

Essential Strategies -  
Active Learning in the  
Secondary Classroom for Teachers  
9-12

Lawrenceville High School

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## Underlining Thoughts about Differentiated Instruction

Experienced teachers have always known:

The teacher must consider such differences as the students':

- Learning styles, skill levels, and rates
- Learning difficulties
- Language proficiency
- Background experiences and knowledge
- Interests
- Motivation
- Ability to attend
- Social and emotional development
- Various intelligences
- Levels of abstraction
- Physical needs

With Differentiated Instruction:

1. Effective classrooms should be places in which it is natural for students **to be active learners, decision makers, and problem solvers**
2. Classrooms should not be "one-size-fits-all" curriculum where students are treated as **passive recipients of information**.
3. "Covering information" takes a backseat to making meaning out of important ideas = each brain needs to **make its own meaning of ideas and skills**.
4. Learning environments must feel **emotionally safe for learning to take place (Maslow's Hierarchy of Needs)**.
5. For learning to take place, students must experience appropriate levels of challenge.

## Key Characteristic of a Differentiated Classroom:

- Student centered  
shifting the emphasis from the "teacher and instruction" to the "student and learning"
- New Focus  
redefines the role of the teacher  
teacher learns to ask more questions to encourage problem solving and thinking

## Scaffolding: Key Characteristics

The key characteristics for effective teaching include:

Provide clear directions

Clarify purpose for instruction by asking essential questions

Keep students on task

Provide clear expectations for quality

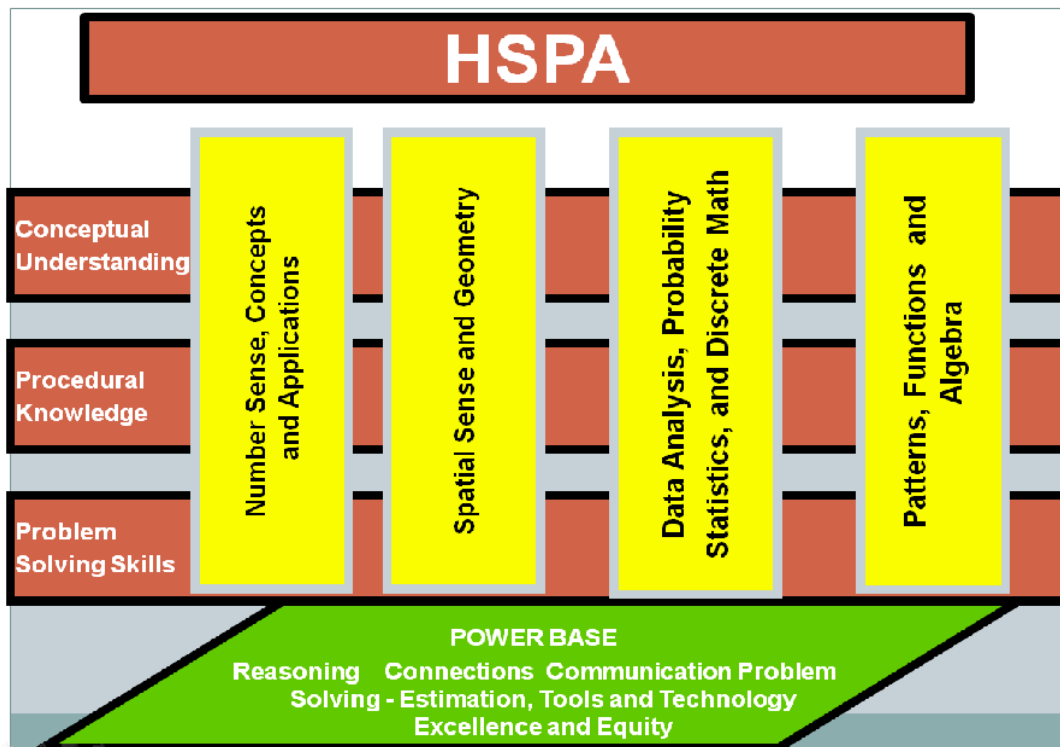
Point students to worthy sources for help and information

Reduce uncertainty, surprise and disappointment to maximize learning efficiency

Deliver efficiency by requiring *hard work, not wasted work*

## Curriculum should be differentiated in three areas:

- Content:  
Multiple options for taking in information.
- Process:  
Multiple options for making sense of the ideas.
- Product:  
Multiple options for expressing what they know.



