Edexcel C4 June 2013 (R)

4. (a) Find the binomial expansion of

$$\sqrt[3]{(8-9x)}, \qquad |x| < \frac{8}{9}$$

in ascending powers of x, up to and including the term in x^3. Give each coefficient as a simplified fraction.

(6)

(b) Use your expansion to estimate an approximate value for $\sqrt[3]{7100}$, giving your answer to 4 decimal places. State the value of x, which you use in your expansion, and show all your working.

(3)

$$\sqrt[3]{8-9x}$$

$$= 8^{\frac{1}{3}}\left(1-\frac{9x}{8}\right)^{\frac{1}{3}}$$

$$\approx 2\left(1+\frac{1}{3}\left(-\frac{9x}{8}\right)+\frac{\left(\frac{1}{3}\right)\left(-\frac{2}{3}\right)\left(-\frac{9x}{8}\right)^2}{2}+\frac{\left(\frac{1}{3}\right)\left(-\frac{2}{3}\right)\left(-\frac{5}{3}\right)\left(-\frac{9x}{8}\right)^3}{6}\right)$$

$$= 2-\frac{3x}{4}-\frac{9x^2}{32}-\frac{45x^3}{256}$$

$$\sqrt[3]{7100}$$

$$= \sqrt[3]{1000\times 7.1}$$

$$= 10\times\left(8-9\times\frac{1}{10}\right)^{\frac{1}{3}}$$

$$\approx 10\left(2-\frac{3}{4}\times\frac{1}{10}-\frac{9}{32}\times\left(\frac{1}{10}\right)^2-\frac{45}{256}\times\left(\frac{1}{10}\right)^3\right)$$

$$\approx 19.2201$$