		NOTE: If they evaluate $\dfrac{d^2 S}{dx^2}$ it must be correct [= 42] An incorrect value is A0.	
(c)	M1	Uses **their** minimum value of x in the **given** expression, even if they identify $x = -2$ as the value giving a minimum S. If their minimum is not explicitly identified, then award M0. If they substitute both values without identifying which is which, award M0.	
	A1	For the correct value of S	

Question	Scheme	Marks
8(a)	$42 = \dfrac{4}{2}\left(2a + (4-1)d\right) \Rightarrow 42 = 4a + 6d$ oe $23 = a + 4d$ $\Rightarrow a = 3, \quad d = 5$ $n\text{th term} = 3 + (n-1)5 = 5n - 2 \Rightarrow S_n = \sum_{r=1}^{n}(5r - 2)$ $[P = 5, \ Q = 2]$	B1 B1 M1A1 M1A1 [6]
(b)	$S_{2n} - 3U_n = 1062$ $\Rightarrow \dfrac{2n}{2}\left(2 \times '3' + (2n-1)'5'\right) - 3\left['3' + (n-1)'5'\right] = 1062$ $\Rightarrow 10n^2 + n - 15n + 6 = 1062 \Rightarrow 10n^2 - 14n - 1056 = 0$ $10n^2 - 14n - 1056 = (5n + 48)(2n - 22) = 0$ $\Rightarrow n = 11$	M1 M1 M1 A1 [4]
		Total 10 marks

Part	Mark	Notes
(a)	B1	Forms a correct equation in *a* and *d* for **either** the sum of the first 4 terms or for the 5th term This must be correct.
	B1	Forms correct equations in *a* and *d* for **both** the sum of the first 4 terms and for the 5th term Both must be correct.
	M1	Solves their two equations simultaneously by any method. Accept a pair of equations as follows: $pa + qd = 21$ or 42 $ra + sd = 23$ where $p \neq r$ and $q \neq s$ Allow a maximum of one arithmetical error in the solution of their SE.
	A1	For **both** $a = 3$ and $d = 5$
	M1	Attempts to form the required expression using their values of *a* and *d* They must use the *n*th term for this.
	A1	For the correct expression as written. This must be exactly as written in the question with the inclusion of the $\sum$. However, allow the omission of $S_n = \ldots\ldots$
ALT for last 2 marks		
	M1	$$S_n = \sum_{r=1}^{n}(Pr - Q) \Rightarrow 3 = P - Q \quad 5 = (2P - Q) - (P - Q) = P$$ $$\Rightarrow 3 = 5 - Q \Rightarrow Q = 2$$
	A1	For the correct expression as written. This must be exactly as written in the question with the inclusion of the $\sum$. However, allow the omission of $S_n = \ldots\ldots$ Allow also $S_n = \sum_{r=1}^{n}(Pr - Q) \ (\Rightarrow) \ P = 5, Q = 2$ for this mark.
(b)	M1	Applies the summation formula and the *n*th term formula correctly to form an equation in *n* using their values for *a* and *d* For this mark you must see an equation, e.g., $$\frac{2n}{2}(2 \times 3 + (2n - 1)5) - 3[3 + (n - 1)5] = 1062$$ However, allow recovery in the next step.
	M1	Forms a 3TQ $\quad 10n^2 - 14n - 1056 = 0$ o.e. Condone missing $= 0$ if it is clear they are solving this equation.
	M1	Attempts to solve their 3TQ Accept any method. If their 3TQ is incorrect, only award this mark when you can see their method. If a calculator is used with an incorrect 3TQ and no method is seen, this mark is not available.