Question	Answer	Marks	Guidance
3(c)	Discriminant of $\mathrm{q}(x) = 3^2 - 4\times6\times3$ $= -63$ which is < 0	**M1**	For calculation of discriminant and confirmation that it is < 0
	$\mathrm{q}(x) = 0$ has no real solutions hence $\mathrm{p}(x) = 0$ has only one real solution	**A1**	For a correct conclusion from correct work.
4	$(a+x)^3 = a^3 + 3a^2x + 3ax^2\left[+x^3\right]$	**B1**	
	$\left(1-\frac{x}{3}\right)^5 = 1 - \frac{5}{3}x + \frac{10}{9}x^2 \ldots$	**2**	**M1** allow one sign error or one arithmetic slip
	$a^3 = 27, \quad a = 3$	**B1**	
	Term in x: $3a^2 - \frac{5}{3}a^3 = b$	**M1**	For multiplying *their* terms, must have sum of 2 relevant products = b
	$b = -18$	**A1**	
	Term in x^2 : $3a - \frac{5}{3}\left(3a^2\right) + \frac{10}{9}a^3 = c$	**M1**	For multiplying *their* terms, must have sum of 3 relevant products = c
	$c = -6$	**A1**	
5(a)	$\mathrm{f} \geqslant -4$	**2**	**M1** for a valid method to find the least value of $x^2 + 4x$ **A1** for $\mathrm{f} \geqslant -4$, $y \geqslant -4$ or $\mathrm{f}(x) \geqslant -4$
5(b)	$\mathrm{g} > 1$	**B1**	Allow $y > 1$ or $\mathrm{g}(x) > 1$
5(c)	$\left(1+\mathrm{e}^{2x}\right)^2 + 4\left(1+\mathrm{e}^{2x}\right)[=21]$	**M1**	
	$\mathrm{e}^{4x} + 6\mathrm{e}^{2x} - 16 = 0$ $\left(\mathrm{e}^{2x}+8\right)\left(\mathrm{e}^{2x}-2\right) = 0$	**M1**	**Dep** for quadratic in terms of e^{2x} and attempt to solve to obtain $\mathrm{e}^{2x} = k$
	$\mathrm{e}^{2x} = 2$ $x = \frac{1}{2}\ln k$	**M1**	**Dep** on both previous M marks, for attempt to solve $\mathrm{e}^{2x} = k$
	$x = \ln\sqrt{2}$ or $\ln 2^{\frac{1}{2}}$	**A1**	
6(a)(i)	720	**B1**	
6(a)(ii)	480	**B1**	

Question	Answer	Marks	Guidance
6(a)(iii)	[Starts with 6 or 8]: 192	**B1**	
	[Starts with 9]: 72	**B1**	
	Total = 264	**B1**	
	Alternative [Ends with 9]:48	**(B1)**	
	[Ends with 1,3 or 5]:216	**(B1)**	
	Total = 264	**(B1)**	
6(b)	$\frac{45n!}{(n-4)!4!} = \frac{(n+1)(n+1)!}{((n+1)-5)!5!}$	**B1**	
	$45 = \frac{(n+1)^2}{5}$ leading to $15 = n+1$ or $n^2+2n-224=0$	**M2**	**M1** for 15 **M1** for $n+1$ OR **M1** for $n^2+2n-224=0$ oe **M1** for $(n-14)(n+16)=0$
	$n=14$ only	**A1**	
7(a)(i)	110 (m)	**B1**	
7(a)(ii)		**B2**	**B1** for a line joining $(0,5)$ and $(10,5)$ **B1** for a line joining $(10,-2)$ and $(40,-2)$
7(b)(i)	$v = (2t+4)^{\frac{1}{2}}(+c)$	**M1**	For $k(2t+4)^{\frac{1}{2}}$
	$9 = 4 + c$	**M1**	**Dep** for attempt to find c using $v=9$ and $t=6$ in *their* v
	$(2t+4)^{\frac{1}{2}} + 5$	**A1**	