

Santa Ana Math Club

February 26, 2011

Name: _____

School: _____

Grade: _____

Geometry + Shapes

1. How many rectangles are there? _____



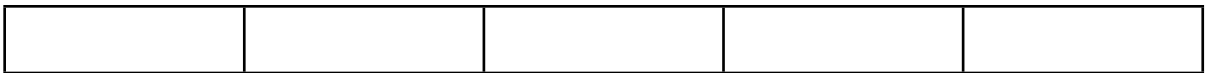
2. How many rectangles are there? _____



3. How many rectangles are there? _____



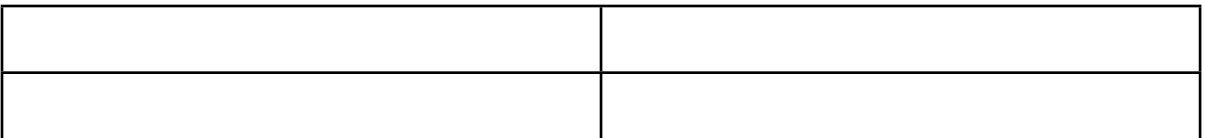
4. How many rectangles are there? _____



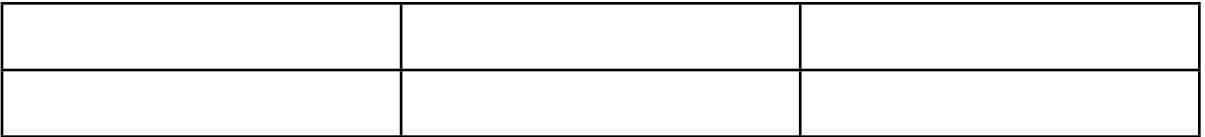
5. How many rectangles are there? _____



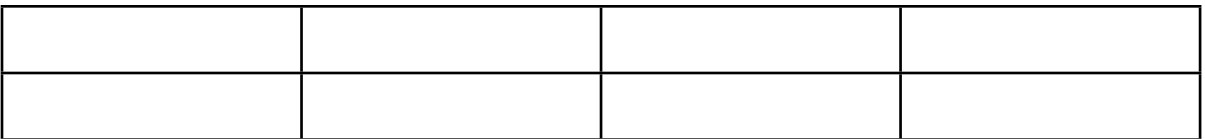
6. How many rectangles are there? _____



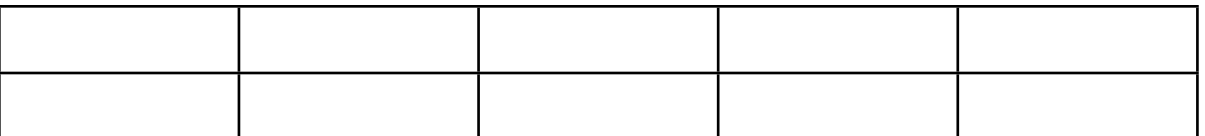
7. How many rectangles are there? _____



8. How many rectangles are there? _____



9. How many rectangles are there? _____



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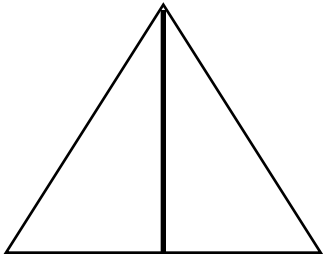
February 26, 2011

Name: _____

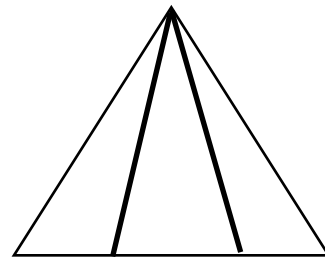
School: _____

Grade: _____

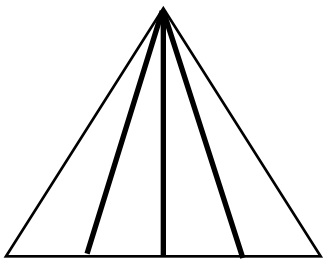
10. a. How many triangles are there? _____



