

## STEP II, 2007, Q14 MS

**Q14** The pdf sketch in (i) consists of three (actually, five – don't forget to indicate clearly the zero bits!) pieces. Then, equating expressions for the endpoints of these pieces, which are defined in two different ways, immediately gives  $a$  and  $b$  in terms of  $k$ . After this, equating the total area under this graph to 1 (total probability) then gives the exact value of  $k$ , and hence  $a$  and  $b$  also. This is the bulk of the question done, and most of it is really pure mathematical content.

The last part is similar in content, requiring – in statistical terms – only the observation that  $m$  is given by  $\int_1^m f(x) = \frac{1}{2}$ . Now, it is not immediately clear which piece of the function that  $m$  lies in, so a little bit of justification needs to be given to explain the relevance of any subsequent working that you give. Some fairly simple approximations for  $e$  should enable you to show that  $m$  is **not** in the first piece but **is** in the second.

**Answers:** (ii)  $a = 2 \ln k$ ,  $b = \frac{\ln k}{2k}$ ;  $k = e^{1/3}$ ,  $a = \frac{2}{3}$ ,  $b = \frac{1}{6} e^{-1/3}$ ; (iii)  $m = 3(e^{1/3} - 1/2)$ .



# NextStepMaths.com

To view mark schemes, fully worked solutions and examiner's comments, and for more details about tutoring and other services offered, go to [NextStepMaths.com](http://NextStepMaths.com)