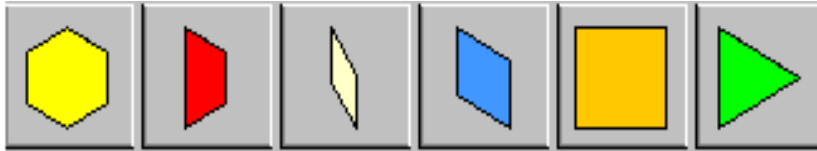
## Building the Pattern Blocks

Graph each of the sets of ordered pairs below.  
Use one rubberband to connect each set of points together.

Each shape should make a different shape.

- $(0,8), (1,10), (3,10), (4,8), (3,6), (1,6)$
- $(5,10), (9,10), (8,8), (6,8)$
- $(6,6), (5,8), (4,6), (5,4)$
- $(6,1), (7,3), (8,1)$
- $(1,2), (1,4), (3,4), (3,2)$
- $(9,2), (8,5), (9,8), (10,5)$

- There are 100 square units on the geoboard.
- Determine the area of each of the polygon shapes that was just plotted.
- Be able to explain how each area was determined.



- Two shapes are similar if their corresponding angles are equal in measure and their corresponding sides form a ratio.
- Based on these criterion, tell which of the shapes on the graph are similar to their corresponding commercial model and which of the shapes on the graph are not similar to the corresponding commercial model.
- Be able to use mathematical reasoning to tell how you determined your answer.



## Building Understanding for Writing and Evaluating Expressions

### Number Trick 1

- Using the graphing calculator and the home screen.
- Start with \_\_\_\_\_.
- Multiply 6 times a starting number
- Then add 15,
- Divide this result by 3,
- Then subtract your answer from 80.

### Number Trick 2

- Pick a number
- Multiply the starting number by 2
- Then add 6,
- Divide this result by 2,
- Then subtract your original number(8).

### Number Trick 3

- Pick a number, write it down, and enter that number.
- Add 9
- Multiply the result by 3.
- Subtract 6.
- Divide this result by 3.
- Subtract your original number.

You write the number trick for  $4\left(\frac{x+7}{4} + 5\right) - x + 13$ .

### Now You Try It

- Choose a secret number.
- Now choose four more nonzero number and in any order,
- add one of them,
- multiply by another,
- subtract another,
- and divide by the final number.
- Complete the Description column, the sequence of steps, and the expression for each step.
- Test your expression by picking a value for x. You can use the graphing calculator to find your answer.

## Solving Equations is Just Undoing Operations

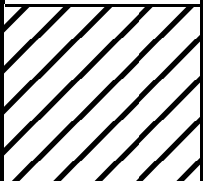
Number trick 4

- Pick a number
- Divide the number by 4
- Add 7
- Multiply the result by 2
- Subtract 8

