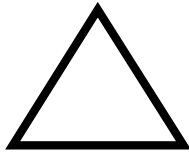


# Problem of the Month

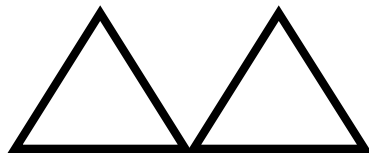
## Tri - Triangles

### Level A:

Lisa is making triangle patterns out of toothpicks all the same length. A triangle is made from three toothpicks. Her first pattern is a single triangle.

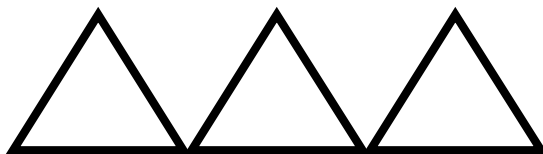


Her second pattern is shown below:



How many toothpicks are needed for her second pattern?

Her third pattern is shown below:



How many toothpicks are needed for her third pattern?

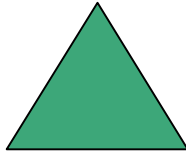
If she continued the same pattern, how many toothpicks are needed for the fifth pattern?

How many toothpicks are needed for the tenth pattern?

If you had 81 toothpicks, what pattern number could you make?  
Explain how you know.

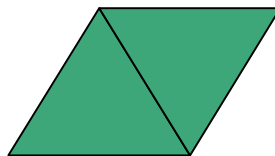
**Level B:**

Your classroom has triangular shape tables.



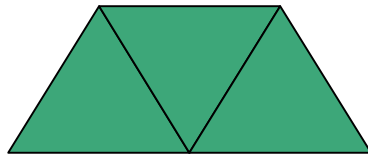
Three students can sit around one table.

Two tables can be pushed together so that two sides are adjacent.



How many students can sit around the tables in this arrangement?

Tables can be added to the arrangement by pushing together tables so that each additional table is adjacent to one side of the row of tables. The arrangement may grow to be a long row of tables.



How many students can sit around three tables in this arrangement?

How many students can sit around with five tables in a row arrangement?

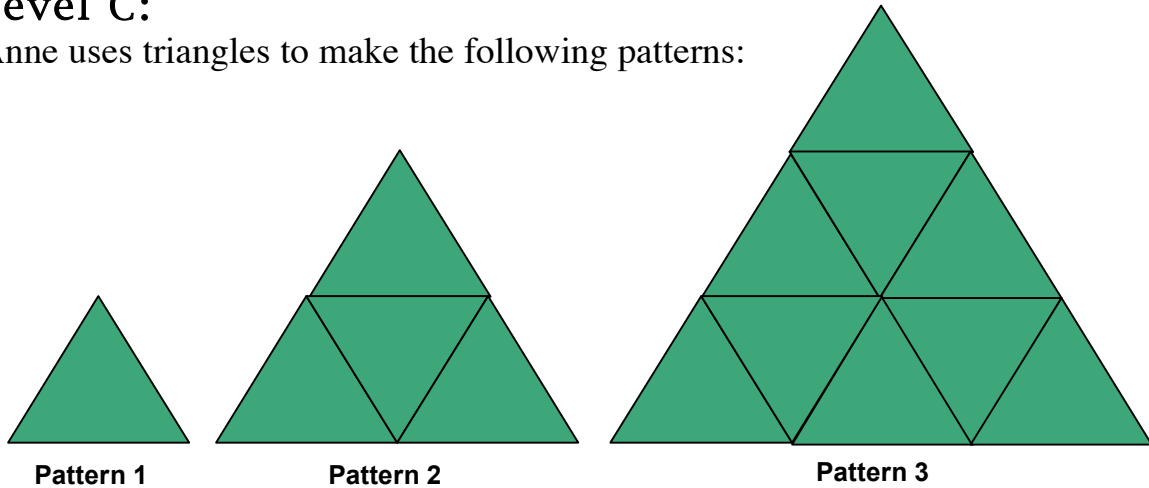
Determine how many students can sit around twelve desks in a row without drawing the arrangement?

