Solution	Marks
1. Since $P(A\cup B) = P(A)+P(B)-P(A\cap B)$	1M
and $P(A\cap B) = P(A)P(B)$	1M
$\therefore$ $0.7 = 0.4 + P(B) - 0.4P(B)$	1A
$P(B) = 0.5$	1A
	---------(4)
2. (a) Since $u = e^{2x}$, $\therefore$ $\frac{du}{dx} = 2e^{2x}$.	1A
$\frac{dy}{dx} = \frac{dy}{du}\cdot\frac{du}{dx} = \left(\frac{1}{u}-2u\right)\cdot 2u = 2-4u^2 = 2-4e^{4x}$	1M+1A 1M for $\left(\frac{1}{u}-2u\right)\cdot 2u$
$\frac{dy}{dx} = \frac{dy}{du}\cdot\frac{du}{dx} = \left(\frac{1}{u}-2u\right)\cdot 2e^{2x} = \left(\frac{1}{e^{2x}}-2e^{2x}\right)\cdot 2e^{2x} = 2-4e^{4x}$	[1M]+[1A]
$y = \ln u - u^2 + c$ $y = \ln e^{2x} - (e^{2x})^2 + c$ $y = 2x - e^{4x} + c$	[1M]
$\frac{dy}{dx} = 2-4e^{4x}$	[1A] f.t.
(b) Using (a), $y = \int (2-4e^{4x})dx$	1M
$= 2x - e^{4x} + c$ for some constant c.	
Putting $x = 0$ and $y = 1$, we have $c = 2$.	
$\therefore$ $y = 2x - e^{4x} + 2$	1A
	---------(5)
3. (a) $a = 8$, $b = 6$, $c = 5$ [$a = 8$, $b = 7$, $c = 5$]	1A+1A 1A for anyone correct 1A for all (award 1A for a=18, b=36[37], c=65)

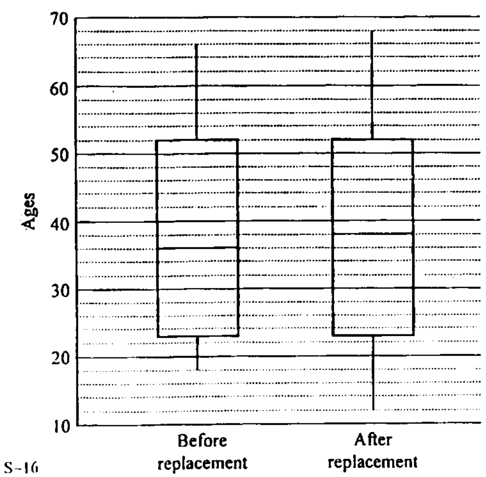
(b)

	Min	Q_1	Median	Q_3	Max
Before replacement	18	23 [22.75]	36	52	66
After replacement	12	23 [22.75]	38	52	68

1A
1A

Using $a = 8$, $b = 7$, $c = 5$ will give

	Min	Q_1	Q_2	Q_3	Max
Before	18	22.75	36	52	66
After	12	22.75	36.5	52	68



1M any box-and-whisker diagram with correct scale

1A all correct, same scale

---------(6)

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Solution	Marks
4. (a) $(1+ax)^{-\frac{1}{n}} = 1+\left(-\frac{1}{n}\right)(ax)+\frac{1}{2}\left(-\frac{1}{n}\right)\left(-\frac{1}{n}-1\right)(ax)^2+\cdots$	1M+1A 1M for any 2 terms correct
$= 1-\frac{a}{n}x+\frac{(n+1)a^2}{2n^2}x^2+\cdots$	
Solving $\frac{a}{n} = \frac{4}{3}$ and $\frac{(n+1)a^2}{2n^2} = \frac{32}{9}$, we have	1M (1A for anyone if the first two rows are omitted)
$9(n+1)\left(\frac{4n}{3}\right)^2 = 64n^2$	
$n+1 = 4$	
$n = 3$ and $a = 4$	1A+1A
(b) The expansion is valid for $-\frac{1}{4} < x < \frac{1}{4}$. [$\lvert x\rvert < \frac{1}{4}$]	1M
	---------(6)

