STEP II, 2001, Q1

1 Use the binomial expansion to obtain a polynomial of degree 2 which is a good approximation to $\sqrt{(1-x)}$ when x is small.

(i) By taking $x = 1/100$, show that $\sqrt{(11)} \approx 79599/24000$, and estimate, correct to 1 significant figure, the error in this approximation. (You may assume that the error is given approximately by the first neglected term in the binomial expansion.)

(ii) Find a rational number which approximates $\sqrt{(1111)}$ with an error of about 2×10^{-12}.