Explain how you figured it out.

How many tables in a row are needed to seat 105 students?  
Explain your answer.

### Level C:

Anne uses triangles to make the following patterns:



The pattern continues in the same geometric design.  
Draw Pattern 4, how many triangles are needed?

How many triangles are needed to construct Pattern 7?

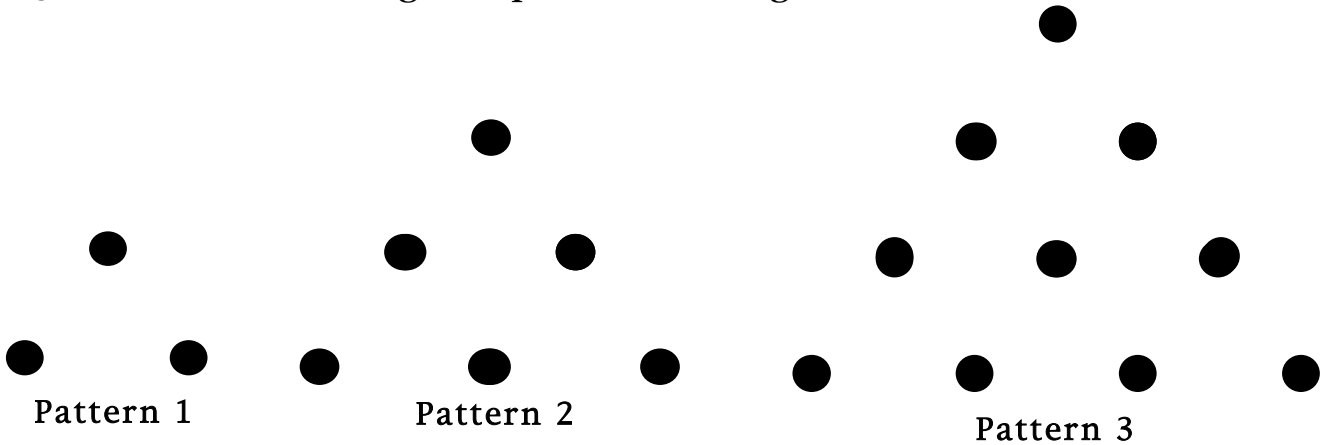
How many triangles are needed to construct Pattern 16?  
Explain how you determined your rule.

Write a rule to find the number of triangles needed for the  $n$ th pattern? Explain your rule.

Suppose a pattern had 2,025 triangles, what is the pattern number?  
Explain.

**Level D:**

Jo constructs triangular patterns using dots.