5. (a)

t	0	1.5	3	4.5	6
R	8	7.88177	7.54717	7.04846	6.45161

Solution	Marks
	1M correct to 4 d.p.
$\int_0^6 R\,dt \approx \frac{1.5}{2}[8+6.45161+2(7.88177+7.54717+7.04846)]$	1M
≈ 44.5548	1A
$\therefore$ The total bonus for the first 6 months is 44.5548 thousand dollars.	
(b) $\frac{dR}{dt} = \frac{-2400t}{(t^2+150)^2}$	1A
$\frac{d^2R}{dt^2} = \frac{7200(t^2-50)}{(t^2+150)^3}$	1A
< 0 for $0 < t < 6$	
$\therefore$ The graph of R is concave downward in the interval $0 \le t \le 6$.	
The approximation in (a) is an underestimate.	1M
	---------(6)

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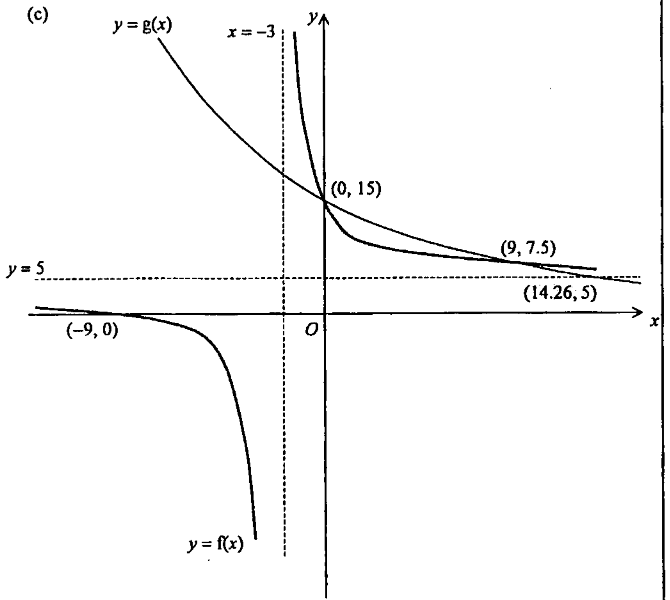
Solution	Marks
6. (a) The probability that the heaviest student is in the selection	
$= \dfrac{C_2^9}{C_3^{10}}$	1M denominator, maybe awarded in (b) or (c) below 1M numerator
$= C_1^3\left(\dfrac{1}{10}\right)$	1M C_1^3 1M $\dfrac{1}{10}$
$= 1-\dfrac{9}{10}\cdot\dfrac{8}{9}\cdot\dfrac{7}{8}$	1M denominator 1M numerator with fraction subtracted by 1
$= \dfrac{3}{10}$ $\boxed{0.3}$	1A
(b) The probability that the heaviest one out of the 3 selected students is the 4 th heaviest among the ten students	
$= \dfrac{C_2^6}{C_3^{10}}$	1M numerator
$= C_1^3\left(\dfrac{1}{10}\right)\left(\dfrac{6}{9}\right)\left(\dfrac{5}{8}\right)$	1M for $\left(\dfrac{1}{10}\right)\left(\dfrac{6}{9}\right)\left(\dfrac{5}{8}\right)$
$= \dfrac{1}{8}$ $\boxed{0.125}$	1A
(c) The probability that the 2 heaviest student are not both selected	
$= 1-\dfrac{C_1^8}{C_3^{10}}$	1M for numerator and probability subtracted by 1
$= \left(\dfrac{8}{10}\right)\left(\dfrac{7}{9}\right)\left(\dfrac{6}{8}\right)+C_1^3\left(\dfrac{2}{10}\right)\left(\dfrac{8}{9}\right)\left(\dfrac{7}{8}\right)$	1M Sum of the two cases
$= \dfrac{14}{15}$ $\boxed{0.9333}$	1A a–1 for r.t. 0.933
	---------(7)
7. (a) The required probability	
$= \dfrac{0.39\times0.58}{0.48\times0.65+0.39\times0.58+0.13\times0.5}$	1A numerator 1A denominator
$= 0.375$ (p)	1A
(b) The required probability	
$= C_2^5(0.375)^2(1-0.375)^3$	1M binomial, for any p 1M $C_2^5p^2(1-p)^3$, for p in (a)
$= 0.3433$	1A a–1 for r.t. 0.343 ---------(6)

