Summations (Standard Formulae) (From OCR 4725)

Q1, (Jun 2006, Q4)

Use the standard results for $\sum_{r=1}^{n} r^3$ and $\sum_{r=1}^{n} r^2$ to show that, for all positive integers n,

$$\sum_{r=1}^{n}(r^3 + r^2) = \tfrac{1}{12}n(n+1)(n+2)(3n+1).$$ [5]

Q2, (Jan 2007, Q3)

Use the standard results for $\sum_{r=1}^{n} r$ and $\sum_{r=1}^{n} r^3$ to find

$$\sum_{r=1}^{n} r(r-1)(r+1),$$

expressing your answer in a fully factorised form. [6]

Q3, (Jun 2008, Q5)

Find $\sum_{r=1}^{n} r^2(r-1)$, expressing your answer in a fully factorised form. [6]

Q4, (Jun 2011, Q4)

Find $\sum_{r=1}^{2n}(3r^2 - \tfrac{1}{2})$, expressing your answer in a fully factorised form. **[6]**

Q5, (Jun 2012, Q4)

Find $\sum_{r=1}^{n}(3r^2 - 3r + 2)$, expressing your answer in a fully factorised form. **[7]**

Q6, (Jun 2013, Q5)

Find $\sum_{r=1}^{n}(4r^3 - 3r^2 + r)$, giving your answer in a fully factorised form. **[6]**

Q7, (Jun 2014, Q8)

(i) Show that $\sum_{r=n}^{2n} r^3 = \tfrac{3}{4}n^2(n+1)(5n+1)$. **[4]**

(ii) Hence find $\sum_{r=n}^{2n} r(r^2-2)$, giving your answer in a fully factorised form. **[5]**

Q7, (Jun 2016, Q1)

Find $\sum_{r=1}^{n}(3r+1)(r-1)$, giving your answer in a fully factorised form. **[5]**

Q8, (Jun 2017, Q1)

Find $\sum_{r=1}^{n}(r^2 - r - 8)$, giving your answer in a fully factorised form. **[5]**
