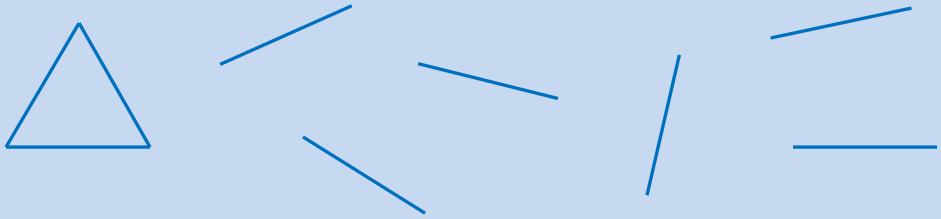
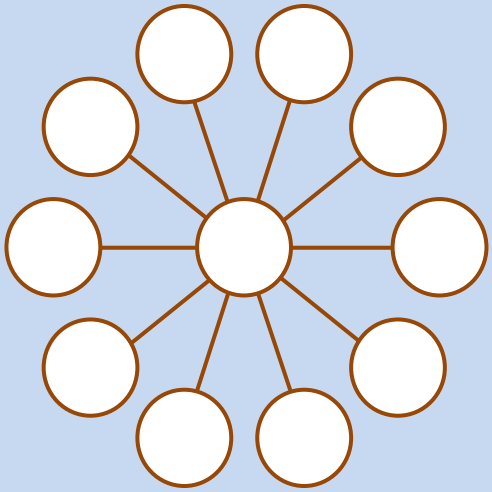
Math Challenge Questions

(October, 2009)

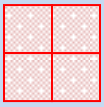
1) Using 9 straight line segments of equal length form 5 equilateral triangles.

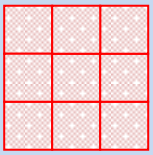


2) Using the whole numbers from 1 to 11, arrange them in the circles in the figure below so that they add up to the same amount in all directions.



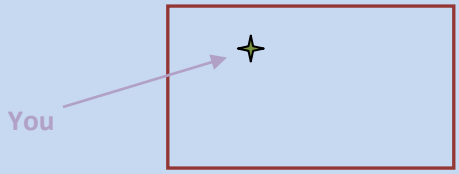
3) The following pictures show how you can divide a square into 4 and 9 non overlapping squares.



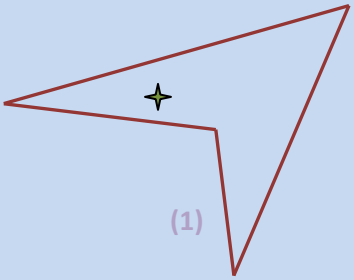


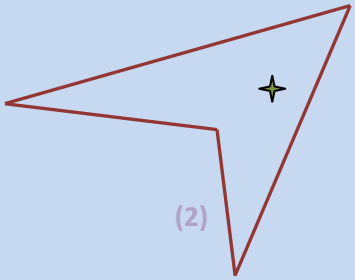
The non overlapping squares do not need to be the same size, however not all possibilities exist. In particular, you can't divide a square up into 2 squares. What are all the possible numbers of non overlapping squares you can divide a square into?

4) No matter where you stand in a rectangular room, you can see every part of every wall just by turning your head.

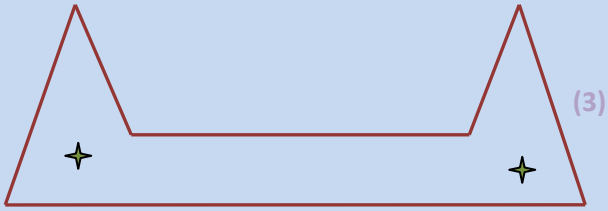


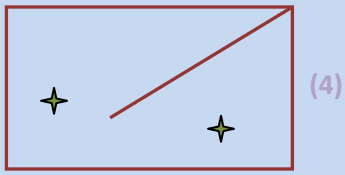
In a room with four walls that looks like this, seeing every part of every wall depends on where you stand. In the first case you can't; in the second you can.





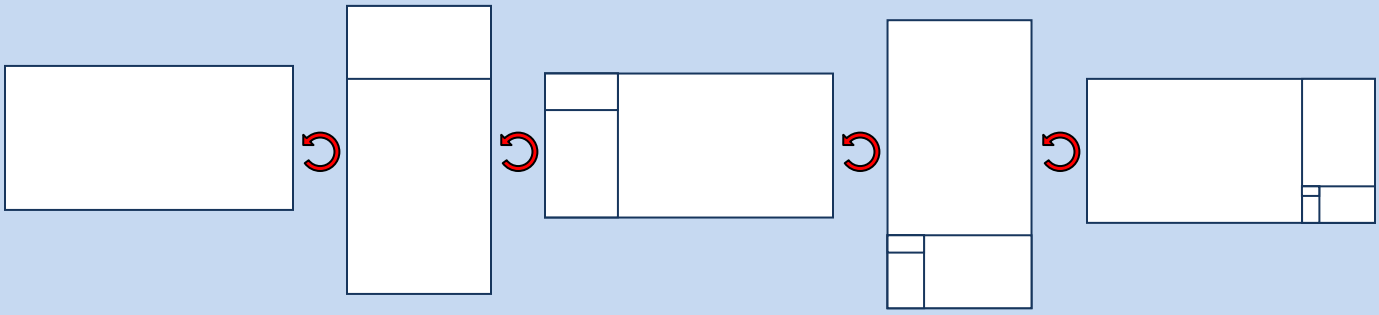
The following are two examples of six walled rooms that **require** two people to see every part of each wall at the same time. Note: a wall sticking into a room counts as two (sides).





Design a room with 7 walls that **requires** three people to see every part of each wall at the same time.

5) Imagine a rectangle that is two units long by 1 unit high. Now rotate it 90°. At the top of the rectangle highlight another rectangle with the same proportion. This rectangle will be 1 unit by ½ of a unit. Now rotate again and draw another rectangle with the same proportion in the top of the smaller rectangle.



Repeating this process, you get a figure that has an infinite number of rectangles contained inside each other. All the points in each rectangle are inside every rectangle before it. There is a point that is inside every rectangle. Where in the rectangle is that point?