Problem to Undo:  $\frac{3(2 - 4x)}{4} - 7 = 14$

Description	Expression

Just Undo It

Description	Sequence	Expression	Undo	Result
Pick a Number				



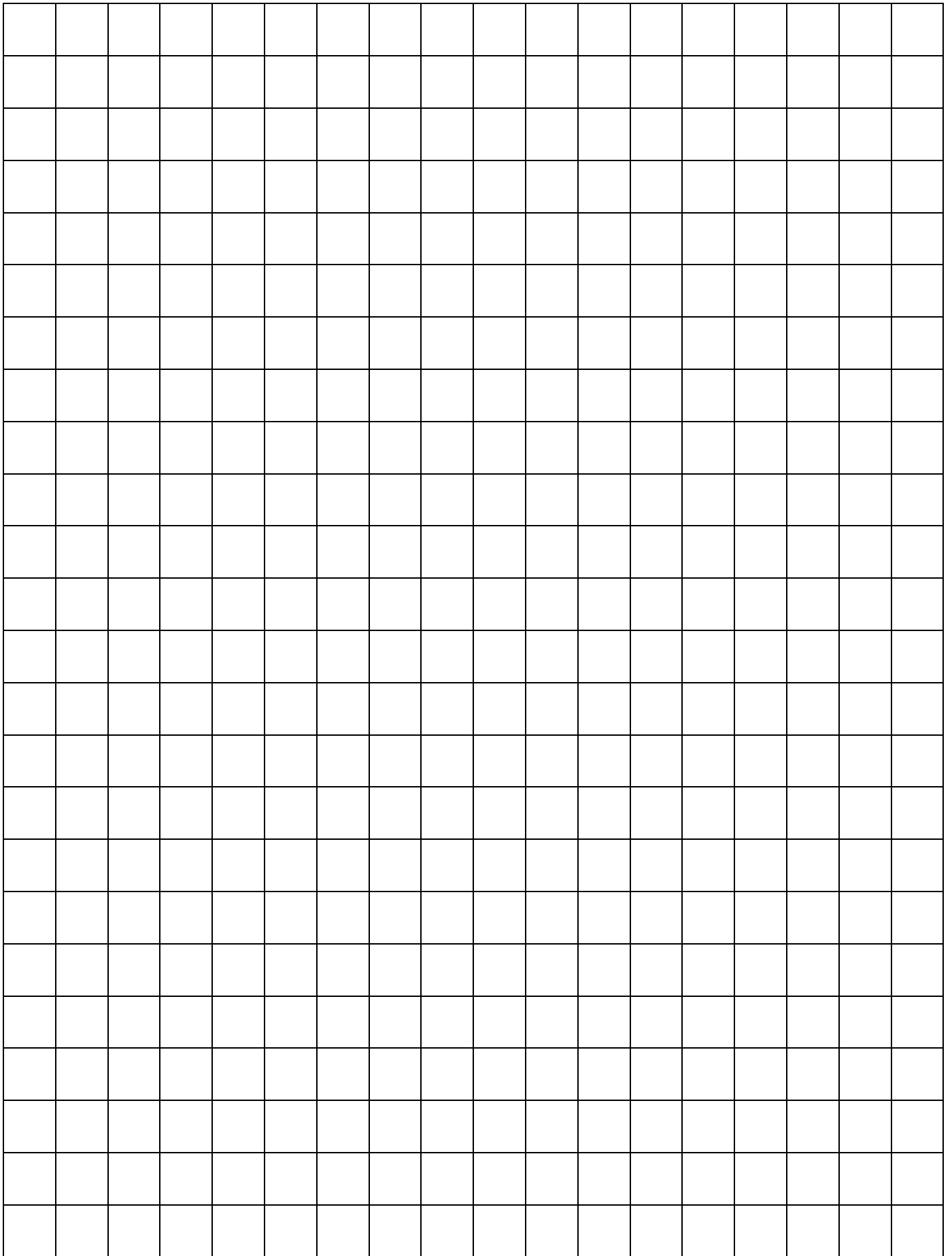
<b>Area</b>	<b>Minimum Perimeter</b>	<b>Maximum Perimeter</b>
<b>1</b>		
<b>2</b>		
<b>3</b>		
<b>4</b>		
<b>5</b>		
<b>6</b>		
<b>7</b>		
<b>8</b>		
