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11	**9d**	(i) Rationalise the denominator in the expression $\dfrac{1}{\sqrt{n}+\sqrt{n+1}}$, where n is an integer and $n \geq 1$. (ii) Using your result from part (i), or otherwise, find the value of the sum $\dfrac{1}{\sqrt{1}+\sqrt{2}} + \dfrac{1}{\sqrt{2}+\sqrt{3}} + \dfrac{1}{\sqrt{3}+\sqrt{4}} + \ldots + \dfrac{1}{\sqrt{99}+\sqrt{100}}$.	**1** **2**

(i) $\dfrac{1}{\sqrt{n}+\sqrt{n+1}} \times \dfrac{\sqrt{n}-\sqrt{n+1}}{\sqrt{n}-\sqrt{n+1}}$

$= \dfrac{\sqrt{n}-\sqrt{n+1}}{n-(n+1)}$

$= \dfrac{\sqrt{n}-\sqrt{n+1}}{-1}$

$= \sqrt{n+1}-\sqrt{n}$

(ii) From (i), $\dfrac{1}{\sqrt{n}+\sqrt{n+1}} = \sqrt{n+1}-\sqrt{n}$

State Mean:
0.75/1
0.30/2

$\therefore$ As $n = 1$, $\dfrac{1}{\sqrt{1}+\sqrt{2}} = \sqrt{2}-\sqrt{1}$

$n = 2$, $\dfrac{1}{\sqrt{2}+\sqrt{3}} = \sqrt{3}-\sqrt{2}$

$n = 3$, $\dfrac{1}{\sqrt{3}+\sqrt{4}} = \sqrt{4}-\sqrt{3}$

$\therefore$ series is $(\sqrt{2}-\sqrt{1}) + (\sqrt{3}-\sqrt{2})$

$+ (\sqrt{4}-\sqrt{3}) + \ldots + (\sqrt{100}-\sqrt{99})$

$= -\sqrt{1} + \sqrt{100}$

$= -1 + 10$

$= 9$

* These solutions have been provided by *projectmaths* and are not supplied or endorsed by the Board of Studies

Board of Studies: Notes from the Marking Centre

(i) This part was generally done well. A majority of candidates realised the need to multiply top and bottom by $\sqrt{n}-\sqrt{n+1}$. However, many then had difficulty with the algebra involved in simplifying the denominator. Most recognised a difference of two squares, but commonly wrote $\left(\sqrt{n}+\sqrt{n+1}\right)\left(\sqrt{n}-\sqrt{n+1}\right) = n-n+1$.

Common features were the omission of the initial working line for rationalising the denominator, illegible writing, poor use of the surd sign such as $\sqrt{n}+1$ for $\sqrt{n+1}$, and not putting brackets around the terms in the denominator when squaring them.

(ii) Many candidates did not connect parts (i) and (ii). Those who did easily completed the solution. A common error was to suppose the series to be either arithmetic or geometric and to spend time trying to test the series to find either a common difference or common ratio. A significant number of candidates who substituted the values for n into the correct expression from part (i) did not recognise the collapsing sum.

Source: http://www.boardofstudies.nsw.edu.au/hsc_exams/

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