13	12a	(i) Write $\sqrt{3}\cos x - \sin x$ in the form $2\cos(x + \alpha)$, where $0 < \alpha < \frac{\pi}{2}$.	1
		(ii) Hence, or otherwise, solve $\sqrt{3}\cos x = 1 + \sin x$, where $0 < \alpha < 2\pi$.	2

(i) $\sqrt{3}\cos x - \sin x = 2\cos(x + \alpha)$

Dividing through by 2:

$$\frac{\sqrt{3}}{2}\cos x - \frac{1}{2}\sin x = \cos(x + \alpha)$$

As $\cos \alpha = \frac{\sqrt{3}}{2}$, then $\alpha = \frac{\pi}{6}$

$$\therefore \sqrt{3}\cos x - \sin x = 2\cos(x + \frac{\pi}{6})$$

(ii) $\sqrt{3}\cos x = 1 + \sin x$

$$\sqrt{3}\cos x - \sin x = 1$$

$$2\cos(x + \frac{\pi}{6}) = 1$$

$$\cos(x + \frac{\pi}{6}) = \frac{1}{2}$$

$$x + \frac{\pi}{6} = \frac{\pi}{3}, \frac{5\pi}{3}$$

$$x = \frac{\pi}{6}, \frac{3\pi}{2}$$

State Mean:
0.75/1
1.44/2

* 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) Most candidates gained 1 mark by establishing the correct trigonometric relationship, enabling them to calculate $\alpha = \frac{\pi}{6}$.

Common problems were:

- providing answers which were negative
- providing answers in degrees.

(ii) Candidates who got the correct result in (a) (i) usually went on to gain the 2 marks by establishing the correct trig equation and solving it. Candidates who used an incorrect answer to part (i) and who demonstrated the relevant skills were not further penalised if they arrived at a correct solution for their incorrect α-value.

A common problem was:

- ignoring the given domain.

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