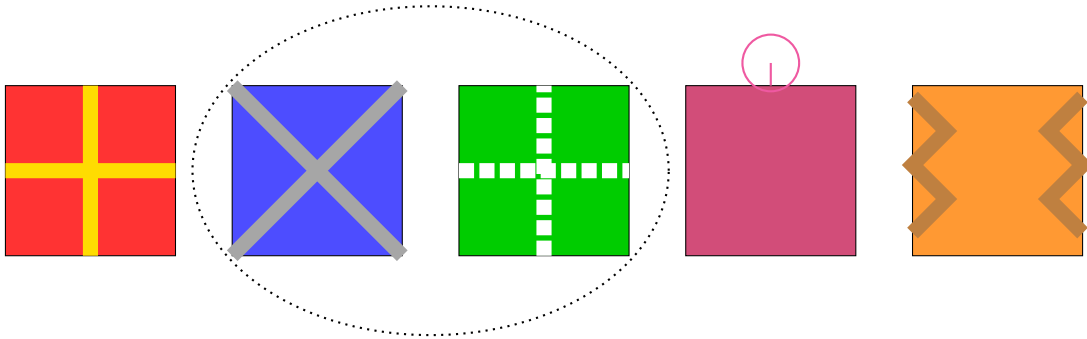


12 Days of ChrisMATH — Day 4

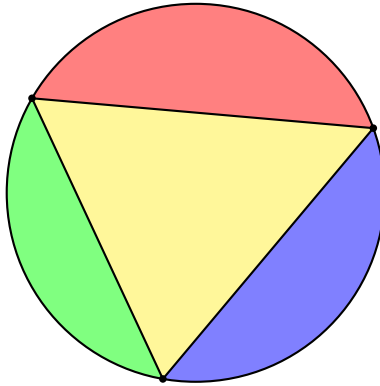
Level 1:

Under the Christmas tree, there are five presents. Eva the Elf wants to pick two presents to check for magical surprises. One selection Eva could make is shown below. How many different pairs of presents can Eva choose?

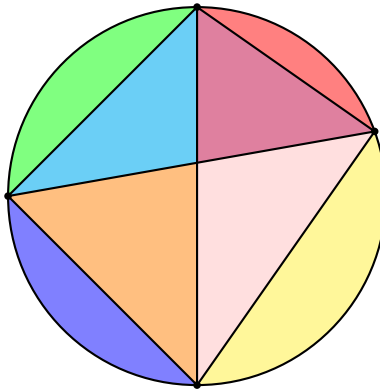


Level 2:

Adeline the Elf makes a Christmas ornament by connecting 3 points around a circle in such a way that she has the most regions possible. Her ornament is shown below.



Adeline continues crafting and makes an ornament with 4 points around a circle.

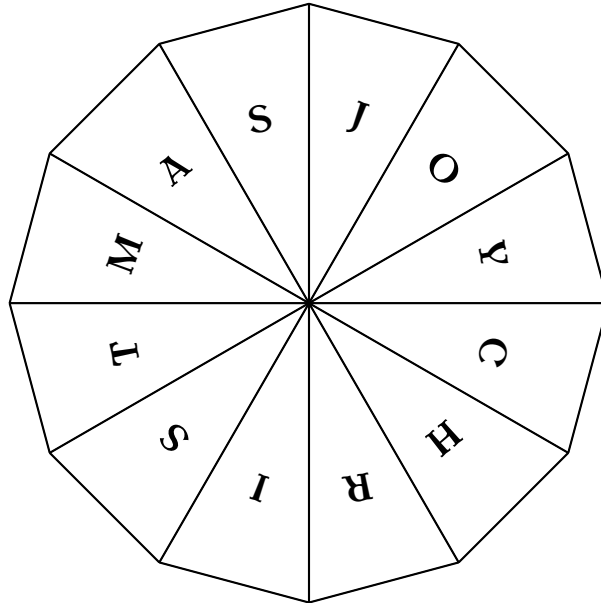


Adeline the Elf loves her beautiful ornaments. She continues making them by connecting n points around a circle and colouring the regions formed. What is the maximum number of regions Adeline will obtain when $n = 8$?

Number of points	Regions
1	1
2	2
3	4
4	8
5	16
⋮	⋮
8	?

Level 3:

After Christmas dinner, Amaya the Elf enjoys serving a regular dodecagon-shaped cake. She slices the cake into 12 congruent triangular pieces, and labels the pieces with "Christmas Joy". Her cake is shown below:



Amaya would like to frost each region using one of four colors: red, blue, green, or yellow, ensuring that no two adjacent regions share the same color. One such frosting is shown below. In how many distinct ways can Amaya frost the slices of the cake?

