

## STEP II, 2006, Q3 EC

- 3 A lot of candidates made a faltering start to this question before moving on to pastures greener. This was usually occasioned by a realisation that life was going to be very tough here – which it was if they failed to appreciate that  $\frac{1}{5 + \sqrt{24}} = 5 - \sqrt{24}$ . Those who saw this early on generally made their way to at least the first 8 marks. Although there are other

ways to go about the first part, the use of the binomial theorem, with the  $\sqrt{24}$ -bits all cancelling out, establishes that the given expression is indeed an integer (without necessarily having to find out which). The three modest inequalities that followed were easily established with just a modicum of care. However, it was again the case that candidates' lack of comfort with inequalities once more prevented a convincing conclusion to (i) since most candidates resorted to approximation: showing that  $N \approx 9601.9999$  is NOT the same as showing that, because  $N$  lies between ... and ... , it is actually equal to it (to four decimal places). Sadly, most candidates did not seem to understand such a difference in logical terms.

For part (ii), it was necessary only to mimic the work of part (i) but in a general setting. Most candidates attempting this question were happy to leave it at this point; of those who continued, many picked up two or three marks – only a handful actually polished it off properly.



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