

MATHCOUNTS[®] Problem of the Week Archive

Be Thankful for Math! – November 22, 2021

Problems & Solutions

The Zappone family has a table that can seat eight people comfortably, which is perfect, since there will be eight people sitting down to Thanksgiving dinner. The rectangular table can seat three people on each of the longer sides and one person on each of the shorter sides. Grady, who is 3 years old and can't read yet, is asked to place a pre-printed name card at each table setting to indicate where everyone should sit. What is the probability that Uncle Rob's name card will be placed at a table setting along one of the two shorter sides of the table? Express your answer as a common fraction.

Since Grady can't read, we can assume that each person's name card has an equal probability of being placed at any of the table settings. Therefore, the probability that Uncle Rob is placed at one of the two seats on the shorter sides of the table is $2/8 = 1/4$.

For Thanksgiving dinner, Mrs. Zappone is preparing a huge turkey, as well as potatoes, carrots, green beans, cranberry salad and dinner rolls. The problem is that sometimes, it's hard to fit all of the food you want onto your plate! Grandpa Curt takes a little bit of everything, while Grady sticks to turkey and dinner rolls. How many distinct combinations of food items are possible at the Zappone family feast, assuming everyone takes some turkey?

Since everyone is taking turkey, we really just have to count how many ways a person can choose from P (potatoes), C (carrots), G (green beans), S (cranberry salad) and D (dinner rolls). A person could choose none of the side dishes – this is 1 possible combination. A person could just choose one of the side dishes. Since there are five to choose from, this is 5 ways to choose just one side dish. A person could choose two side dishes, for which there are ${}_5C_2 = 5!/[2!(5-2)!] = 10$ possible combinations. (We could also list the possible combinations out to find that there are 10 ways to choose two side dishes: PC, PG, PS, PD, CG, CS, CD, GS, GD and SD.) For three side dishes, there are also ${}_5C_3 = 10$ possible combinations. For four side dishes, there are ${}_5C_4 = 5$ possible combinations. (We can also think of choosing four side dishes as choosing one side dish to leave out. There are 5 possible side dishes we could leave out, so there are 5 possible ways to choose four side dishes.) Finally, there is only 1 way to choose all 5 side dishes. This is a total of $1 + 5 + 10 + 10 + 5 + 1 = 32$ combinations of side dishes a person could choose to go with turkey.

For Thanksgiving dessert, Mrs. Zappone baked an incredible homemade apple pie. Eight equal slices (sectors) of the round pie are cut and one piece is distributed to each person at dinner. After this is done, there is exactly $1/3$ of the pie left. How many degrees are in the central angle of each person's slice of pie?

*Since there is $1/3$ of the pie left, that means $2/3$ of the pie was cut into eight equal pieces. A sector that is two-thirds of a round pie has a central angle measure of $(2/3)(360) = 240$ degrees. Split evenly between eight pieces of pie, this would make the central angle of each person's slice of pie **30** degrees.*

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