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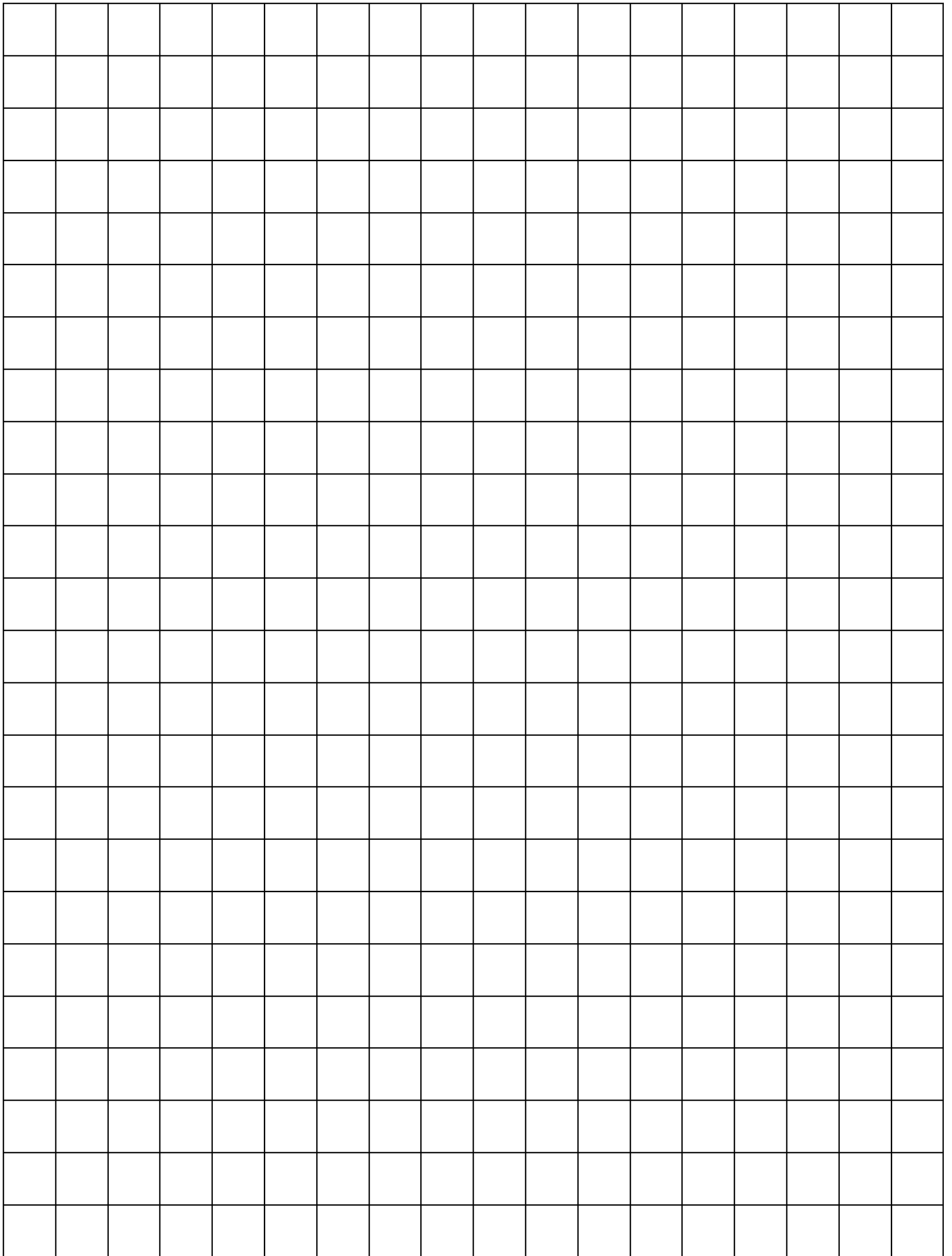
**Group 1: Create shapes with the tiles that have area of 1, 5, 9, 13, and 17. Try to make different shapes with these areas until you have found the ones with the smallest perimeter and the ones with the greatest perimeter. Record you results on the graph paper.**

