# 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. More than 70% of the candidates were able to mention $P(Y \mid X) \neq P(Y)$ or $P(X \cap Y) \neq P(X)P(Y)$ to conclude that $A$ and $B$ were not independent events. Only some candidates were unable to show their numerical values in comparison. |
| (b) | Very good. A very high proportion of the candidates were able to use the identity $P(X \cup Y) = P(X) + P(Y) - P(X \cap Y)$ to find the value of $P(X \cup Y)$ while a few candidates were unable to find the value of $P(X \cap Y)$ . |
| 2 (a) | Good. Some candidates were unable to count the correct number of relevant outcomes for the sum of 7 , hence unable to work out the denominator of the required probability properly. |
| (b) | Fair. Although many candidates guessed correctly that the required conditional probability remains unchanged, they were unable to provide a mathematical argument to justify the guess. |
| 3 (a) | Very good. A very high proportion of the candidates were able to write down the required variance. |
| (b) | Very good. More than 70% of the candidates were able to find the answer using a Poisson probability with a mean of 3.6 instead of a mean of 1.8 . |
| (c) | Good. Only a number of candidates made careless mistakes in finding the required probability. |
| 4 (a) | Very good. More than 60% of the candidates were able to evaluate the approximate 95% confidence interval for the population proportion $p$ . However, some candidates wrongly used $n=64$ instead of $n=100$ in evaluating the approximate confidence interval $\left(\frac{64}{100}-1.96\sqrt{\frac{(0.64)(0.36)}{n}}, \frac{64}{100}+1.96\sqrt{\frac{(0.64)(0.36)}{n}}\right)$. |
| (b) | Good. Some candidates were unable to distinguish the concept between the confidence interval for the population mean and the approximate confidence interval for the population proportion. |
| 5 (a) | Very good. A very high proportion of the candidates were able to expand $e^{kx}$ while some candidates were unable to simplify the coefficient of $x^2$ . |
| (b) | Very good. More than 70% of the candidates were able to find the coefficient of $x^2$ while a small number of candidates made careless mistakes in expanding $(1+2x)^7$ . |



| Question Number | Performance in General |
|---|---|
| 6 (a) | Fair. Some candidates wrongly evaluated the indefinite integral $\int 3^x dx$ as $\ln 3(3^x) + \text{constant}$ instead of $\frac{3^x}{\ln 3} + \text{constant}$ . |
| (b) (i) | Very good. More than 70% of the candidates were able to find the two $x$-intercepts of $C$ , while a small number of candidates were unable to write a quadratic equation in $3^x$ . |
| (ii) | Fair. Although many candidates were able to use the results of (a) and (b)(i) to find the area of the required region, they were unable to give the answer in exact value. |
| 7 (a) | Very good. Nearly all of the candidates were able to apply chain rule to find $\frac{dy}{dx} = 3\sqrt{2x+8} + 6x$ . |
| (b) | Good. Some candidates were unable to solve the equation involving radical $3\sqrt{2x+8} + 6x = -6$ , and many candidates were unable to reject the inappropriate root $x = \frac{1}{2}$ . |
| 8 (a) | Very good. More than 60% of the candidates were able to apply quotient rule or product rule to find $f'(x)$ and hence find the values of $\alpha$ and $\beta$ by solving the equation $f'(x) = 0$ , while some candidates wrongly wrote the value of $\beta$ as 0 instead of 1 . |
| (b) | Good. Many candidates employed a suitable substitution in evaluating the definite integral $\int_1^{e^2} \frac{(\ln x)^2}{x} dx$ . |

**Section B**

| Question Number | Performance in General |
|---|---|
| 9 (a) | Good. Many candidates were able to formulate the corresponding equations in means and standard deviations, but some candidates were unable to give the numerical answers either in an exact fraction or correct to 4 decimal places. |
| (b) | Good. Many candidates were able to apply the result of (a) . |
| (c) | Fair. About half of the candidates were unable to use inequality to formulate the problem. Besides, many candidates used 1.28 instead of 1.29 in the inequality. |
| 10 (a) | Very good. More than 70% of the candidates were able to find the required probability. |
| (b) | Good. Some candidates missed the term $(1-0.9)^2(1)$ when finding the required probability. |
| (c) | Very good. Most candidates were able to formulate the required probability using binomial distribution. |
| (d) (i) | Good. About half of the candidates were able to find the required probability by using the result of (b). However, some candidates wrongly used 0.7 and 0.3 instead of $(0.7)^6$ and $(0.3)^6$ respectively in the required probability. |
| (ii) | Good. Many candidates were able to formulate the required probability by using an appropriate binomial probability |
| (iii) | Good. Many candidates were able to formulate the required conditional probability by using the result in (d)(ii). |
| 11 (a) (i) | Very good. More than 60% of the candidates were able to find the correct answer using trapezoidal rule. However, a small number of candidates were unable to use the correct sub-intervals when applying the trapezoidal rule. |
| (ii) | Good. Many candidates were able to find $\frac{dA(t)}{dt}$ by quotient rule, but some candidates were unable to simplify $\frac{d^2A(t)}{dt^2}$ . |
| (b) (i) | Very good. Most candidates were able to formulate and evaluate the definite integral $\int_0^{12} \frac{t+8}{\sqrt{t+3}}dt$ by using a suitable substitution. |
| (ii) | Poor. Most candidates just mentioned $\frac{d^2A(t)}{dt^2} > 0$ without proof. They showed difficulties in using inequality to express the relation between $P_1$ and its over-estimate, hence unable to complete the argument. |



| Question Number | Performance in General |
|---|---|
| 12 (a) | Very good. More than 70% of the candidates were able to express $\ln\left(\frac{27-2N}{Nt}\right)$ as a linear function of $t$ . |
| (b) (i) | Good. Many candidates were able to use the slope of the linear function to find $\beta$ , while a few candidates wrongly took the given horizontal intercept as the vertical intercept to find $\alpha$ . |
| (ii) | Fair. Many candidates wrongly gave the limiting value of $N$ instead of the least value of $N$ as the answer. Some candidates were unable to evaluate $\frac{d}{dt}te^{-0.1t}$ when finding $\frac{dN}{dt}$ . |
| (iii) | Poor. Most candidates were unable to find the derivative of $\frac{dN}{dt}$ to describe how the rate of change of the number of chickens varies. Only a very small number of candidates were able to determine the sign of $\frac{d^2N}{dt^2}$ for $0 \le t \le 20$ . |

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 the confidence interval for the population mean and the approximate confidence interval for the population proportion;
3. have more practice in solving equation involving radicals;
4. have more practice in $\int a^{bx}dx$ , where $a$ and $b$ are constants;
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.