

STEP II, 2021, Q2 EC

Question 2

On the whole, candidates performed well on this question. Almost all attempts correctly verified the identity in (i). Part (ii) however received more poor attempts than any other part. Candidates who understood what was being asked of them almost always scored all the marks, whilst those who misunderstood the meaning of the question often scored 0. The most common mistakes were to assume already that $p = a + b$ and $q = a^2 + b^2$, which is what the question required them to show, or to try to evaluate the discriminant of the quadratic in attempt to show it had real roots; these candidates failed to realise that the roots could be complex, as indicated by the first line of the question. Some candidates failed to sufficiently justify why the relation for r held, not realising that they had to show the opposite implication to what they had done in (i).

Part (iii) had more successful attempts than (ii). The most common mistake was to not use part (i), as the question specified, to prove that c was a root, and instead to expand out every term in terms of a, b, c ; such attempts could not score credit for showing c was a root. Those that spotted how to use the relation in (i) would give short, quick solutions. Many candidates however were able to deduce the last relation between s, t, u, v even if they were unable to successfully answer earlier parts of the question, spotting that the product of the roots should give rise to a multiple of the constant term in the cubic. Again, some candidates once again expanded everything in terms of a, b, c to verify the relation, which did not score credit as it was not deduced from the cubic.

Candidates were able to score credit in (iv) without attempting all the previous parts and many did, often successfully. The simplest solution involving the cubic in (iii) lead quickly to the values of a, b, c , although it was possible to solve the equations by substituting them into one another, which led to the same cubic expression. However, despite many attempts finding the solutions a, b, c , surprisingly few actually verified that their claimed solution did actually satisfy all four equations, leading to incomplete solutions and not receiving full credit.



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