Solution	Marks
8. (a) (i) Since $G(0)=9$, $\therefore\ 2a-12+(a+12)=9$ $a=3$	1
(ii) $G(x)=6-12e^{-kx}+15e^{-2kx}$ $G'(x)=12ke^{-kx}-30ke^{-2kx}$ $=6ke^{-kx}(2-5e^{-kx})$	1A
$G'(x)=0$ when $e^{-kx}=\dfrac{2}{5}$ or $x=\dfrac{1}{k}\ln\dfrac{5}{2}$ $\boxed{\dfrac{0.9163}{k}}$	1A
and $G'(x)\begin{cases}<0 & \text{when } 0\le x<\dfrac{1}{k}\ln\dfrac{5}{2}\\ >0 & \text{when } x>\dfrac{1}{k}\ln\dfrac{5}{2}\end{cases}$	1M
$\therefore$ $G(x)$ is minimum when $e^{-kx}=\dfrac{2}{5}$.	
$G''(x)=-12k^2e^{-kx}+60k^2e^{-2kx}$ When $e^{-kx}=\dfrac{2}{5}$, $G''(x)=\dfrac{24}{5}k^2>0$ Since $G(x)$ has only one stationary point for $x\ge0$, $G(x)$ is minimum when $e^{-kx}=\dfrac{2}{5}$.	$\boxed{1M}$
(ii) $G(x)=6-12e^{-kx}+15e^{-2kx}$ $=15(e^{-2kx}-\dfrac{4}{5}e^{-kx})+6$ $=15(e^{-kx}-\dfrac{2}{5})^2+\dfrac{18}{5}$ $G(x)$ is minimum when $e^{-kx}=\dfrac{2}{5}$.	$\boxed{1M}+\boxed{1A}$ $\boxed{1M}$
The minimum CDO $=\left[6-12\left(\dfrac{2}{5}\right)+15\left(\dfrac{2}{5}\right)^2\right]$ mg/L $=3.6$ mg/L	1A f.t. ---------(5)
(b) (i) Solving $G(x)=4.5$, we have $6-12e^{-kx}+15e^{-2kx}=4.5$ $10(e^{-kx})^2-8e^{-kx}+1=0$	1M
$e^{-kx}=\dfrac{4\pm\sqrt{6}}{10}$ $x=-\dfrac{1}{k}\ln\dfrac{4\pm\sqrt{6}}{10}$	1A
Hence $-\dfrac{1}{k}\ln\dfrac{4-\sqrt{6}}{10}+\dfrac{1}{k}\ln\dfrac{4+\sqrt{6}}{10}=2.85$	1M+1A
$\dfrac{1}{k}\ln\dfrac{4+\sqrt{6}}{4-\sqrt{6}}=2.85$ $k\approx0.5$ (1 d.p.)	1A

