

STEP II 1999 Comments

Question 1

This is a nice question, and a good demonstration of the power of using logarithms to compare the size of very large (or indeed very small) numbers. The first part is probably the hardest, needing to identify the terms that are small and so that you can ignore. The second part is just really applying various laws of logarithms, and then using these results (along with the fact that log is strictly increasing) to order the different values.

Question 2

I think the difficulty in this question comes from being able to distinguish between the original quadratic, its discriminant which becomes itself a quadratic, and then the discriminant of that quadratic, and the relationship between the three. The actual algebra is straightforward, but being able to understand exactly what you're trying to prove is the tricky bit!

Question 3

Pretty doable, I think. The final part is probably the trickiest, involving a relatively subtle argument that exactly one of the two values in the required product is negative.

Question 4

The first two parts of this are fairly straightforward, I think. The third part is a lot harder, needing to choose the right identity and then do a fair bit of algebra. I actually worked back from the left hand side of the given answer to guess the right identity to use, then worked it forwards.

Question 5

What a rubbish question! All the difficulty comes from having to do various arithmetic calculations which is neither interesting nor a particularly good test of a candidate's mathematical ability. Definitely one of my least favourite questions.

Question 6

On the other hand, this is a great question! The maths works out neatly, and there's a nice difficulty progression.

Question 7

This is a nice question, and not too tricky. Just working through the algebra doesn't give any indication as to why the restriction on the value of a is required. Neither of the sketches are too bad, and just need consideration of the important points.

Question 8

This is a little too algebra heavy for my taste. The first part has come up a few times, in 1995 STEP III Q4 and 1996 STEP I Q6. The final part requires a few different techniques and knowing what terms are "small" and so can be ignored.

Question 9

What a strange universe this is! None of the algebra is too bad, but keeping track of the various constants and variables and what they represent is important.

Question 10

A bit harder than the standard STEP 1D collisions question, with the multiple collisions and finding the kinetic energy loss, but even then it's just a case of following standard methods, just applying them in a more difficult context than previously.

Question 11

A question which on the surface looks to be a circular motion question, but is really about projectiles (and, later, geometry!). I like the final part in particular – the hint giving just enough of a nudge in the right direction.

Question 12

This is a pretty standard conditional probability question, and possibly even a little easy for STEP II. The second part requires a little bit of parsing, but once you've got the idea it's pretty quick.

Question 13

The hardest bit here is working out the distribution of R . Once you've got that, the rest is just pretty standard integration. Realising that, by symmetry, you can just consider the case $k < \frac{1}{2}$ does make things easier.

Question 14

This is one of those questions that if you figure out how to do it, it's pretty easy. Working out that the only possible strategies are just stopping when you roll a certain number of higher then makes all the maths easy to work out.