

Question	Scheme	Marks	AOs
13(a)	$R = \frac{\sqrt{5}}{2}$	B1	1.1b
	$\tan \alpha = \frac{1}{2} \Rightarrow \alpha = \dots$	M1	1.1b
	$\alpha = 0.464$	A1	1.1b
	$\theta = \frac{\sqrt{5}}{2} \sin(x + 0.464)$		
		(3)	
(b)	$\left(26 - \frac{\sqrt{5}}{2}\right)^\circ\text{C}$ or awrt $24.9^\circ\text{C}$	B1ft	2.2a
		(1)	
(c)	$\left(\frac{\pi t}{3} - 8\right) + 0.464 = \frac{7\pi}{2}$	M1	3.1b
	$t = 17.686\dots$	A1	1.1b
	17:42 or 5:42 pm or 17 hours 42 minutes after midnight	A1	3.2a
		(3)	
(d)	e.g. The "26" should be increased	B1	3.5c
		(1)	

**(8 marks)**

### Notes

(a)

B1:  $R = \frac{\sqrt{5}}{2}$  or the exact equivalent

M1: Proceeds to a value of  $\alpha$  from  $\tan \alpha = \pm \frac{1}{2}$  or  $\tan \alpha = \pm 2$  or  $\cos \alpha = \pm \frac{1}{"R"}$  or  $\sin \alpha = \pm \frac{\frac{1}{2}}{"R"}$

A1:  $\alpha =$  awrt  $0.464$

(b)

B1ft: Deduces the correct temperature. Follow through their  $R$  and condone lack of units here.

(c)

M1: A complete method to find a value of  $t$  from  $\left(\frac{\pi t}{3} - 8\right) + 0.464 = \alpha$  where  $\alpha$  is one of

$\frac{\pi}{2}, \frac{3\pi}{2}, \frac{7\pi}{2}, \frac{11\pi}{2}$

A1: For awrt 17.7 following a suitable equation

A1: Deduces the correct time

(d)

B1: For any suitable refinement that increases the mean temperature but does not change the variation of temperature