Solution	Marks
(ii) $G'(x)=6e^{-0.5x}-15e^{-x}$ [$12ke^{-kx}-30ke^{-2kx}$]	
$G''(x)=-3e^{-0.5x}+15e^{-x}$ [$-12k^2e^{-kx}+60k^2e^{-2kx}$]	1M
$\quad =3e^{-0.5x}(5e^{-0.5x}-1)$ [$12k^2e^{-kx}(5e^{-kx}-1)$]	
$G''(x)=0$ when $x=-\frac{1}{0.5}\ln\frac{1}{5}$ (≈ 3.2) [$x=-\frac{1}{k}\ln\frac{1}{5}$]	
and $G''(x)\begin{cases}<0 & \text{when } x>-\frac{1}{0.5}\ln\frac{1}{5} \quad \left[x>-\frac{1}{k}\ln\frac{1}{5}\right]\\ >0 & \text{when } 0\le x<-\frac{1}{0.5}\ln\frac{1}{5} \quad \left[0\le x<-\frac{1}{k}\ln\frac{1}{5}\right]\end{cases}$	1M
[$G'''(x)=1.5e^{-0.5x}(1-10e^{-0.5x})$ [$12k^3e^{-kx}(1-10e^{-kx})$]	
When $e^{-kx}=\frac{1}{5}$, $G'''(x)=-0.3<0$ [$-2.4k^3<0$]	
Since $G'(x)$ has only one stationary point for $x\ge 0$,	
$G'(x)$ is greatest when $e^{-kx}=\frac{1}{5}$.]	[1M]
$\therefore$ 3.2 km downstream from the location of discharge of the waste, the rate of change of the CDO is greatest.	1A
(iii) Solving $G(x)=5.5$, we have	
$30e^{-x}-24e^{-.5x}+1=0$	
$e^{-0.5x}=\frac{12\pm\sqrt{114}}{30}$	
$x=-\frac{1}{0.5}\ln\frac{12\pm\sqrt{114}}{30}$	
$x\approx 0.6$ or 6.2	1A
$\therefore$ The river will return to be healthy 6.2 km downstream form the location of discharge of waste.	1
[Since $\lim_{x\to\infty}G(x)=\lim_{x\to\infty}\left(6-12e^{-0.5x}+15e^{-x}\right)=6>5.5$	
$\therefore$ The river will return to be healthy.	[1]
Solving $G(x)=5.5$, we have $x\approx 0.6$ or 6.2	
$\therefore$ The river will return to be healthy 6.2 km downstream form the location of discharge of waste.]	[1A]
	----------(10)

Solution	Marks
9. (a) (i) $\ln P'(t)=-kt+\ln\frac{0.04ak}{1-a}$	1A
From the graph,	
$-k\approx\frac{-8-(-3.5)}{18-0}$, $k\approx 0.25$	1A a–1 for more than 2 d.p.
$\ln\frac{0.04ak}{1-a}\approx -3.5$, $a\approx 0.7512\approx 0.75$	1A a–1 for more than 2 d.p.
$P'(t)\approx 0.03e^{-0.25t}$	
$P(t)\approx -0.12e^{-0.25t}+c$ for some constant c	1M
Since $P(0)=0.09$, $\therefore$ $c\approx 0.21$	1A
Hence $P(t)\approx -0.12e^{-0.25t}+0.21$	
(ii) $\mu=P(3)\approx 0.1533$	1A $\mu\in[0.1530, 0.1533]$
(iii) Stabilized PPI in town $A=\lim_{t\to\infty}P(t)=0.21$	1M+1A
	----------(8)
(b) (i) Suppose $b=0.09$.	
(I) $Q'(t)=0.24(3t+4)^{-\frac{3}{2}}$	
$Q(t)=\frac{1}{3}(0.24)(-2)(3t+4)^{-\frac{1}{2}}+c$ for some constant c	1A
$\quad=-0.16(3t+4)^{-\frac{1}{2}}+c$	
Since $Q(0)=0.09$, $\therefore$ $c=0.17$	1A
If $Q(t)=\mu\approx 0.1533$	
$-0.16(3t+4)^{-\frac{1}{2}}+0.17\approx 0.1533$	1M
$(3t+4)^{\frac{1}{2}}\approx\frac{0.16}{0.0167}$	
Since $3t+4>0$	
$\therefore$ $t\approx 29.3$	$t\in[28.2, 29.3]$
i.e. the PPI will reach the value of μ.	1
[Since $Q(0)=0.09$, $\lim_{t\to\infty}Q(t)=0.17$ and Q is continuous and strictly increasing $(Q'(t)>0)$,	[1M]
$\therefore$ Q can reach any value between 0.09 and 0.17 including $\mu\approx 0.1533$.]	[1]
(II) Stabilized PPI in town $B=\lim_{t\to\infty}Q(t)=0.17$	
$\therefore$ The stabilized PPI will be reduced by 0.04.	1A
(ii) $0.05<b$ (<1).	1A
Otherwise, $Q'(t)\le 0$ and the PPI will not increase. It follows that the epidemic will not break out.	1
	----------(7)

