MATHEMATICS ENRICHMENT CLUB.

Problem Sheet 3, May 20, 2019[1]

1. Let a and b be positive integers such that $2^a \quad 2^b = 2016$. Find the value of $a + b$.

2. Let $ABCD$ be a square, with M and N the mid points of the sides BC and AD respectively. K is an arbitrary point on the extension of the diagonal AC beyond

Senior Questions

1. Given that a, b, and c are positive integers, solve

   (a) $a!b! = a! + b!$

   (b) $a!b! = a! + b! + 2^c$

   (c) $a!b! = a! + b! + c!$

2. (a) Prove that for $n \quad 3$, $(n + 1)! > (n \quad 2)(1! + 2! + \cdots + n!)$.

   (b) Use part (a) or otherwise, show that for $n \quad 3$, $(n + 1)!$ is not divisible by $1! + 2! + \cdots + n!$.