Question 1.
What is the remainder of the sum of
\[(1!)^5 + (2!)^5 + (3!)^5 + ... + (2010!)^5\]
when divided by 5?

Question 2.
Let \(ABC\) be an equilateral triangle. Extend \(\overline{AB}\) to a point \(D\) such that \(B\) is the midpoint of \(\overline{AD}\).
Let \(E\) be a point such that \(BD = DE\).
Find \(\angle BED\) if the distance from \(E\) to \(C\) is as large as possible.

Question 3.
The polynomial \(x^3 - 120x^2 + 2010x - 729\) has three real roots \(r, s,\) and \(t\). Find the hypotenuse of a right triangle whose legs are the geometric and arithmetic means of \(r, s,\) and \(t\).

Question 4.
Given that \(\sin(12) \cos(78) = -24 \sin^4 x + 16 \sin^6 x + 9 \sin^2 x\), find \(x\).

By XLI KYC AMXL XLI XAS PIXXIV REQI.
(Shift the letters by \(\gamma\) to the left, where \(\gamma\) is the number of distinct primes in the prime factorization of the current year, not including 1 :P)