

Pentominoes

What Happens

Students will construct the 12* different shaped pentominoes in groups of two and record their results on centimeter graph paper. The students' work focuses on:

- Spatial problem solving
- Shape recognition
- Geometric relationships
- Puzzle-solving
- Cooperative Learning
- Geometric constructions

Grouping

Intro can be given to the whole class (25 – 30 students). It can be taught in a 30 – 40 minute time slot. Students will work in pairs for collecting their data. The full group will meet again to discuss results

Materials

- Fraction squares (bucket per table)
- Centimeter graph paper
- Pentomino sets (one per student) *optional*
- Pentomino puzzle cards *optional*
- Centimeter graph paper overheads *optional*
- Overhead/projector, whiteboard, or poster paper

Time:

Activity

Discovery

- Distribute fraction squares
- Tell students that today we will be working with squares to construct different shapes
- Take two squares. With full edges touching how many different shapes can you make? Show examples on the overhead of full edges touching. Rotations and flips of the same shape do not count as another shape.
- Have students come to the overhead to demo their results. (Answer: 1 shape). These are called dominoes



- With 3 squares? (Answer: 2 shapes. No rotations or flips). These are called triominoes.



- With 4 squares? (Answer: 5 shapes. No rotations or flips). These are called tetraminoes.



Task

- Tell students "Today we will be constructing Pentominoes."
- "Does anyone know what a Pentomino is?"
- Pentominoes are shapes that can be made from 5 squares, in any configuration with full edges touching. Pentominoes are the geometric shapes that are formed by joining 5 squares edge to edge.
- Have students make educated guesses on the possible number of pentominoes
- Explain to students: "Today we are going to construct our own set of Pentominoes using these fraction squares on your tables. With your partner I want you to make as many shapes as possible that follow these two rules":
 - You must use five squares
 - The squares must be joined edge to edge
- * Do not tell students there are 12 Pentominoes. Let them discover this themselves.
- Please record your results on cm graph paper
- Illustrate one pentomino on the overhead/projector and how to record it on graph paper
- Pair students (random pairing works best)

- Distribute centimeter graph paper

Allow children to work for an extended period of time generating pentominoes. Circulate the room making sure that students are working together, following the rules, recording their data. Judge the difficulty of the project and join pairs if necessary. Allow them to struggle with this for awhile before combining pairs.

Conclusion

- Review and compare student results
- Students record missing solutions
- Illustrate solutions on the overhead
- Label the pieces

Optional

- Distribute pentomino sets to each pair of students
- Have students match puzzle pieces with their solutions
- Students record missing solutions
- Illustrate solutions on the overhead
- Label the pieces

Extension

- Hexominoes
- Can you find a pattern among the number of solutions for each square you add to the problem?
 - 1 square – 1 solution
 - 2 squares – 1 solution
 - 3 squares – 2 solutions
 - 4 squares – 5 solutions
 - 5 squares – 12 solutions
 - 6 squares – 35 solutions