# α Alpha Round

AMSA-MAMS Pi Day Mathematics Tournament

March 10, 2018

1. There are 5 boys and 5 girls on a math team. How many ways can the coach form a team of 5 if the boys are indistinguishable from the other boys, and the girls are indistinguishable from the other girls?

2. $243_7 + 4C_{13} = x_{10}$. What is the value of x? Note: a_b denotes a in base b.

3. What is the largest prime factor of $1 + 2 + 3 + \ldots + 160$?

4. Let W be the number of wins Kyrie Irving has and L be the number of losses Kyrie Irving has. The least common multiple of W and L is 600, and the greatest common factor of W and L is 20. If $L = 60$, what is W?

5. Srujal is stressing out about the grade he got on his test. In his class of 18 (including him) the lowest grade was a 1 and the highest grade was a 67 (out of 100). The average (arithmetic mean) grade was 13. Assuming everyone got different integer grades, and that Srujal got neither the highest or lowest grade, what is the maximum possible grade Srujal got?

6. What is $\sqrt{12 + \sqrt{12 + \sqrt{12 + \ldots}}}$?

7. John predicts the Patriots will have a 93.75% chance of winning at least one Super Bowl in the next 4 years. If the probability that the Patriots win a Super Bowl each year is the same, what is the probability that they win next year? Express your answer as a common fraction.

8. The six right triangles are all similar with right angles at points A B C D E, and F with
$$\triangle AOB \sim \triangle BOC \sim \triangle COD \sim \triangle DOE \sim \triangle EOF \sim \triangle FOG$$
If $AO = \sqrt{3}$ and $AB = 1$, find the length of AG if A, O, and G, are all colinear. Write your answer as a fraction in simplest radical form.
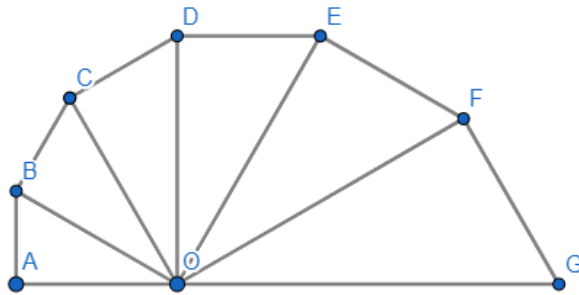
9. A pack contains n cards numbered from 1 to n. Two consecutive numbered cards are removed from the pack and sum of the remaining cards is 1224. If the smaller of the numbers on the removed card is k then calculate $k - 20$.

10. 4 distinct points are chosen at random from a 5×5 grid of points. What is the probability that the four points are the vertices of a rectangle with sides parallel to the sides of the grid? Express your answer as a common fraction.