# MAΘ Competition Team Problem Set 12

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**Problem 1.** Anders has 24 apples. In how many ways can he share them with Minjoo and Jiwu so that each of the three people has at least two apples?

**Problem 2.** When 7 fair standard 6-sided dice are thrown, the probability that the sum of the numbers on the top faces is 10 can be written as

$$\frac{n}{6^7},$$

where $n$ is a positive integer. What is $n$?

**Problem 3.** Suzanne went to the bank and withdrew \$800. The teller gave her this amount using \$20 bills, \$50 bills, and \$100 bills, with at least one of each denomination. How many different collections of bills could Suzanne have received?

**Problem 4.** For some particular value of $N$, when $(a+b+c+d+1)^N$ is expanded and like terms are combined, the resulting expression contains exactly 1001 terms that include all four variables $a, b, c$, and $d$, each to some positive power. What is $N$?

**Problem 5.** How many non-similar triangles have angles whose degree measures are distinct positive integers in arithmetic progression?

**Problem 6.** Consider polynomials $P(x)$ of degree at most 3, each of whose coefficients is an element of $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$. How many such polynomials satisfy $P(-1) = -9$?

**Problem 7 (Challenge).** Dom rolls three fair standard six-sided dice. Then he looks at the rolls and chooses a subset of the dice (possibly empty, possibly all three dice) to reroll. After rerolling, he wins if and only if the sum of the numbers face up on the three dice is exactly 7. Dom always plays to optimize his chances of winning. What is the probability that he chooses to reroll exactly two of the dice?