

MATHCOUNTS[®] Problem of the Week Archive

Pi(e) Day – March 13, 2023

Problems & Solutions

March 14, or 3/14, is Pi Day because the first few digits of the number pi are 3.14! While the day celebrates the mathematical type of pi, it is a little more fun to celebrate the delicious pie that you can eat. Try out the problems below about pie in honor of Pi Day!

Joana has four different types of fruit: apple, blueberry, pumpkin and apricot. She needs to make a pie that contains *at least* one type of fruit. However, she wants the pie to taste good! Joana does not like the combinations of apple with blueberry or blueberry with pumpkin, so those flavor combinations are not allowed. How many different combinations of flavors can she use?

If Joana puts only one flavor in, there are 4 choices for which flavor to add. If Joana wants to add 2 flavors, there are 6 possible pairs of flavors, but two of them are not allowed. This gives $6 - 2 = 4$ more choices. If Joana wants to add 3 flavors, she cannot add blueberry, since that would prevent both apple and pumpkin. This gives 1 more choice if Joana combines apple, pumpkin and apricot. Finally, it is impossible to put all 4 flavors in because blueberry cannot go with apple or pumpkin. In total, there are $4 + 4 + 1 = 9$ choices.

Joana makes 4 pies, and now it's time to bake them! She has two ovens, and each can only hold one pie at a time. Joana has 4 pies, which take 7, 10, 15 and 20 minutes to bake. What is the shortest amount of time in which she can bake all four pies?

*Joana can bake two pies in each oven. It is optimal to bake the longest and shortest pies in one oven and the rest in the other oven. In one oven, she bakes the 20- and 7-minute pies, giving a total of 27 minutes. In the other oven, she bakes the 15- and 10-minute pies, which takes 25 minutes. Thus, to bake all four pies, Joana must wait **27** minutes.*

Joana's pies are smelling delicious! But she has family coming to her house soon, and she needs to cut them. If she has 6 family members coming to her house, and each family member wants a piece of every pie, what is the minimum number of cuts needed on a single pie to feed everyone, including herself (7 people in total)? The pieces of the pie do not need to be equal in size.

*The first cut will clearly split a pie into two pieces. Joana can make a second cut to split the pie into quarters. To maximize the number of pieces, she makes a third cut such that it intersects the first two cuts at different locations. This will generate 7 pieces in total, because the triangle in the middle of the pie gives an extra piece. Therefore, Joana needs **3** cuts per pie to give each family member a piece of every pie.*

These problems were submitted by a MATHCOUNTS volunteer, Ishir Garg. Thank you, Ishir!

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