Solution	Marks
10. (a) $f(0) = g(0) \Rightarrow k = \frac{45}{3} = 15$	1A
$f(9) = g(9) \Rightarrow \frac{15}{a} = \frac{90}{12} \Rightarrow a = 2$	1A
	---------(2)
(b) Since $\lim_{x\to -3^-} f(x) = \lim_{x\to -3^-} \frac{5x+45}{x+3} = -\infty$ and $\lim_{x\to -3^+} f(x) = \lim_{x\to -3^+} \frac{5x+45}{x+3} = +\infty$,	
$\therefore$ $x = -3$ is a vertical asymptote.	1A
Since $\lim_{x\to \pm\infty} f(x) = \lim_{x\to \pm\infty} \frac{5+\frac{45}{x}}{1+\frac{3}{x}} = 5$,	
$\therefore$ $y = 5$ is a horizontal asymptote.	1A
	---------(2)
(c) 	1A asymptotes 1A shape and position 1A intercepts and intersections ---------(3)
(d) (i) $A = \int_0^9 \frac{5x+45}{x+3}\,dx$	1A
$= \int_0^9 \left(5+\frac{30}{x+3}\right)dx$	
$= \left[5x+30\ln(x+3)\right]_0^9$	1A ignore limits
$= 45+30\ln 4$ [86.5888]	1A $a-1$ for r.t. 86.589

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Solution	Marks
(ii) Let $u = 2^{-\frac{1}{9}x}$, then $\ln u = -\frac{\ln 2}{9}x$ and $dx = -\frac{9}{\ln 2}\cdot\frac{1}{u}\cdot du$.	1M
$\int_\alpha^{\alpha+9} 15\cdot 2^{-\frac{1}{9}x}\,dx$	
$= \int_{2^{-\alpha/9}}^{2^{-(\alpha/9)-1}} 15u\left(-\frac{9}{\ln 2}\cdot\frac{1}{u}\right)du$	1M change of variable and limits
$= \left[-\frac{135}{\ln 2}u\right]_{2^{-\alpha/9}}^{2^{-(\alpha/9)-1}}$	1M ignore limits
$= \frac{135}{\ln 2}\left(2^{-\frac{\alpha}{9}} - 2^{-\frac{\alpha}{9}-1}\right)$	
$= \frac{135}{2\ln 2}\cdot 2^{-\frac{\alpha}{9}}$	1A
Let $u = 2^{-\frac{1}{9}x}$, then $\ln u = -\frac{\ln 2}{9}x$ and $dx = -\frac{9}{\ln 2}\cdot\frac{1}{u}\cdot du$.	[1M]
$\int 15\cdot 2^{-\frac{1}{9}x}\,dx = \int 15u\left(-\frac{9}{\ln 2}\cdot\frac{1}{u}\right)du$	
$= -\frac{135}{\ln 2}\cdot 2^{-\frac{1}{9}x} + c$ for some constant c	[1M]
$\int_\alpha^{\alpha+9} 15\cdot 2^{-\frac{1}{9}x}\,dx = \frac{135}{\ln 2}\left(2^{-\frac{\alpha}{9}} - 2^{-\frac{\alpha}{9}-1}\right)$	[1M]
$= \frac{135}{2\ln 2}\cdot 2^{-\frac{\alpha}{9}}$	[1A]
$\int_\alpha^{\alpha+9} 15\cdot 2^{-\frac{1}{9}x}\,dx = 15\int_\alpha^{\alpha+9} e^{-\frac{1}{9}x\ln 2}\,dx$	[1M]
$= \frac{-9\times 15}{\ln 2}\left[e^{-\frac{1}{9}x\ln 2}\right]_\alpha^{\alpha+9}$	[1M] ignore limits
$= \frac{-135}{\ln 2}\left[2^{-\frac{1}{9}x}\right]_\alpha^{\alpha+9}$	[1M]
$= \frac{135}{\ln 2}\left(2^{-\frac{\alpha}{9}} - 2^{-\frac{\alpha}{9}-1}\right)$	
$= \frac{135}{2\ln 2}\cdot 2^{-\frac{\alpha}{9}}$	[1A]
If $\frac{135}{2\ln 2}\cdot 2^{-\frac{\alpha}{9}} = 45+30\ln 4$, then	
$-\frac{\alpha}{9}\ln 2 = \ln\left[(45+30\ln 4)\frac{2\ln 2}{135}\right]$	
$\alpha \approx 1.5253$	1A $a-1$ for r.t. 1.525 ---------(8)

