Summations (Standard Formulae) MS (From OCR 4725)

Q1, (Jun 2006, Q4)

$\Sigma r^3 + \Sigma r^2$	M1		Consider the sum as two separate parts
$\Sigma r^2 = \frac{1}{6}n(n+1)(2n+1)$	A1		Correct formula stated
$\Sigma r^3 = \frac{1}{4}n^2(n+1)^2$	A1		Correct formula stated
$\frac{1}{12}n(n+1)(n+2)(3n+1)$	M1		Attempt to factorise and simplify or expand both expressions
	A1	5	Obtain given answer correctly or complete verification
		5	

Q2, (Jan 2007, Q3)

	M1		Expand to obtain $r^3 - r$
	M1		Consider difference of two standard results
$\frac{1}{4}n^2(n+1)^2 - \frac{1}{2}n(n+1)$	A1		Obtain correct unfactorised answer
	M1		Attempt to factorise
	A1		Obtain factor of $\frac{1}{4}n(n+1)$
$\frac{1}{4}n(n-1)(n+1)(n+2)$	A1	6	Obtain correct answer
		6	

Q3, (Jun 2008, Q5)

	M1	Express as difference of two series
	M1	Use standard results
$\frac{1}{4}n^2(n+1)^2 - \frac{1}{6}n(n+1)(2n+1)$	**A1**	Correct unsimplified answer
	M1	Attempt to factorise
	A1	At least factor of $n(n+1)$
$\frac{1}{12}n(n+1)(3n+2)(n-1)$	**A1**	Obtain correct answer
	6	

Q4, (Jun 2011, Q4)

$3\times\frac{1}{6}\times 2n(2n+1)(4n+1)-\frac{1}{2}\times 2n$

$2n^2(4n+3)$

M1		Express as sum of two series
A1 A1		Each term correct a.e.f.
M1		Attempt to factorise
A2	**6**	Completely correct answer, (A1 if one factor not found)

6

Q5, (Jun 2012, Q4)

$\frac{1}{2}n(n+1)(2n+1)-\frac{3}{2}n(n+1)+2n$

$n(n^2+1)$

M1	Express as sum of 3 series
M1	Use standard series results, at least 1 correct
A1	Two terms correct
A1	Third term correct
M1	Obtain factor of n
A2	Obtain correct answer c.a.o.
	Allow A1 for $\frac{1}{2(2n^2+2)}$
[7]	

Q6, (Jun 2013, Q5)

$4\times\frac{1}{4}n^2(n+1)^2-3\times\frac{1}{6}n(n+1)(2n+1)+\frac{1}{2}n(n+1)$

$n^3(n+1)$

M1	Express as sum of three series
A1	Obtain 2 correct (unsimplified) terms
A1	Obtain correct 3rd (unsimplified) term
M1	Attempt to factorise, at least factor of n
A2	Obtain correct answer, A1 if not fully factorised
[6]	

Q7, (Jun 2014, Q8)

(i)	M1	Difference of sum to $2n$ and $n-1$	
	A1	Correct unsimplified answer	$\frac{1}{4}(2n)^2(2n+1)^2-\frac{1}{4}(n-1)^2n^2$
	M1	Sensible attempt to factorise, at least factor n^2	
	A1	Obtain **given** answer no errors seen	
	[4]		
(ii)	M1	Difference of **(i)** and another standard result	
	M1	Difference of $\sum_1^{2n}r-\sum_1^{k}r$ for $k=n-1$ or n	$\frac{1}{2}(2n)(2n+1)-\frac{1}{2}n(n-1)$
	A1	Obtain complete unsimplified expression	(i) - 2 x above
	M1	Sensible attempt to factorise, at least factor $n(n+1)$	
¾ $n(n+1)^2(5n-4)$	A1	Obtain correct answer	$(n+1)(n+1)$ is OK for $(n+1)^2$
	[5]		

Q7, (Jun 2016, Q1)

$\frac{1}{2}n(n+1)(2n+1)-n(n+1)-n$

$\frac{1}{2}n(2n+3)(n-1)$ or $n(n+\frac{3}{2})(n-1)$

M1*	Expand and attempt to use standard series, at least one used correctly
A1	Any two terms correct, may be unsimplified
A1	All terms correct
DM1	Attempt to find 3 factors
A1	Obtain correct answer
[5]	

Q8, (Jun 2017, Q1)

	M1	Use at least 2 correct standard results, must have 3 terms
$\frac{1}{6}n(n+1)(2n+1)-\frac{1}{2}n(n+1)-8n$	A1	Obtain correct unsimplified answer
	M1	Attempt to factorise, must get at least a factor of n and simplify
$\frac{1}{6}n(2n^2-50)$	A1	Obtain correct answer
$\frac{1}{3}n(n-5)(n+5)$	A1	Obtain correct final answer
	[5]	