Candidates' Performance

Module 1 (Calculus and Statistics)

In this year, 2389 candidates sat the examination. The mean score was 55 marks. Candidates generally performed better in Section A than in Section B.

Section A

Question Number	Performance in General
1 (a)	Very good. Over 90% of the candidates were able to find the value of a by setting up an equation involving a and p.
(b)	Very good. Most candidates were able to find the value of p by using $\text{Var}(X)=\text{E}(X^2)-(\text{E}(X))^2$, $\text{Var}(2X+a^2)=4\text{Var}(X)$ and $8\text{E}(aX-1)=8a\text{E}(X)-8$.
2 (a)	Very good. About 75% of the candidates were able to find the required probability by considering the complementary event.
(b) (i)	Very good. Most candidates were able to find the required probability by considering the complementary event. However, a small number of candidates omitted the binomial coefficients in finding the probability.
(ii)	Fair. Many candidates were able to consider $\frac{1}{p}$, where p is the probability that a photocopy of the document is *unacceptable*. However, only some candidates were able to find the required expected number of *acceptable* photocopies as $\frac{1}{p}-1$.
3 (a)	Good. Many candidates were able to write $\text{P}(A\cap B)=\text{P}(B\mid A)\text{P}(A)$. However, they did not use $\text{P}(B)=\text{P}(A\cap B)+\text{P}(A'\cap B)$ to set an equation in $\text{P}(A)$. Also, some candidates did not calculate $\text{P}(B)$.
(b)	Good. Some candidates mixed up mutually exclusive events with independent events.
(c)	Good. Many candidates were able to use the properties of independent events to find the value of k.
4 (a)	Very good. Over 70% of the candidates were able to use the correct formula to find the confidence interval.
(b)	Good. Some candidates were unable to look up the correct value from the standard normal table, whereas others answered $\beta=99\%$ instead of $\beta=99$.
5 (a)	Good. Many candidates were able to expand $(1+ke^x)^3$ as $1+3ke^x+3k^2e^{2x}+k^3e^{3x}$ and expanded e^x, e^{2x} and e^{3x} accordingly. However, some candidates did not state the required coefficients explicitly.
(b)	Good. Many candidates were able to find the value of k and the coefficient of x^2.

Question Number	Performance in General
6 (a)	Fair. Many candidates were unable to find $\frac{\mathrm{d}}{\mathrm{d}x}\left(\ln x^4\right)$ correctly, they wrongly wrote $\ln x^4 = 4\ln x$ which is incorrect when $x < 0$.
(b)	Good. Some candidates were unable to consider the case $x \neq 0$ when they applied the first derivative test for maximum and minimum.
(c)	Fair. Many candidates wrongly gave the equation of tangent as $y = 0.437751649$ instead of $y = 4\ln 5 - 6$.
7 (a)	Good. Some candidates used the wrong formulas of total surface area and volume of a right circular cylinder.
(b)	Good. Many candidates were able to apply the first derivative test or the second derivative test for maximum in order to draw a correct conclusion.
8 (a)	Very good. Most candidates were able to find $\frac{\mathrm{d}}{\mathrm{d}x}(xe^{mx})$. However, a small number of candidates were unable to find $\int xe^{mx}\,\mathrm{d}x$ accordingly.
(b)	Good. Some candidates were unable to factorize the expression, hence they were unable to find m .

Section B

Question Number	Performance in General
9 (a)	Very good. Over 80% of the candidates were able to find the required probability by standardising the normal variable.
(b)	Good. Some candidates overlooked the condition that Tom catches the earliest departing bus when he arrives at the bus stop, hence they wrongly included the probability of catching the bus departing at 7:23 in finding the required probability of catching the bus departing at 7:30.
(c) (i)	Good. Some candidates were unable to find the probability that Mary greets Tom on a certain morning, hence they were unable to find the required probability.
(ii)	Good. Many candidates were able to find the required conditional probability.
(iii)	Fair. Some candidates were able to find the required probability by considering the complementary event. However, many candidates were unable to realise that this should be done under the given condition.
(iv)	Fair. Only some candidates were able to solve the problem with the correct inequality.

Question Number	Performance in General
10 (a)	Very good. About 95% of the candidates were able to find the required probability.
(b)	Good. Some candidates were unable to use correct combination coefficients in counting.
(c) (i)	Good. Some candidates did not show the Poisson probability explicitly.
(ii)	Good. Some candidates omitted the binomial coefficient.
(iii)	Fair. Many candidates were unable to find the probability of receiving a cup in the two situations, they omitted the probability of joining the game in the calculation.
11 (a) (i)	Very good. Most candidates were able to use the correct sub-intervals when applying the trapezoidal rule.
(ii)	Good. Many candidates were able to consider the second derivative $A''(t)$ to determine whether the estimate α_1 is an over-estimate or an under-estimate. However, some candidates were unable to show clearly that $A''(t)<0$ for $0\le t<2$ in order to draw a correct conclusion.
(b) (i)	Good. Many candidates were able to use integration by substitution to find β.
(ii)	Poor. Most candidates were unable to use the results of (a)(ii) in the argument.
12 (a)	Very good. Most candidates were able to find the correct linear function of t.
(b) (i)	Very good. Over 70% of the candidates were able to find the values of a and b.
(ii)	Fair. Only some candidates were able to find the derivatives.
(iii)	Fair. Some candidates were able to find the limit of P. However, many candidates were unable to state clearly the increasing trend of P when they drew conclusion.
(iv)	Fair. Many candidates were unable to test whether $\frac{dP}{dt}$ attains its greatest value when $\frac{d}{dt}\left(\frac{dP}{dt}\right)=0$.

General recommendations

Candidates are advised to:

1. have more practice in counting involving combinations;
2. have more practice in testing for maximum or minimum;
3. have more practice in mathematical operation involving natural logarithms;
4. have more practice in finding $\frac{d}{dt}a^{bt}$, where a and b are constants; and
5. pay attention to the accuracy required for the final answer and keep enough accuracy of intermediate results for this purpose.