Question	Scheme		Marks
6.(a)	$a = 4 \times (-0.5)$ and $b = 4 \times 0.5$		B1
			(1)
(b)(i)	$\sqrt{\dfrac{(2-(-2))^2}{12}} = \dfrac{2\sqrt{3}}{3} = 1.1547...$	awrt **<u>1.15</u>**	M1 A1
(ii)	$[\mathrm{P}(-\frac{2\sqrt{3}}{3} < W < \frac{2\sqrt{3}}{3}) =] \dfrac{\frac{2\sqrt{3}}{3} - (-\frac{2\sqrt{3}}{3})}{2-(-2)} = \dfrac{\sqrt{3}}{3} = 0.57735...$	awrt **<u>0.577</u>**	M1 A1
			(4)
(c)	$\mathrm{P}(W > 1.9) = \frac{2-1.9}{2-(-2)}\ [=0.025]$		M1
	$X \sim \mathrm{B}(100, 0.025)$		M1
	$\to \mathrm{Po}(2.5)\quad \mathrm{P}(X \geq 5) = 1 - \mathrm{P}(X \leq 4) = 1 - 0.8912 = 0.1088$	awrt **<u>0.109</u>**	M1 A1
			(4)
			Total 9

Question Number	Scheme		Marks
3(a)	$\dfrac{a+b}{2} = 6 \qquad \frac{1}{12}(b-a)^2 = 3$		B1
	$a+b=12$ and $b-a = \pm 6$ **or** $a^2 - 12a + 27 = 0$ **or** $b^2 - 12b + 27 = 0$		dM1
	$a = 3,\ b = 9$		A1
			(3)
(b)	$[\mathrm{P}(Y > 6 + \sqrt{3}) =]\ \dfrac{"9" - \left(6+\sqrt{3}\right)}{"9" - "3"}$		M1
	$= \dfrac{3-\sqrt{3}}{6}$ or $0.211(32...)$	awrt 0.211	A1
			(2)
(c)	$[\mathrm{F}(y) =] \begin{cases} 0 & y < 3 \\ \dfrac{y-3}{6} & 3 \leqslant y \leqslant 9 \\ 1 & y > 9 \end{cases}$		B1 B1
			(2)
			Total 7

3. A point is to be randomly plotted on the x-axis, where the units are measured in cm.

The random variable R represents the x coordinate of the point on the x-axis and R is uniformly distributed over the interval $[-5, 19]$

A negative value indicates that the point is to the left of the origin and a positive value indicates that the point is to the right of the origin.

(a) Find the exact probability that the point is plotted to the right of the origin.

(1)

(b) Find the exact probability that the point is plotted more than 3.5 cm away from the origin.

(2)

(c) Sketch the cumulative distribution function of R

(2)

Three independent points with x coordinates R_1, R_2 and R_3 are plotted on the x-axis.

(d) Find the exact probability that

(i) all three points are more than 10 cm from the origin

(3)

(ii) the point furthest from the origin is more than 10 cm from the origin.

(2)

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DO NOT WRITE

Question Number	Scheme	Marks
2. (a)	$\{E(X) = 8 \Rightarrow\}\ \dfrac{\beta+\alpha}{2} = 8$	B1
		[1]
(b)	$\{P(X \leqslant 13) = 0.7 \Rightarrow\}\{\text{or} \Rightarrow P(8 \leqslant X \leqslant 13) = 0.2\}$	
	$\dfrac{13-\alpha}{\beta-\alpha} = \dfrac{7}{10}$ or $\dfrac{\beta-13}{\beta-\alpha} = \dfrac{3}{10}$ or $\dfrac{13-8}{\beta-\alpha} = \dfrac{1}{5}$ or $\dfrac{13-8}{\beta-13} = \dfrac{0.2}{0.3} \Rightarrow \alpha =$ or $\beta =$	M1
	$\left.\begin{array}{r}\beta+\alpha=16\\ 7\beta+3\alpha=130\end{array}\right\}\ \beta = 20.5,\ \alpha = -4.5$ Either $\alpha = -4.5$ **or** $\beta = 20.5$	A1
	Both $\underline{\alpha = -4.5}$ **and** $\underline{\beta = 20.5}$	A1
		[3]
(c)	$\left\{\text{Var}(X) = \dfrac{(20.5 - -4.5)^2}{12}\right\}$ $\underline{\dfrac{625}{12}}$ or awrt $\underline{\mathbf{52.1}}$	B1 ft
		[1]
(d)	$\{P(5 \leqslant X \leqslant 35)\} = \dfrac{20.5-5}{20.5 - -4.5}\left\{= \dfrac{15.5}{25}\right\} = \dfrac{31}{50}$ $\underline{\dfrac{31}{50}}$ or $\underline{\mathbf{0.62}}$	M1 A1
		[2] 7

Question Number	Scheme		Marks
6(a)	$\frac{5-2}{b-a}=\frac{3}{16}$ oe or $1-\left(\frac{2-a}{b-a}+\frac{b-5}{b-a}\right)=\frac{3}{16}$ oe	$\frac{5-a}{b-a}=\frac{3}{16}$ oe	M1
	$\frac{a+b}{2}=6$ oe		M1
	$a=-2$ and $b=14$	$a=4.4$ and $b=7.6$	A1
			(3)
(b)	$[c\mathrm{E}(X)+1=3\Rightarrow]6c+1=3$		M1
	$c=\frac{1}{3}$		A1
			(2)
(c)	$\left[\mathrm{Var}X=\frac{(b-a)^2}{12}=\right]\frac{64}{3}$ oe	$\left[\mathrm{Var}X=\frac{(b-a)^2}{12}=\right]\frac{64}{75}$ oe	B1ft
			(1)
(d)	$\mathrm{E}(X^2)="\left(\frac{64}{3}\right)"+6^2=\frac{172}{3}$ or	$\mathrm{E}(X^2)="\left(\frac{64}{75}\right)"+6^2=\frac{2764}{75}$	M1A1
			(2)
(e)	$\mathrm{P}\left(\frac{3}{2}X-b>a\right)\Rightarrow\mathrm{P}(X>8)=\frac{3}{8}$	$\mathrm{P}\left(\frac{3}{2}X-b>a\right)\Rightarrow\mathrm{P}(X>8)=0$	M1A1
			(2)
	Notes		**Total 10**

