2015 **13 b** Consider the binomial expansion $(2x + \frac{1}{3x})^{18} = a_0x^{18} + a_1x^{16} + a_2x^{14} + \ldots$

where a_0, a_1, a_2, … are constants.

(i) Find an expression for a_2. **2**

(ii) Find an expression for the term independent of x. **2**

(i) $$(2x + \frac{1}{3x})^{18} = \ldots + {}^{18}C_2\,(2x)^{16}\left(\frac{1}{3x}\right)^2 + \ldots$$

$$= \ldots + {}^{18}C_2\,2^{16}\left(\frac{1}{3}\right)^2 x^{14} + \ldots$$

$$\therefore a_2 = {}^{18}C_2\,2^{16}\left(\frac{1}{3}\right)^2$$

State Mean: **1.49**

(ii) $$T_{k+1} = {}^{18}C_k\,(2x)^{18-k}\left(\frac{1}{3x}\right)^k$$

$$x^{18-k} \times x^{-k} = x^0$$

$$x^{18-k} = x^0$$

$$18 - 2k = 0$$

$$k = 9$$

Substitute in ${}^{18}C_k\,(2x)^{18-k}\left(\frac{1}{3x}\right)^k$:

$${}^{18}C_9\,(2x)^9\left(\frac{1}{3x}\right)^9 = {}^{18}C_9\,2^9\left(\frac{1}{3}\right)^9$$

State Mean: **1.57**

* These solutions have been provided by *projectmaths* and are not supplied or endorsed by BOSTES.

Board of Studies: Notes from the Marking Centre

(b)(i)
Many candidates recognised and used terms of a binomial expansion, in particular the general term to help solve this question.

Common problems were:
- calculating the incorrect term, such as the second term
- using k = 3 instead of k = 2 in their expressions
- not recognising that only the coefficient was required.

(ii)
Some candidates who could not complete (i) had some success in this part.