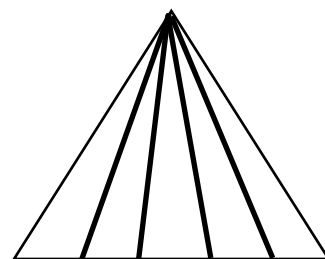
b. How many triangles are there? _____



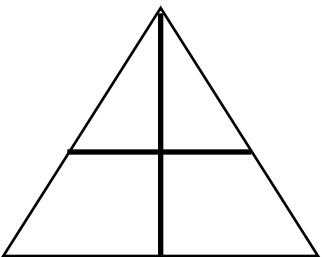
11. a. How many triangles are there? _____



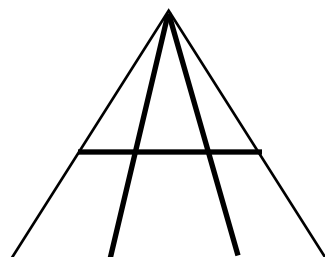
b. How many triangles are there? _____



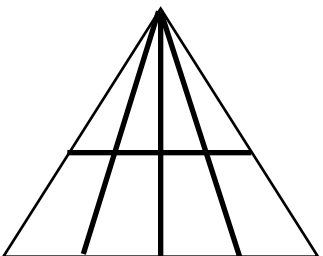
12. a. How many triangles are there? _____



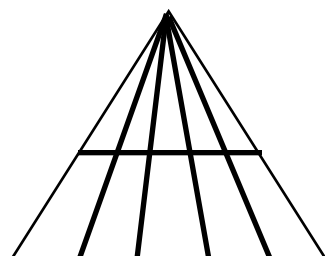
b. How many triangles are there? _____



13. a. How many triangles are there? _____



b. How many triangles are there? _____



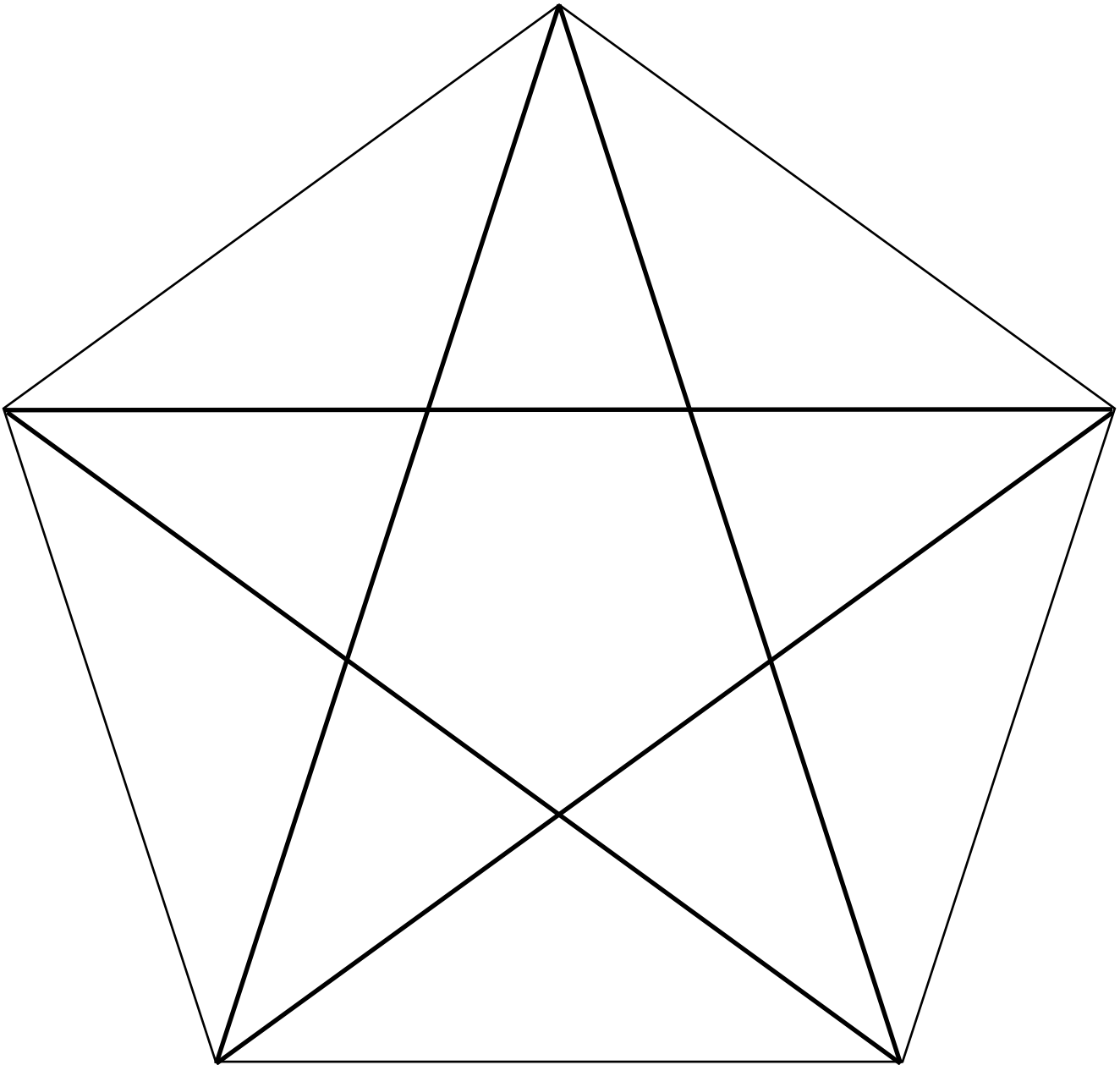
14. Do you see any correlation between questions 1-4 and questions 10-11?