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Solution	Marks
11. Let X_A and X_B be the numbers of persons entered the building using entrances A and B respectively within a 15-minute period.	
(a) (i) $P(X_A=0)=\frac{(3.2)^0e^{-3.2}}{0!}=e^{-3.2}$ $\boxed{0.0408}$ (p_1)	1A $a-1$ for r.t. 0.041
(ii) $P(X_B=0)=\frac{(2.7)^0e^{-2.7}}{0!}=e^{-2.7}$ $\boxed{0.0672}$ (p_2)	1A $a-1$ for r.t. 0.067
(iii) $P(X_A+X_B\ge 1)=1-P(X_A=0 \text{ and } X_B=0)$	
$=1-P(X_A=0)P(X_B=0)$	
$=1-e^{-3.2}e^{-2.7}$	1M $1-(p_1)(p_2)$
$=1-e^{-5.9}$ $\boxed{0.9973}$	1A $a-1$ for r.t. 0.997
(iv) $P(X_A+X_B=2)$	
$=P(X_A=2)P(X_B=0)+P(X_A=1)P(X_B=1)+P(X_A=0)P(X_B=2)$	1M for the 3 cases
$=\frac{(3.2)^2e^{-3.2}}{2!}\cdot e^{-2.7}+\frac{3.2e^{-3.2}}{1!}\cdot\frac{2.7e^{-2.7}}{1!}+e^{-3.2}\cdot\frac{(2.7)^2e^{-2.7}}{2!}$	1A
$=17.405e^{-5.9}$ $\boxed{0.0477}$	1A $a-1$ for r.t. 0.048 ----------(7)
(b) (i) Since k is the most probable number of persons entered the building within a 15-minute period,	
$\therefore$ $P(X=k-1)\le P(X=k)$ and $P(X=k+1)\le P(X=k)$	1M+1M
Hence $\frac{\lambda^{k-1}e^{-\lambda}}{(k-1)!}\le\frac{\lambda^k e^{-\lambda}}{k!}$	
$k\le\lambda$	1
and $\frac{\lambda^{k+1}e^{-\lambda}}{(k+1)!}\le\frac{\lambda^k e^{-\lambda}}{k!}$	
$\lambda\le k+1$	
$\lambda-1\le k$	1
(ii) From (b)(i), $k=5$.	1A
The probability required	
$=C_2^4[P(X=k)]^2[1-P(X=k)]^2[P(X=k)]$	
$=C_2^4\left(\frac{(5.9)^5e^{-5.9}}{5!}\right)^2\left(1-\frac{(5.9)^5e^{-5.9}}{5!}\right)^2\left(\frac{(5.9)^5e^{-5.9}}{5!}\right)$	1M for binomial 1M for all
≈ 0.0183	1A $a-1$ for r.t. 0.018 ----------(8)

Solution	Marks
12. Let E_X and E_Y be the lifetimes of brand X and brand Y CFLs respectively.	
(a) $P(E_X<8200)=0.1151$ $\Rightarrow$ $P\left(\frac{E_X-\mu}{400}<\frac{8200-\mu}{400}\right)=0.0808$	
$\Rightarrow$ $\frac{8200-\mu}{400}=-1.4$	1A for either
$\Rightarrow$ $\mu=8760$	1A
$P(E_Y<8200)=0.1587$ $\Rightarrow$ $P\left(\frac{E_Y-8800}{\sigma}<\frac{8200-8800}{\sigma}\right)=0.1587$	
$\Rightarrow$ $\frac{8200-8800}{\sigma}=-1.00$	
$\Rightarrow$ $\sigma=600$	1A
$a_1=0.3811$, $a_2=0.0548$	1A
$b_1=0.2120$, $b_2=0.2586$, $b_3=0.2120$	1A $b_1=b_3\in[0.2101, 0.2120]$
$\boxed{b_1=0.2109,\ b_2=0.2608,\ b_3=0.2109}$	$b_2\in[0.2586, 0.2624]$ ----------(5)
(b) The mean of the lifetimes of the 2 brands only differ a little but the standard deviation of the lifetimes of brand X CFLs is significantly smaller than that of brand Y.	
I shall choose brand X because the lifetimes of its CFLs are more reliable.	1M
I shall choose brand Y because there will be a bigger chance of getting a long life CFL.	$\boxed{1M}$
I shall choose brand Y because the mean lifetime is larger.	$\boxed{1M}$ ----------(1)
(c) (i) Let X_a, X_b and X_c be the lifetimes of lamps a, b and c resp.	
(I) The required probability	
$=P(X_a>8200)[P(X_b>8200 \text{ or } X_c>8200)]$	1M
$=[1-P(E_X<8200)]\{1-[P(E_X<8200)]^2\}$	1M
$\approx(1-0.0808)(1-0.0808^2)$	1M
$\boxed{\approx 2(0.9192)^2(1-0.9192)+(0.9192)^3}$	$\boxed{1M}$+$\boxed{1M}$+$\boxed{1M}$
≈ 0.9132	1A
(II) The required probability	
$=\frac{P(X_a<8200)P(X_b>8200)P(X_c>8200)}{1-0.9132}$	1M for numerator 1M for denominator
$=\frac{0.0808(1-0.0808)^2}{1-0.9132}$	
$=0.7865$	1A

