Candidates' Performance

Module 1 (Calculus and Statistics)

Candidates generally performed better in Section A than in Section B.

Section A

Question Number	Performance in General
1 (a)	Very good. Most candidates were able to find the values of a and b by setting up two equations involving them.
(b)	Good. Many candidates were able to find the value of $\mathrm{Var}(6-5X)$ while some candidates wrongly found the value of $(\mathrm{E}(6-5X))^2$ instead of $\mathrm{E}((6-5X)^2)$.
2 (a)	Very good. Most candidates were able to find the value of $\mathrm{P}(A' \cap B')$ while a few candidates failed to find the value of $\mathrm{P}(A' \cap B)$ properly.
(b)	Fair. Many candidates mixed up mutually exclusive events with independent events. Only some candidates were able to mention $\mathrm{P}(A \cap B) = 0$ to conclude that A and B are mutually exclusive events.
3 (a)	Good. Some candidates did not simplify the answer and some candidates failed to give an answer as an expression in terms of p.
(b) (i)	Very good. Most candidates were able to set up an equation by using the result of (a).
(ii)	Good. Some candidates failed to use the result of (b)(i) to find the required probability.
4 (a)	Very good. Most candidates were able to write a binomial probability while a few candidates wrongly wrote $(0.25)^3(1-0.25)$ instead of $(0.75)^3(1-0.75)$.
(b)	Very good. Most candidates were able to use the result of (a) while a few candidates wrongly wrote $1-\left((0.75)^4+\left(\frac{27}{256}\right)\right)$ instead of $1-\left((0.75)^4+4\left(\frac{27}{256}\right)\right)$.
(c)	Good. Some candidates failed to get the correct answer because they made a mistake in (b).
5 (a)	Very good. Most candidates were able to expand e^{-4x} while a few candidates failed to show working steps.
(b)	Very good. Most candidates were able to find the coefficient of x^2 while a few candidates made a carless mistake in expanding $(2+x)^5$ as $2^5+C_1^5(2^4)x+C_2^5(2^3)x^2+\cdots+x^5$.
6 (a)	Good. Many candidates were able to find the x-coordinates of the two points of intersection of C_1 and C_2, while some candidates failed to write a quadratic equation in e^x.
(b)	Good. Some candidates failed to give a simplified answer and left an absolute value sign in the answer, and some candidates got a wrong answer $-\frac{e^6}{2}+2e^4+\frac{e^2}{2}$ instead of $\frac{e^6}{2}-2e^4-\frac{e^2}{2}$.
7 (a)	Very good. Most candidates were able to apply chain rule to find $\frac{\mathrm{d}y}{\mathrm{d}x}$.
(b)	Good. Some candidates made careless mistakes in simplifying the equation involving radical, and some candidates failed to write a quadratic equation in x^2.
8 (a)	Good. Many candidates were able to apply product rule to find $\frac{\mathrm{d}}{\mathrm{d}x}\left((x^6+1)\ln(x^2+1)\right)$ while some candidates did not understand the definition of polynomial and simply left $(x^6+1)\frac{2x}{x^2+1}+6x^5\ln(x^2+1)$ as the final answer instead of $(2x^5-2x^3+2x)+6x^5\ln(x^2+1)$.
(b)	Fair. Many candidates employed a wrong substitution in finding $\int(x^6+1)\frac{2x}{x^2+1}\mathrm{d}x$, and many candidates made careless mistakes in calculating the integration.

Section B

Question Number	Performance in General
9 (a) (i)	Very good. Most candidates were able to use the correct formula to find the confidence interval while a few candidates treated 16 as the variance rather than the standard deviation of the given distribution.
(ii)	Very good. A few candidates wrongly used the sample mean in (a)(i) to find the width of the interval concerned.
(b) (i)	Very good. Most candidates were able to perform standardization and find the required probability.
(ii)	Very good. Most candidates were able to formulate the required probability form while a few candidates used wrong probabilities in substitution.
10 (a)	Very good. A few candidates missed the first case in the required sum of the Poisson probabilities.
(b)	Very good. A few candidates unnecessarily multiplied the Poisson probability to the required probability form.
(c)	Very good. A few candidates wrongly used $\frac{3.2^3e^{-3.2}}{3!}(0.7)^2$ instead of $\frac{3.2^3e^{-3.2}}{3!}(0.7)^3$ in the calculation.
(d)	Good. Some candidates failed to count the number of cases correctly, such as they wrongly multiplied 3 instead of 3! to the term $(0.12)(0.7)(0.08)$.

(e)	Good. Some candidates did not realize that a conditional probability is considered here. Some candidates did not consider the Poisson probabilities as a part of the joint probability in the numerator of the required conditional probability.
11 (a)	Good. Some candidates did not formulate the required amount as a definite integral, and some candidates did not use the correct number of sub-intervals when applying the trapezoidal rule.
(b)	Fair. Many candidates failed to find $\frac{d^2f(t)}{dt^2}$ correctly, as a result, many candidates failed to determine the nature of the estimate in (a).
(c)	Very good. Most candidates were able to find the indefinite integral by using the method of substitution.
(d)	Good. Many candidates were able to find the correct total amount of oil produced by company Y for comparison. However, some candidates failed to show that the estimate in (a) is an under-estimate and hence could not complete the argument.
12 (a)	Very good. Most candidates were able to express $\ln\left(\frac{200}{S}-1\right)$ as a linear function of t.
(b) (i)	Very good. A few candidates failed to use the slope of the linear function as a means to find the value of the unknown b.
(ii)	Fair. Many candidates failed to differentiate $2^{-0.5t}$ with respect to t correctly when finding the required derivatives $\frac{dS}{dt}$ and $\frac{d^2S}{dt^2}$.
(iii)	Poor. Only a few candidates were able to make use of the sign of $\frac{dS}{dt}$ to discuss the behaviour of S. Most candidates failed to determine the change of the sign of $\frac{d^2S}{dt^2}$ correctly.

General recommendations

Candidates are advised to:

1. be more careful in doing computations in order to avoid careless mistakes;
2. have a better understanding of the difference between mutually exclusive events and independent events;
3. have a better understanding of the difference between polynomials and mathematical expressions;
4. have more practice in solving equations involving radicals;
5. have more practice in $\frac{d}{dt}a^{bt}$, where a and b are constants;
6. write 'ln' rather than 'In' for natural logarithms; and
7. pay attention to the accuracy required for the final answer and keep enough accuracy of intermediate results for this purpose.