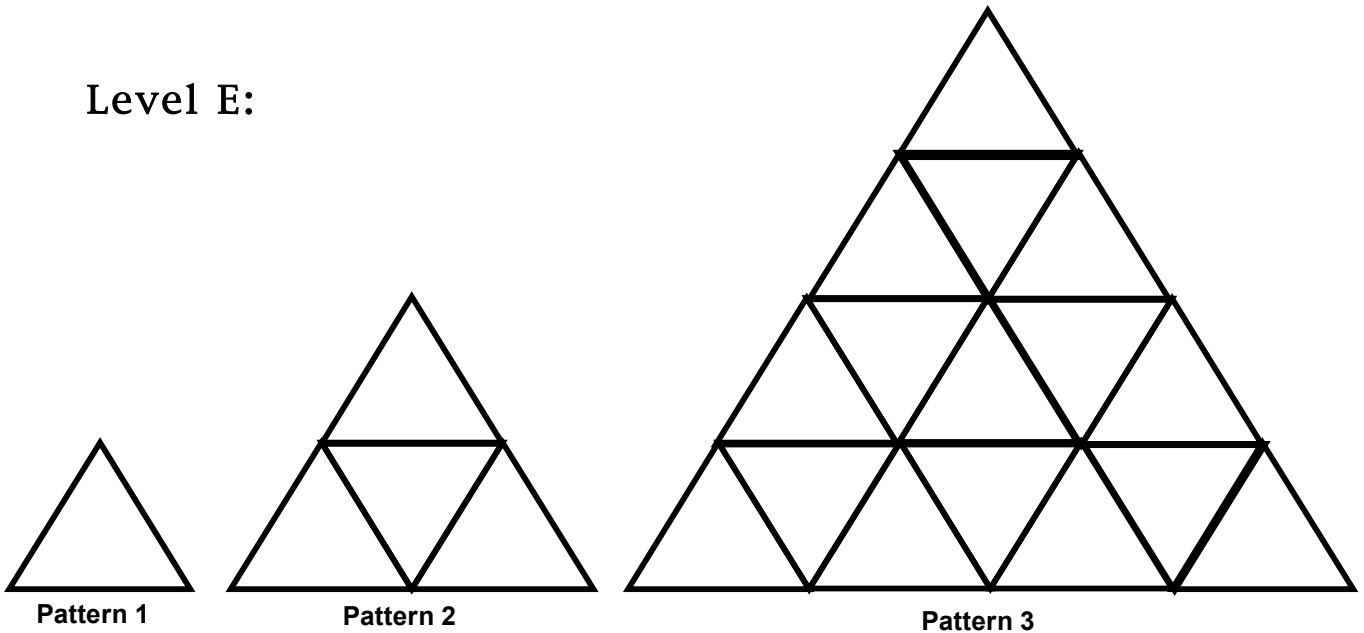


The pattern continues in the same geometric design.  
How many dots are needed to make Pattern 5?

How many dots are needed for the  $n$ th pattern?  
Explain your rule.

Jo was born in 1953, she was wondering if she could make a triangular pattern out of exactly 1,953 dots. If she could, what would the pattern number be? Explain your answer.

Level E:



Craig constructs the designs above from equal line segments. The design in Pattern 1 is made up of three line segments. Pattern 2 is made up of nine line segments. Pattern 3 is made up of thirty line segments, and so on.

How many line segments are needed to make Pattern 8?

How many line segments are needed to make Pattern 16?

Determine a function for finding the number of line segments needed to make the pattern for any number  $n$ . Justify why your function works.

You have 6,294,528 equal line segments. Can you construct a design that belongs in this sequence using just those line segments? If so, what pattern number would that be? If not, how many more line segments might you need to construct a design that fits the sequence?

## Problem of the Month

# Tri - Triangles

### Primary Version Level A

**Materials:** A picture of the three patterns, paper, pencil and toothpicks for students to make the different patterns.

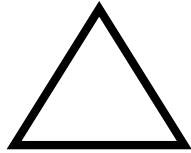
**Discussion on the rug:** (Teacher holds up the pictures of the triangle patterns) "Here are different patterns. How many toothpicks would it take to make the first pattern? (Students may build and count) How many toothpicks do you need to build the second pattern? (Students may build and count) (Teacher asks the children to think about how the number of toothpicks changed from first pattern to the second.)

**In small groups:** (Each student has access to toothpicks, paper, pencil and the picture of the first three patterns. The teacher explains that they may either build or draw the pattern to help find the answers. Teacher asks the following questions. Only go on to the next question if students have success.)

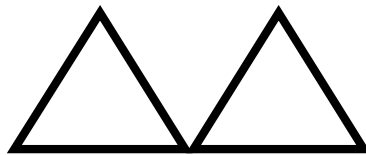
How many toothpicks do you need to build the first pattern?  
How many toothpicks do you need to build the second pattern?  
How many toothpicks do you need to build the third pattern?  
How many toothpicks do you need to build the fourth pattern?  
How many toothpicks do you need to build the sixth pattern?  
(At the end of the investigation have students either discuss or dictate a response to this summary question.)

**Tell me how you know.**

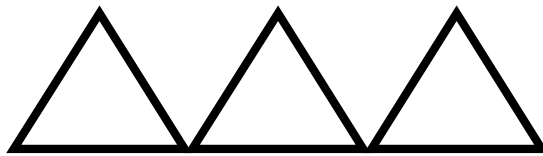
Problem of the Month  
**Tri - Triangles**



First Pattern



Second Pattern



Third Pattern