AIMS Maths Competition 2021
Senior Round 2

START: 10:30am
END TIME : 12:00pm

No calculators are allowed.
All answers should be written as decimal. (For example, if the answer is 1/2 please write 0.5)

1. How many zeroes are at the end of 80! ? (80! = 80 × 79 × 78 ×….× 2 × 1)
2. What is the last digit of $2^{20} \times 3^{17}$?
3. What is $\frac{1}{8} + \frac{2}{100} + \frac{3}{40}$ expressed as a decimal?
4. If *p, q, r* are positive (> 0) integers, and $p + \frac{1}{q+\frac{1}{r}} = \frac{25}{19}$, what is the value of *q*?
5. If (*a* + 2) added to (*b* + 2) is 2020, what is the value of $(\frac{a}{2}$ -3) added to ($\frac{b}{2}$ - 5)?
6. How many 8 letter words can be formed from the letters *AADDDHTT*
   (The words do not have to make sense. For example *ADADHDTT* or *TTDHDDAA*.)
7. Find the exact value of $\sqrt{(1000)(1001)(1002)(1003) + 1}$ without using a calculator.
8. If $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \ldots. = A$, and $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots. = A \times B$. What is the value of *B*?
9. What is the remainder when $7^{(8^9)}$ is divided by 100 ?
10. How many ordered triples (*a, b, c*) of odd positive integers satisfy *a* + *b* + *c* = 11 ?
11. In Triangle *ABC*, *D* is the midpoint of *AB* and |*DC*| = |*AD*|. If ∠*ABC* = 34^o what is ∠*BAC*?
12. *ABCD* is a trapizoid with *AB* parallel to *CD*. The diagonals *AC* and *BD* meet at *P* . If the area of *ABP* is 16 and the area of *CDP* is 25, what is the area of the trapezoid?
13. How many positive integers less that 200 are relatively prime to both 15 and 24? (two number are said to be relatively prime if their common factor is 1.)
14. Let *S* be a set of 4 elements. We wish to count the number of subsets of subsets of *S*. More precisely, find the number of pairs (*X, Y*) such that $X \subseteq Y \subseteq S$.
15. if *x, y, z* are positive integers such that

$$\begin{cases} x^2y + y^2z + z^2x = 2186 \\ x^2z + y^2x + z^2y = 2188 \end{cases} \quad (1)$$

Find the value of $x^2 + y^2 + z^2$