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Math 2590
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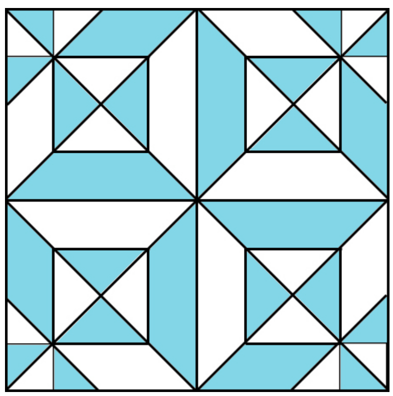
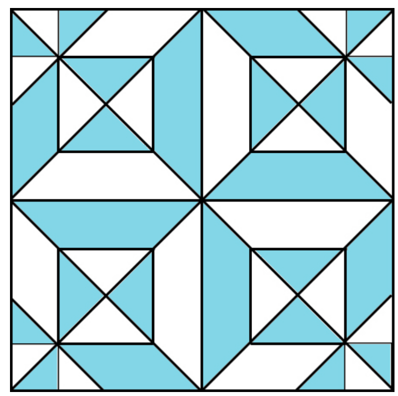
Solutions to Equations

1. The answer is already provided for you on the answer page.

2. There are two solutions:

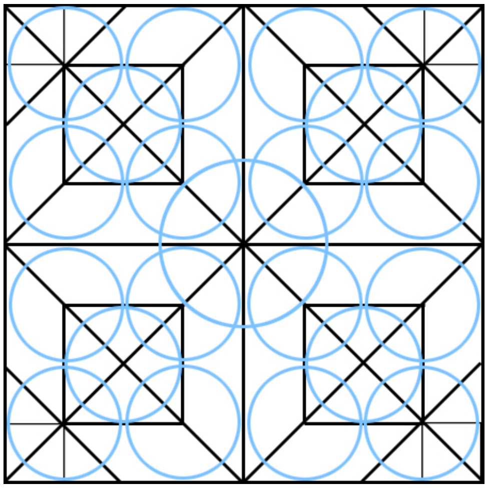


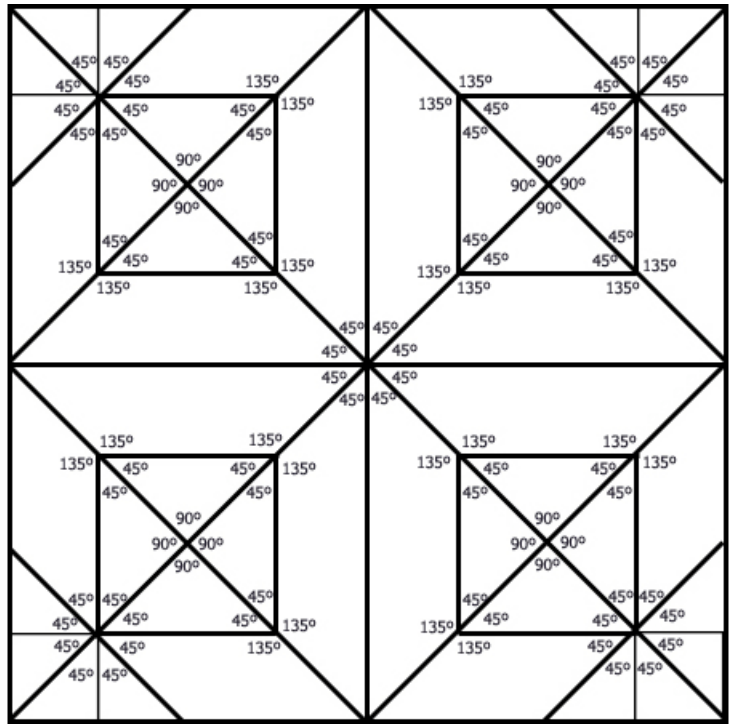
or



There are 48 areas in this crease pattern. The two-colourability rule works because of the symmetry in origami. Each fold creates two areas and there will always be an even number of regions created.

3.





(a.) The sum of the odd numbered angles is 180 degrees and the sum of the even numbered angles is 180 degrees. The total sum for all angles within the circles is 360 degrees. In the case of the intersection being in a corner or on a side, the odd and even numbers equate a quarter circle or a half circle respectively. The same odd and even numbered angle sums result.

(b.) It is important that the sum of the even numbers is equivalent to the sum of the odd number of angles to ensure symmetry of the final product. By folding a piece of paper in straight lines, you create even spaces on both sides of the fold, regardless of how many times you fold it. That means that the spaces directly opposite each other should be even. Therefore, the odd and even numbered areas will add up to the same value. This process of circle packing ensures proper folds and as a result, proper formation of an object without cutting or tearing the paper at all.

4.

Number of Folds (n)	Areas that result (r)	Formula
0	1	
1	2	2*1=2

2	4	2*2= 4
3	8	2*4= 8
4	16	2* 8= 16
5	32	2*16= 32

Conjuncture 1:
The number of regions for each additional fold increases by 2 times the previous number of areas.

Conjuncture 2:
r= 1*2*2*2*2*2…. *2, n times.

(i.e.) For 4 folds, 1*2*2*2*2=16

This is illustrated in the table to the left.

This is true because when you add a fold to the folded paper already in existence, you are creating double the spaces on the piece of paper that were already in existence. When a folded paper is folded in half, all of the areas within that fold will be folded in half again with an additional fold. Therefore, doubling the number of regions on the piece of paper you are working with.

Conjuncture 3
If r= maximum number of regions that one can make with 'k' lines on a page, then

2^(k)=r

Test this: ____

r=2^(k) r=2^(3) r=8 r=2^(4) r=2*2*2*2
r= 2*2*2

r=16	r=2*2*2*2*2	r=2^(2)		r= 64
	r= 32	r=2*2	r=2^(6)	
r=2^(5)		r=4	r= 2*2*2*2*2*2	