MATHCOUNTS® Problem of the Week Archive

Ice Cream Shoppe – June 26, 2017

Problems & Solutions

Small Town Ice Cream Shoppe carries five kinds of ice cream: vanilla, chocolate, strawberry, lemon custard, and caramel swirl. They also have three types of toppings: sprinkles, chopped nuts, and hot fudge. A "Shoppe Supreme" consists of three scoops of ice cream, not necessarily distinct flavors, and three scoops of toppings, also not necessarily distinct. The ice cream is always scooped before the toppings are added, in how many distinct ways can a Shoppe Supreme be assembled at Small Town Ice Cream Shoppe?

*For each of the three scoops of ice cream there are 5 options and for each of the three scoops of toppings there are 3 options. In total, there are 5 × 5 × 5 × 3 × 3 × 3 = **3375** ways to assemble a Shoppe Supreme.*

In the Ice Cream Shoppe, there are stools at the counter. Janet, Mason, Renae, Steve and Trina are going to sit side-by-side at the counter so that there are no empty seats between them. If Trina and Mason must sit next to each other, in how many possible distinct orders can they sit?

*Since Trian and Mason must sit together, let's consider them as one unit. That means there are 4! = 24 orders in which the four "units" can sit. However, Trina and Mason could switch places within their unit, thus there are 24 × 2 = **48** orders in which the five people can sit.*

Finally, Janet, Mason, Renae, Steve and Trina's orders are done but the waitress has forgotten who ordered what (and she is too embarrassed to ask). If she randomly places the drinks down, one in front of each person, what is the probability that she sets each of the five drinks down in front of the person who ordered it? Express your answer as a common fraction.

*There are 5! = 120 orders in which the drinks could be set down. Only one placement would be correct, thus there is a **1/120** chance that she would get it right.*

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