QUESTION NUMBER

13.(a) (i)

$g\left(\frac{\pi}{6}\right) = \frac{2\pi}{6}$

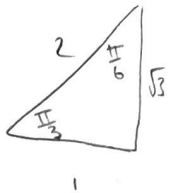
$= \frac{\pi}{3}$

$f(g(\frac{\pi}{6}))$

$= f(\frac{\pi}{3})$

$= 2\sin\frac{\pi}{3}$

$= \sqrt{3}.$



13.(a) (ii)

$f(g(x))$

$= f(2x)$

$= 2\sin 2x$

13.(b) (i)

$2\sin p = \frac{1}{3}$

$\sin p = \frac{1}{6}$

13.(b) (ii)

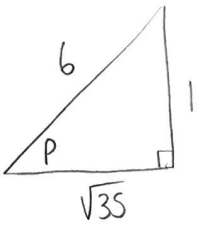
$f(g(p)) = 2\sin 2p$

$= 2(2\sin p\cos p)$

$= 4 \times \frac{1}{6} \times \frac{\sqrt{35}}{6}$

$= \frac{4\sqrt{35}}{36}$

$= \frac{\sqrt{35}}{9}.$



Question			Generic scheme	Illustrative scheme	Max mark
13.	(a)	(i)	$\bullet^1$ state exact value	$\bullet^1$ $\sqrt{3}$	**1**
		(ii)	$\bullet^2$ interpret notation $\bullet^3$ state expression for $f\left(g\left(x\right)\right)$	$\bullet^2$ $f\left(2x\right)$ or $2\sin\left(g\left(x\right)\right)$ $\bullet^3$ $2\sin 2x$	**2**
Notes:					
1. For $f\left(g\left(x\right)\right)=2\sin 2x$ without working, award both $\bullet^2$ and $\bullet^3$. 2. Working for (a)(ii) may be found in (a)(i)					
Commonly Observed Responses:					
Candidate A (a)(ii) $f\left(g\left(x\right)\right)=4\sin x$ $\bullet^2$ ✗ $\bullet^3$ ✓$_1$				**Candidate B - Beware of "2 attempts"** $f\left(g\left(x\right)\right)=2\sin x$ $\bullet^2$ ✗ $\bullet^3$ ✗ $f\left(2x\right)=2\sin 2x$	
	(b)	(i)	$\bullet^4$ find the value of $\sin p$	$\bullet^4$ $\frac{1}{6}$	**1**
		(ii)	$\bullet^5$ expand $f\left(g\left(p\right)\right)$ using double angle formula $\bullet^6$ find value of $\cos p$ $\bullet^7$ substitute and determine exact value	$\bullet^5$ $2\times 2\sin p\cos p$ or $4\sin p\cos p$ **stated explicitly** $\bullet^6$ $\frac{\sqrt{35}}{6}$ $\bullet^7$ $2\times 2\times\frac{1}{6}\times\frac{\sqrt{35}}{6}$ leading to $\frac{\sqrt{35}}{9}$	**3**
Notes:					
1. $\bullet^5$ is not available for expansions which do not involve p. $\bullet^6$ and $\bullet^7$ are still available. However, accept $\sin^{-1}\left(\frac{1}{6}\right)$ in place of p - see Candidate C. 2. $\bullet^7$ is only available as a consequence of substituting into a valid formula from $\bullet^5$. 3. Do not penalise trigonometric ratios which are less than −1 or greater than 1 throughout this question.					
Commonly Observed Responses:					
Candidate C $f\left(g\left(p\right)\right)=4\sin\left(\sin^{-1}\left(\frac{1}{6}\right)\right)\cos\left(\sin^{-1}\left(\frac{1}{6}\right)\right)$ $\bullet^5$ ✓ $4\times\frac{1}{6}\times\frac{\sqrt{35}}{6}$ $\bullet^6$ ✓ $\frac{\sqrt{35}}{9}$ $\bullet^7$ ✓					

[END OF MARKING INSTRUCTIONS]