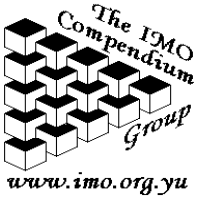
Eötvös Mathematical Competition 1900

1. Let a, b, c, d be fixed integers with d not divisible by 5. Assume that there is an integer m for which $am^3 + bm^2 + cm + d$ is divisible by 5. Show that there is an integer n for which $dn^3 + cn^2 + bn + a$ is divisible by 5.

2. Construct a triangle ABC, given the length c of its side AB, the inradius r, and the exradius r_c corresponding to the side AB.

3. A cliff is 300 meters high. Consider two free-falling raindrops such that the second one leaves the top of the cliff when the first one has already fallen 0.001 millimeters. What is the distance between the drops at the moment the first hits the ground? (Compute the answer to within 0.1mm; Neglect air resistance etc.)



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