15. How about between 6-9 and 12-13?

Challenge: How many triangles are there?

Try to do this in the way we discussed.

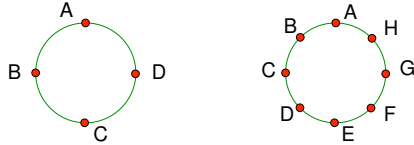
This is meant to be hard. It was a question in a Mathcounts state-level test years ago and is considered to be one of the greatest problems ever on Mathcounts tests.



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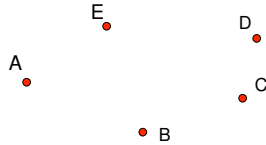
Grade 4 and 5

1. Four points are selected from the circle on the left below. In how many ways you can draw a straight line connecting any two points on the circle?

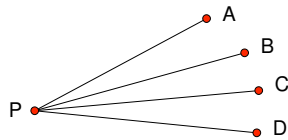


2. Eight points are selected from the circle on the right above. In how many ways you can draw a straight line connecting any two points on the circle? HINT: Starting with few points, see if you can develop a pattern to simplify your counting.

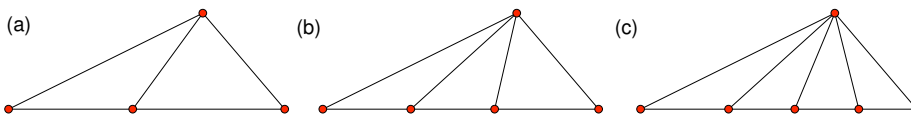
3. How many line segments are there by connecting any two of the points in the plane?



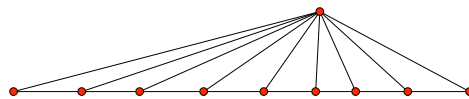
4. How many angles below are less than 90° ?



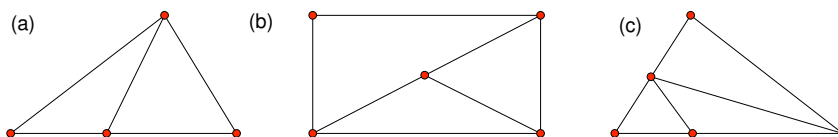
5. How many triangles are in the following figures?



6. How many triangles are in the following figure?

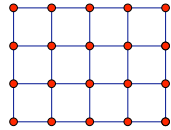


7. How many triangles are in the following figures?

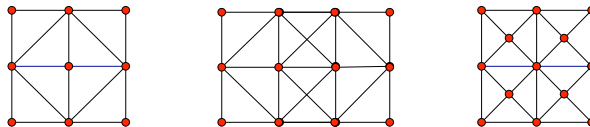


Santa Ana Math Club
Grade 4 and 5

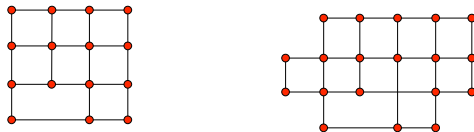
8. How many squares are in the following 3×4 figure? Count each different size of squares first and then add them up to get the total.