Solution	Marks
(ii) Note that $P(E_X < 8200) \approx 0.0808$ and $P(E_Y < 8200) \approx 0.1578$.	
Since a brand X CFL is less likely than a brand Y CFL to have a lifetime less than 8200 hours, and lamp a is the most critical lamp for the lighting system to work (according to the result of (c)(i)(II)),	1
$\therefore$ Lamp a should be a brand X CFL.	
Hence I will put the brand Y CFL as lamp b or c.	1A with explanation
Let X_a and Y_a be the lifetimes of lamp a when using brand X CFL and brand Y CFL respectively. Similar notations are used for the other two lamps.	
$P(Y_a > 8200)[P(X_b > 8200 \text{ or } X_c > 8200)]$	
$= (1-0.1587)(1-0.0808^2)$	
$= 0.8358$	
$P(X_a > 8200)[P(Y_b > 8200 \text{ or } X_c > 8200)]$	1
$= (1-0.0808)[(1-0.0808)+(1-0.1587)-(1-0.0808)(1-0.1587)]$	
$= 0.9074$	
Hence putting the brand Y CFL as lamp b or c will yeild a better system.	1A with explanation
	----------(9)

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Solution	Marks
13. Let X be the number of Grade A potatoes in the 8 selected potatoes.	
(a) $P(X \le 1 \mid p = 0.65) \approx 0.0002 + 0.0033$	1M
≈ 0.0035 $\boxed{0.0036}$	1A
	----------(2)
(b) (i) $P(X \le 3 \mid p = 0.65) \approx 0.0002 + 0.0033 + 0.0217 + 0.0808$	1M
≈ 0.1060 $\boxed{0.1061}$ (q)	1A
(ii) $P(X > 3 \mid p = 0.2)$	1M
$\approx 0.0459 + 0.0092 + 0.0011 + 0.0001 + 0.0000$	1M
$\boxed{\approx 1-(0.1678+0.3355+0.2936+0.1468)}$	
≈ 0.0563	1A
	----------(5)
(c) The required probability	
	1M for the 2 cases
$= C_2^3 q^2(1-q) + C_3^3 q^3$	1M for 1st term
	1M for 2nd term
$\approx C_2^3(0.1060)^2(1-0.1060) + C_3^3(0.1060)^3$	1M+1M+1M
≈ 0.0313 $\boxed{0.0314}$	1A
	----------(4)
(d) The probability that the farmer will wrongly reject *the claim* is 0.1060 whereas the probability that his wife will wrongly reject *the claim* is 0.0313. Therefore the farmer will have a bigger chance of rejecting *the claim* wrongly.	1M
	----------(1)
(e) $P(X \le 2 \mid p = 0.65) \approx 0.0252$	
$P(X \le 3 \mid p = 0.65) \approx 0.0252 + 0.0808 \approx 0.1060$	1M+1A 1M for 0.05 as a value between
Since $P(X \le 2 \mid p = 0.65) < 0.05 < P(X \le 3 \mid p = 0.65)$	
$\therefore$ $k = 2$.	1A independent
	----------(3)

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