Question Number	Scheme		Marks
7 (a)	$\mathrm{P}(L\geqslant 4.5)\Rightarrow\mathrm{P}(A\geqslant 20.25)$		
	$\mathrm{P}(A\geqslant 20.25)=(30-20.25)\times\frac{1}{20}$		M1
	$=0.4875$		A1
			(2)
(b)	$\mathrm{Var}(L)=\mathrm{E}(L^2)-\mathrm{E}(L)^2$		
	$[\mathrm{E}(L^2)=\mathrm{E}(A)]=20$		B1
		$\mathrm{g}(L)=\begin{cases}\frac{L}{10} & \sqrt{10}\leqslant L\leqslant\sqrt{30}\\ 0 & \text{otherwise}\end{cases}$	
	$\mathrm{E}(L)=\mathrm{E}(\sqrt{A})=\frac{1}{20}\int_{10}^{30}\sqrt{a}\,\mathrm{d}A$	$\mathrm{E}(L)=\frac{1}{10}\int_{\sqrt{10}}^{\sqrt{30}}L^2\,\mathrm{d}L$	M1
	$=\frac{1}{20}\left[\frac{2}{3}a^{\frac{3}{2}}\right]_{10}^{30}$	$\frac{1}{10}\left[\frac{l^3}{3}\right]_{\sqrt{10}}^{\sqrt{30}}$	A1
	$=4.4231\ldots$		A1
	$\mathrm{Var}(L)="20"-("4.4231...")^2$		M1
	$=0.4358\ldots$ awrt 0.436		A1
			(6)
	Notes		**Total 8**

Question Number	Scheme	Marks
3(a)	$\frac{3}{4}$	B1
		(1)
(b)	$\mathrm{E}(T)=\dfrac{50+2k}{2}[=25+k]$	B1
	$\mathrm{Var}(T)=\dfrac{(4k)^2}{12}\left[=\dfrac{4k^2}{3}\right]$	B1
	$\mathrm{E}\left(T^2\right)=\dfrac{4k^2}{3}+\left(25+k\right)^2$	M1
	$\dfrac{7k^2}{3}+625+50k=918.76$	
	$7k^2+150k-881.28=0$	dM1
	$k=\frac{-150\pm\sqrt{150^2+4\times7\times881.28}}{14}$	dM1
	$k=4.8$ oe only	A1
		(6)
(c)	$\mathrm{P}(T<25)=\frac{1}{4}$	B1
	B(50, 0.25)	
	$\mathrm{P}\left(X\geq 20\right)=1-\mathrm{P}\left(X\leq 19\right)$	M1
	$=1-0.9861$	
	$=0.0139$ awrt 0.0139	A1
		(3)
		Total 10

Question	**Scheme**	**Marks**
3. (a)	$[\mathrm{f}(d)=]\begin{cases}\frac{1}{5} & -2.5\leq d\leq 2.5\\ 0 & \text{otherwise}\end{cases}$	B1 B1 (2)
(b)	$\sqrt{\dfrac{(2.5-(-2.5))^2}{12}}=1.4433...$ **awrt <u>1.44</u>**	M1 A1 (2)
(c)	0	B1 (1)
(d)	$\left[\dfrac{1-(-1)}{5}\right]=\dfrac{2}{5}$	B1 (1)
(e)	X~B(10, ‘0.4’) $[\mathrm{P}(X\geq 6)=]1-\mathrm{P}(X\leq 5)=1-0.8338=0.1662$ **awrt <u>0.166</u>**	M1 M1 A1 (3) **Total 9**

Question Number	Scheme		Marks
5(a)	$\frac{(a+6)^2}{12}=27$		M1
	$a=\sqrt{27\times12}-6\Rightarrow 12$* or $a^2+12a-288=0\Rightarrow a=12$*		A1*
			(2)
(b)(i)	$\frac{12-b}{18}=\frac{3}{5}$ or $\frac{b+6}{18}=\frac{2}{5}$		M1
	$b=1.2$		A1
			(2)
(ii)	$\text{P}(-6<W<\text{"0.6"})=\frac{\text{"0.6"}+6}{18}$		M1
	$=\frac{11}{30}$ or $0.3666\ldots$		A1ft
			(2)
(c)	Let C be the point where the wood is cut and x is the distance AC		
	$\frac{x}{2}$ and $\left(\frac{160-x}{2}\right)$	$L+W=80$ and $LW=975$	M1
	$\frac{x}{2}\times\left(\frac{160-x}{2}\right)=975\ \Rightarrow x=30$ or 130	$L(80-L)=975\Rightarrow L=15$ or 65	M1
	$\text{P}(\text{"30"}<x<\text{"130"})=\frac{\text{"130"}-\text{"30"}}{160}\left[=\frac{5}{8}\right]$ oe	$\text{P}(\text{"15"}<x<\text{"65"})=\frac{\text{"65"}-\text{"15"}}{80}\left[=\frac{5}{8}\right]$ oe	dM1
	$=\frac{5}{8}$ oe		A1
			(4)
	Notes		**Total 10**