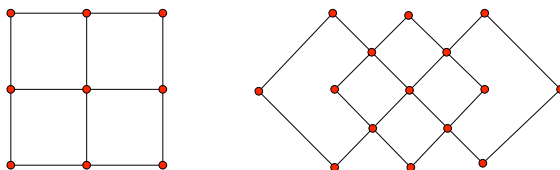
9. How many squares are in the following figures? (First, identify how many different types of squares are in the figure, and then count each type.)



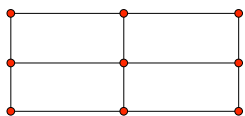
10. How many squares are in the following figure?



11. How many squares are in the following figures?



12. How many rectangles are in the following figure?



13. How many rectangles are in the following figures?

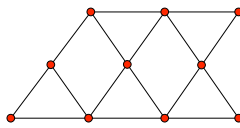


Santa Ana Math Club
Grade 4 and 5

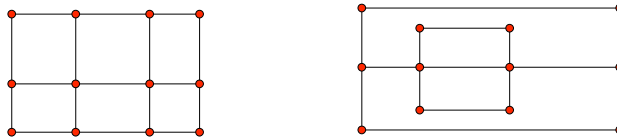
14. How many triangles are in the following figures?



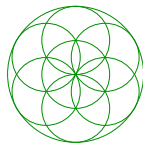
15. How many triangles are in the following figure?



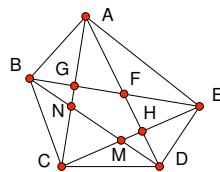
16. How many rectangles are in the following figures?



17. How many circles are in the following figure?



18. How many triangles are in the following figure?



Finding Patterns in Counting Shapes

Orange County Math Circle
<http://www.ocmathcircle.org/>

Alex Zivkovic
Jonathan Li
December 11, 2010

1. Introduction

The activity described below was first implemented in the Orange County Math Circle's Santa Ana Math Club program. The problem set was delivered to students in grades 4 through 7, and contains material that is meant to challenge students at varying math levels.

Please review these instructional pages to see how a formal lesson plan can be developed from our problem set. This packet can be used to accomplish a variety of things, so lesson plans targeted at students with varying mathematical levels can be created.

For this problem set, students at higher or lower mathematical levels can enjoy solving the problems since they fall outside of the school curriculum.

2. Start a discussion about shapes

Depending on the age level of the students, this step can be skipped.

Discuss how rectangles and triangle are defined. Have students work in groups or lead a class discussion on this. Ask them how squares differ from rectangles.

3. Finding patterns by working through the problem sets (Pages 1 and 2)

Students should be asked to start working on the problems.

One of the keys to this lesson is organization, so either choose to withhold that information until they make silly mistakes, or tell the students upfront that they should make tables or charts to keep their information orderly.

A good recommendation for this is to tell students to do (for example) numbers 1 through 4. Problem number 5 is similar, so ask them to **predict** the answer to this problem. There are several such groups of similar problems.

One row of rectangles: 1 – 5

Two rows of rectangles: 6 – 9

Triangles: 10 and 11

Triangles: 12 and 13

Problems 14 and 15 ask to find patterns, so let them work on these individually, then in groups, and lastly lead a discussion on the matter if no answers come up.

Be sure to review the result for those that did not get it.

4. Applying what they learned to a larger problem (Page 3)

This problem is good for groups of several students to work on together. Ask them to try and solve it. Once answers start appearing from the groups, tell them to write them on the board.

Most likely the answers will all vary, since few students will keep organized charts.

Then, tell them to try and find a way of organizing the triangles as they count. Suggest trying different types of triangles and counting those shapes. Tell them to pay attention to triangles that are congruent, yet oriented differently.

If after this, no clear answer arrives, tell them to look at rotational symmetry. Solve the problem using triangles from only one side and multiply the answer by 5.

5. Applying what they learned to individual work (Pages 4 to 6)

These problems are more challenging, so only pass them out to students that you believe will be able to handle the extra work.

They are numbered 1 to 3 on the bottom, so they can be handed out as either a “homework” assignment or they can be a whole other activity entirely.