AIMS Maths Competition 2021 Senior Round 2

**START: 10:30am**

**END TIME : 12:00p**

***No calculators are allowed.***

***Hints are given in italics, In the real exam there will be no hints. It will also be a little bit harder.***

1. How many zeroes are at the end of 80! ? (80! = 80 × 79 × 78 ×….× 2 × 1)

*Try for 5!, then try for 10!*

1. What is the last digit of 220 × 317?

*Look at the last digit of* 20 ,21 ,22 ,23 ,24 ,25 ,26 ,  *and find a pattern*

1. What is + + expressed as a decimal?
2. If *p, q, r*  are positive ( > 0) integers, and *p* + = what is the value of *q*?

*Simplify the expression so there are no fractions left.*

1. If (*a* + 2) added to (*b* + 2) is 2020, what is the value of ( -3) added to ( - 5)?
2. 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*.)

*How many 8 letter words can be formed with the letters ABCDEFGH?*

1. Find the exact value of without using a calculator.
2. If + + + …. = *A*, and + + + …. = *A* x *B.*  What is the value of *B*?

*Lets say AxB = M. Can you write M in terms of A only? (It is tricky but possible)*

1. What is the remainder when is divided by 100 ?

*This is similar to question 2, just look at the last 2 digits and find a pattern.*

1. How many ordered triples (*a, b, c*) of odd positive integers satisfy *a* + *b* + *c* = 11 ?

*For example: (1,1,9), (1,3,7) etc*

1. In Triangle *ABC*, *D* is the midpoint of *AB* and |*DC*| = |*AD*|. If ∠*ABC* = 34*o* what is ∠*BAC*?

*Make a nice diagram, you will not struggle*

1. *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?

*This one was too hard for the paper, enjoy trying it, we will give the answer at camp.*

1. How many positive integers less than 200 are relatively prime to both 7 and 8?

*How about change 200 to 20? or 28? or 42? can you figure out a formula?*

1. 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* ⊆ *Y* ⊆ *S*.

*Lets say (a,d,(b,(c))) << this represents the sets, with (c) is X, then (b,(c)) is Y [X is a subset of Y], and (a,d,(b(c))) is S [Y is a subset of S]*

*Then figure out what can you put in - like (a,b,c,d,(()) or (a,((b,c,d,))).*