Intervention

- **Objectives:**
  - Students will construct the 12 pentomino figures then utilize them to explore area and perimeter concepts.
  - Students will calculate the perimeter and area of composite shapes.
• **Standards:**

  Use geometric concepts and principles in problem-solving situations and communicate the reasoning used in solving these problems.

• **Vocabulary:** 2-dimensional, plane, composite shapes, congruency, edge, adjacent, mirror image, translation, rotation, reflection, sequence, dimensions
Opening Activity

• Using the 5 post-it notes, see how many 5-unit shapes you can create.

• Must use all 5 post-it notes

• Full sides must touch.

• Beware of reflected or rotated images

• Collect your data by recording your shapes on graph paper – keep track of how many you can construct

• Other resources that could be used: centimeter cubes, congruent pieces of paper
Math Talk

• As an individual, how many 5-squared composite shapes could you make?
• How many did you tables mates make?
• As a table, what was the total number made?

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• You have been given a set of pentominos.
• Match the ones you created to the 12 that exist.
• Identify any missing shapes you have
Math Talk

• As a table, what do you find interesting about these shapes?
  – Prompts: What is similar? What is different?
  – Emphasize vocabulary use: congruency, adjacent, edges,
  – Make a list of similarities and differences

• Is there anything you would like to explore?
Investigation #1

• As a table, come up with a strategy that will prove that all 12 pentominoes have the same area.
Investigation #2

• Do shapes with the same area have the same perimeter?

• Make a prediction

• Come up with a way to record data.

• Write a conclusion
Investigation #3

• Many mathematicians refer to pentominos by the letters they look like.

• Can you come up with a reason why the “P” pentomino has less perimeter than the other 11?
In your journal, write a clear conclusion about your investigation – Do shapes with the same area always have the same perimeter?
Check for Understanding

• T or F Shapes that have the same area can have the same perimeter

• T or F Shapes that have the same area can have different perimeter
Investigation #4

• Pick your favorite pentomino.

• If the edge has a length of 2.5 inches, what is the perimeter of your shape?

• If your shape has a perimeter of 15 cm, what is the length of each edge?
Investigation #5

• Pick your 2nd favorite pentomino.
• Create a sequence by moving only one unit square to create another pentomino.
• See if you can create a sequence using all 12 shapes.
• Do you think it does or doesn’t matter on where you start the sequence?
Investigation #6

• Can you make a square?

• How many squares can you make?

• What are the dimensions?

• Record all data.
Investigation #7

• Can you make a rectangle?

• How many different rectangles can you make?

• What are the dimensions?

• Record all data and calculate the area.
Investigation #8

• If you made a rectangle using all of the pentominoes, what would the area be?

• Explain your reasoning.

• What could the dimensions be?
Investigation #9

• Can you make a rectangle using all 12 pieces?

• How many different rectangles can you make?

• Record the dimensions and calculate the area.
• Do you think as a class, did we find all of the solutions?
There are only 4 different rectangles that can be made when using all 12 pieces.

- 6 x 10 - which has 2,339 solutions
- 3 x 20 – which has only 2 solutions
- 4 x 15 – which has 368 solutions
- 5 x 12 – which has 1,010 solutions

FOR A TOTAL OF 2,339 solutions
• Using 2 or more pentomomios, create a complex shape that can be broken down into 3 shapes. (ex. 2 rectangles and a square)

• Draw this shape on graph paper. Color in the 3 shapes. Label the dimensions. Calculate the area
Extensions

• Can you make a ring of pentominos?

• Can you make a box?

• Can you magnify a pentomino shape?