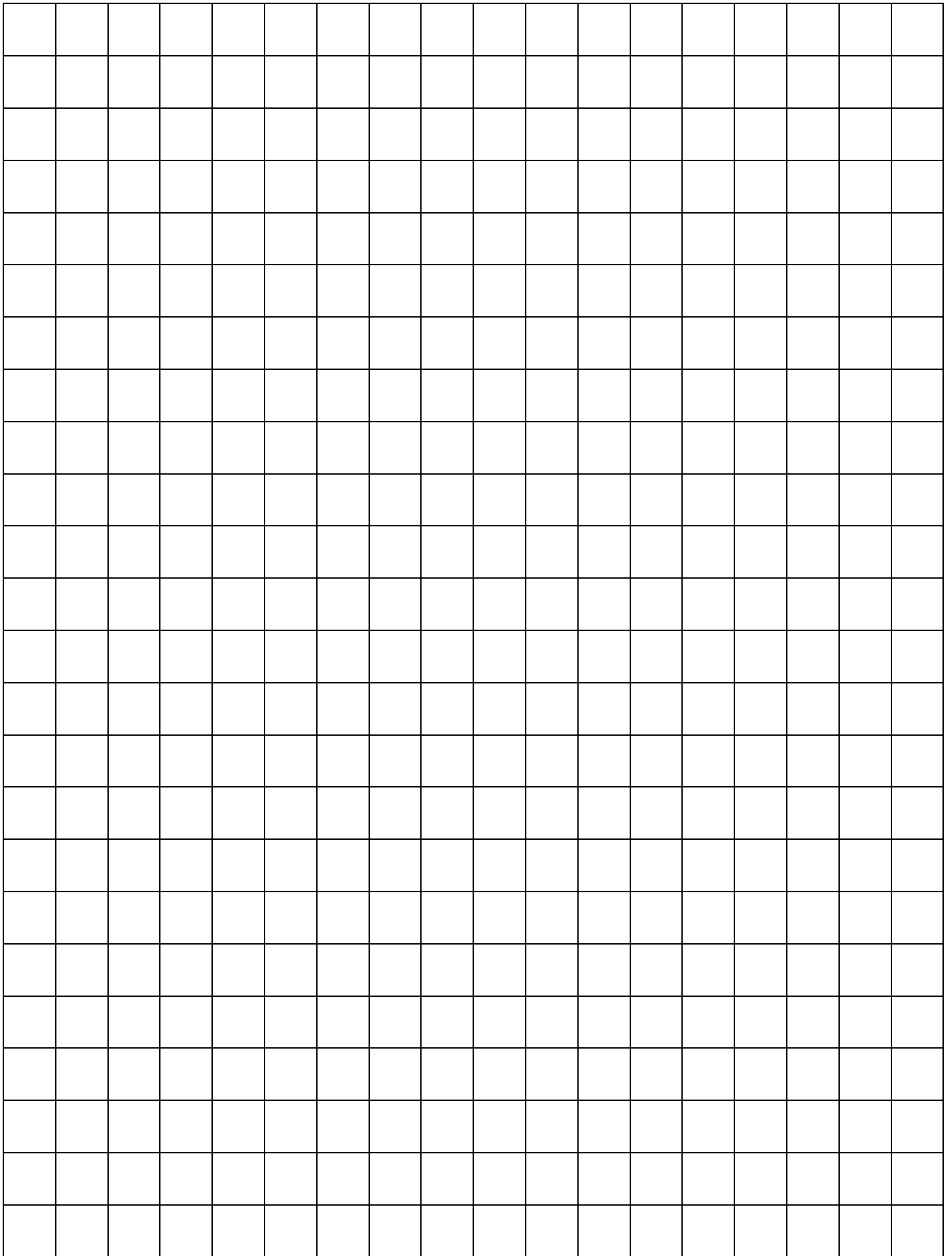
**Group 2: Create shapes with the tiles that have area of 2, 6, 10, 14, and 18. Try to make different shapes with these areas until you have found the ones with the smallest perimeter and the ones with the greatest perimeter. Record you results on the graph paper.**

