Year 1 – Week 13 Exam Questions

Mark Scheme

Question 1

Question			Answer	Mks
1			**DR**	
1	(i)		$(\sqrt{3})^7$ or $\sqrt{3^7}$ or $3^3 \times \sqrt{3}$ or $3\sqrt{243}$	M1
			$27\sqrt{3}$	A1
				[2]
1	(ii)		**DR**	
			$\frac{\sqrt{2}}{1-\sqrt{2}} \times \frac{1+\sqrt{2}}{1+\sqrt{2}}$	M1
			$= \frac{\sqrt{2}+2}{1-2}$ or $\frac{\sqrt{2}+2}{-1}$ or $\frac{\sqrt{2}+2}{1+\sqrt{2}-\sqrt{2}-2}$	A1
			$= -2 - \sqrt{2}$ ISW	A1
				[3]

Question 2

2	(i)		$3^2 - 4k = 0$	M1
			$k = \frac{9}{4}$ or 2.25	A1
				[2]
2	(ii)		$(3-x)(2+x) > 0$ or $(x-3)(x+2) < 0$	M1
			$-2 < x < 3$ or $3 > x > -2$ ISW	A1
			or $x \in (-2, 3)$	
				[2]

Question 3

Question			Answer	Mks
10	(i)		$\frac{3}{8} + \frac{5}{16} + 4p + p = 1$	M1
			$p = \frac{1}{16}$ or 0.0625	A1
				[2]
10	(ii)		$\frac{3}{8} \times \frac{5}{8}$ or $\frac{3}{8} \times \frac{3}{8}$ seen oe	M1
			$\frac{3}{8} \times \frac{5}{8} + \frac{5}{8} \times \frac{3}{8} + \frac{3}{8} \times \frac{3}{8}$ oe	M1
			$= \frac{39}{64}$ or 0.609 (3 sf))	A1
				[3]

Question 4

Question			Answer	Marks
1	(i)		$\frac{\sin x}{20} = \frac{\sin 45}{16}$	M1*
			$\sin x = \frac{20\sin 45}{16}$ $\left(= \frac{5\sqrt{2}}{8}\right)$	A1
				Dep*M1
			62.1 and 117.9	A1 [4]
1	(ii)		$\frac{1}{2}(BC)(20)\sin(45) = 75\sqrt{2}$	M1
			$(BC =)$ 15 (cm)	A1 [2]

Question 5

Question			Answer	Marks
2	(i)		$\frac{2}{3+x-4}$ or $\frac{2}{3+x+4}$	M1
			$y = \frac{2}{x-1}$	A1 [2]
	(ii)		Stretch	B1
			Scale factor $\frac{5}{2}$ parallel to the y -axis	B1 [2]

Question 6

Question			Answer	Marks
4	(i)		$4\left[x^2-3x\right]+11$	
			$4\left[\left(x-\frac{3}{2}\right)^2-\frac{9}{4}\right]+11$ $a=4$	B1
			$(x-3/2)^2$	B1
			$4\left(x-\frac{3}{2}\right)^2+2$ $c=2$	B1
				[3]
	(ii)		No real roots	B1
				[1]
	(iii)		$r=0 \Rightarrow 1$ real root or 1 repeated root	M1
			$r<0 \Rightarrow 2$ real roots	
			$r>0 \Rightarrow$ no real roots	A1
				[2]

Question 7

Question			Answer	Mks
7	(i)	(b)	$\mathbf{a}+\frac{1}{2}(\mathbf{c}-\mathbf{a})$ or $\mathbf{c}+\frac{1}{2}(\mathbf{a}-\mathbf{c})$	M1
			$=\frac{1}{2}(\mathbf{a}+\mathbf{c})$ or $\frac{1}{2}\mathbf{a}+\frac{1}{2}\mathbf{c}$	A1
				[2]
	(ii)		$\overrightarrow{OB}=(\mathbf{a}+\mathbf{c})$	M1
			$\Rightarrow \overrightarrow{OP}=\frac{1}{2}\overrightarrow{OB}$ Must see previous line	A1*
			$\Rightarrow P$ is midpt of OB	dep*
			or OPB is a straight line and $OP = PB$	A1
			Hence diagonals of //m bisect one another	E1
				[4]

Question 8

Question			Answer	Marks	AOs	Guidance
11	(i)	(a)	$18=\left(\frac{8+u}{2}\right)(9)$	M1	3.4	Use of $s=\left(\frac{u+v}{2}\right)t$
			$u=-4$ therefore the speed of P is 4 (m s^{-1})	A1 [2]	1.1	AG
	(i)	(b)	eg $8=-4+9a$	M1	3.4	Use of $v=u+at$ with their u **or** $s=vt-\frac{1}{2}at^2$ **or** $v^2=u^2+2as$ with their u **or** $s=ut+\frac{1}{2}at^2$ with their u
			$a=\frac{4}{3}$ (m s^{-2})	A1 [2]	1.1	Accept 1.33 or better

Question			Answer	Marks	AOs	Guidance
	(ii)		$0=-4+\frac{4}{3}t$	M1	3.1b	Use of $v=u+at$ with $v=0$ and their a and u
			$t=3$	A1	1.1	
			$-s_{\max}=-4t+\frac{1}{2}\left(\frac{4}{3}\right)t^2$	M1	3.4	Use of $s=ut+\frac{1}{2}at^2$ with their a, u & t
			$s_{\max}=6<10$ so P is never at B	A1 [4]	2.2a	Compare with 10 or suitable comment
		OR				
				M1		Use of $s=ut+\frac{1}{2}at^2$ with their u and a and suitable s
			$-10=-4t+\frac{1}{2}\left(\frac{4}{3}\right)t^2$	A1		
				M1		Consider b^2-4ac or attempt to solve three term quadratic in t
			e.g. det $=-24$ therefore not possible	A1		Or $36-60<0$ therefore not possible
		OR				
			$0=(\pm4)^2+2\left(\frac{4}{3}\right)s$ or $v^2=(\pm4)^2+2\left(\frac{4}{3}\right)(-10)$	M2		Use of $v^2=u^2+2as$ with their a and u and either $v=0$ or $s=\pm10$
			$s=-6$ or $v^2=-\frac{32}{3}$	A1		
			Suitable conclusion	A1		Dependent on previous A mark