

# CNCM Math Bowl Preliminary Round 4

CNCM Administration

Let  $p$  be an integer such that  $6p + 27 \equiv 12 \pmod{9}$ . Find the remainder when  $p$  is divided by 3.

**Answer:** 2

How many base 10 numbers are there such that they have 4 digits when written in base 7 and 3 digits when written in base 8?

How many 5-digit integers exist such that the 2nd and 4th digit are the same, and no two consecutive digits are the same?

Reflect the function  $f(x) = x^2 + 5x + 7$  over the line  $y = x$ . The line  $x = 1$  will intersect the reflection at two points. What is the sum of the y-coordinates of these two points?

Basketball shots can account for 3 points, 2 points, or 1 point (free throws). How many such ways are there to score 6 points if the order of shots matter.

There are 12 seated in a row of 12 chairs. If Jack cannot sit next to Chloe, how many ways can the 12 people be seated?

**Answer:** 30240

How many ways are there to go from  $(0, 0)$  to  $(5, 5)$  without going through the point  $(2, 2)$  given that in each move you can only move up or to the right?

Three regular 6-sided dice are rolled. Find the probability that the sum of the numbers rolled on the dice is 11.

Find the coefficient of the  $x^5y$  term of the expression  $(x - y)^6$ .

Find  $\log_3 16 \log_2 27 + \frac{\log_4 25}{\log_2 125} + \log_{26\sqrt{26}} 13 + \log_{26\sqrt{26}} \sqrt{52}$

Of the set  $S = \{2, 3, 5, 6\}$ , Three numbers are chosen to form the three digits of a 3 digit number. This number will then be put to the power of the fourth number. Call the set of possible results  $T$  (for example, 2653 is an element of  $T$ ), and call the ratio of the second-largest element and the third-largest element of  $T$   $R$ . Find  $R$  rounded to the nearest integer.

What is the sum of  $123 + 234 + 345 + \dots + 789 + 8910$ ?

There are 3 circles of radius 1 that are mutually tangent. What is the area of the triangle with vertices at each intersection of two circles?

Let  $A + B = 7$ ,  $2B + 2C = 11$ ,  $3C + 3D = 17$ ,  $4D + 3A = 21$ . Find  $A + 2B + 3C + 4D$ .

I have 103 people in my class and collected data on how many meters they have walked in the past minute. 100 of the students gave distinct integer answers ranging from 1 – 100. The other 3 students gave answers of 11000, 3100, and 1000. How many students gave answers within the inter-quartile range that were less than the mean?