**Group 3: Create shapes with the tiles that have area of 3, 7, 11, 15, and 19. Try to make different shapes with these areas until you have found the ones with the smallest perimeter and the ones with the greatest perimeter. Record your results on the graph paper.**

**Group 4: Create shapes with the tiles that have area of 4, 8, 12, 16, and 20. Try to make different shapes with these areas until you have found the ones with the smallest perimeter and the ones with the greatest perimeter. Record your results on the graph paper.**



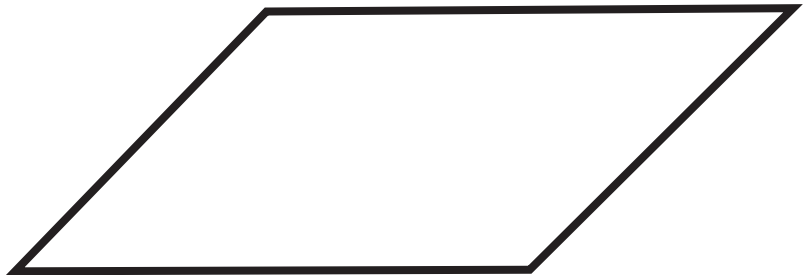
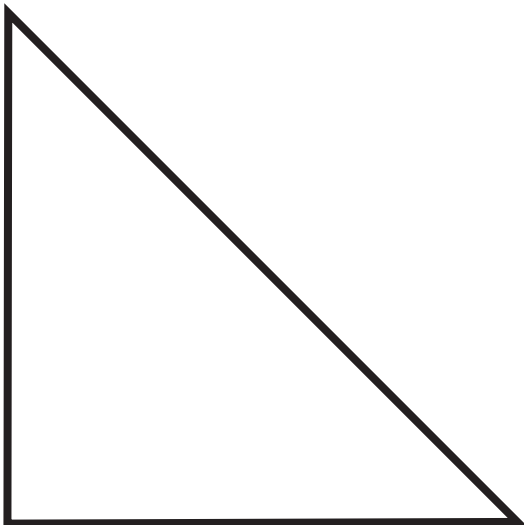
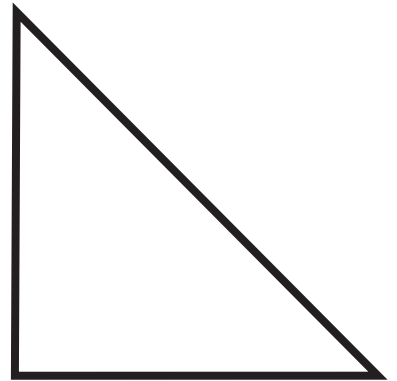
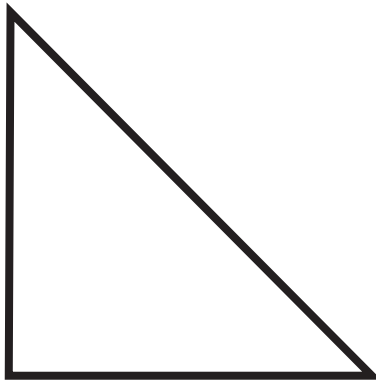
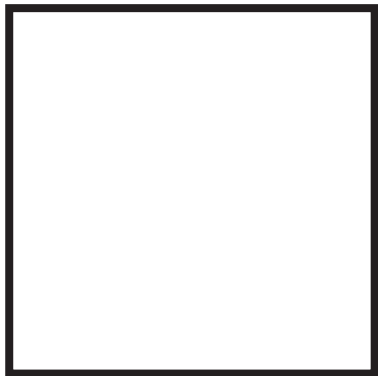
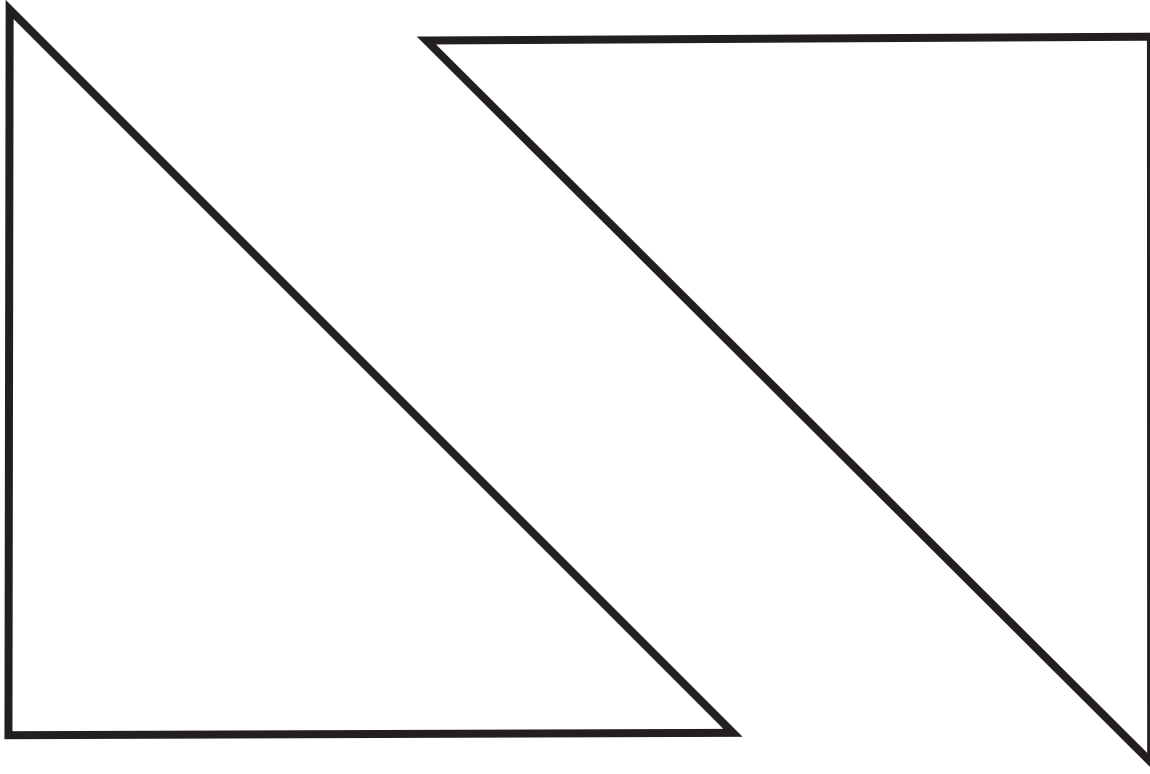




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# Tangram Pieces

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# Tangram Activities

## Activity 1

Study the seven pieces.

Use the communicator template to describe their areas:

Place an A is the shape with the smallest area, B is the next largest area, etc,

If two shapes have the same area repeat the letter.

How many pieces have the same area?

How many different areas exist?

Suppose the area of the small square is equal to 4 square units.

Find the area of each piece.

Do your areas make sense?

Find the area of the entire tangram puzzle.

Use the communicator template of the tangram pieces. Study the length of the various sides.

How many different lengths are involved?

Number the lengths in order from smallest to largest. Start by labeling the smallest side 1, the next largest side 2, etc.

How many different length sides exist in the tangram puzzle?

Suppose the area of the small square is equal to 2 square units.

Use the communicator template of the tangram pieces to record your answers.

Find the length of each side of each piece.

Find the area of each piece.

Find the base and height of each piece.

## Activity 2

Place the three isosceles right triangles on top of each other.

Compare the corresponding angles.

What is the relationship between the three triangles?

Suppose the length of the leg on the smallest triangle is equal to 2 unit.

How long is each of the nine sides of the three triangles? Use the communicator template to record your lengths.

What is the ratio of the corresponding sides of the

Smallest to middle triangle?

Middle triangle to largest triangle?

Smallest triangle to largest triangle?

How do the areas of the three triangles compare?

## Activity 3

Suppose the side of the small square is .

Use the communicator template to record the

Area of each piece.

Length of each side of each piece.

## Activity 4

What shapes make up other shapes?

What shapes (3) can you make with two small isosceles right triangles?

What shapes will make the largest isosceles right triangle?

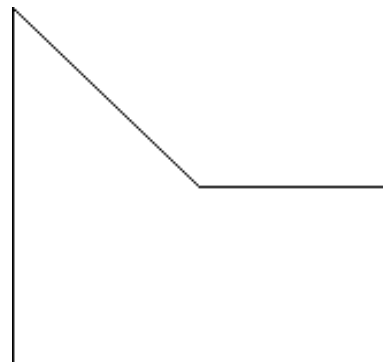
Make the largest isosceles right triangle without using the square piece.

Without using the two largest isosceles right triangles, make a square from the other 5 pieces.

Use the square and small isosceles right triangle to form a right trapezoid.

Make a trapezoid that is similar but not congruent to this trapezoid.

Make a pentagon (2) like the one illustrated.



## Activity 5

The Tasty Tangram Company has recently opened throughout the US. They sell brownies in the shape of the 7 tangram pieces.

Create a set of directions which will help the employees put the seven shapes of brownies together to form the tangram square.

Other groups can put the directions to the test by following the directions.

If the owner of Tasty Tangram franchises decides she will charge \$1 for the small right triangle shape brownie, and all the other shapes will be charged proportionately, how much will she charge for each of the other pieces and how much will the entire brownie tangram cost?