MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

UNIVERSITY OF MALTA, MSIDA

MATRICULATION CERTIFICATE EXAMINATION
INTERMEDIATE LEVEL
MAY 2017

Examiner's Report
Pure Mathematics

Summary of Results

Grade	A	B	C	D	E	F	Abs	Total
Number	38	68	139	78	69	139	48	579
%	6.56	11.74	24.01	13.47	11.92	24.01	8.29	100

Comments on Candidates' Performance

Question 1. In part (a) some candidates failed to work the differentiation of the product involved in $f(x)$ correctly. The equation of the normal was obtained correctly in most cases once the earlier part was worked properly. In part (b), the differentiation of the quotient function $f(x)$ was worked properly by the majority of candidates. The main difficulty in this problem was the solution of the equation obtained once the differentiation of $f(x)$ was equated to zero.

Question 2. The majority of candidates expressed the given function in part (a) into partial fractions properly, but in some cases the correct values of p and q were not correctly obtained. In part (b) few candidates knew how to show that the two given functions intersect at two points. The main difficulty of the problem was to proof that $f(x)-g(x)>0$.

Question 3. Nearly all candidates used the summation formula for a geometric series correctly in part (a); some problems arose in the solution of the equation in terms of the numbers of terms n. In part (b) candidates found it difficult to obtain the value of n, the number of positive terms of the arithmetic progression. Few candidates indicated that there were two appropriate values of n.

Question 4. The values of a and b were correctly obtained by most candidates in part (a). Only few candidates failed to factorise $f(x)$ completely in part (b). In part (c) some candidates failed to draw the sketch of $y = f(x)$ correctly and this led to a wrong set of values of x for which $f(x) < 0$. The correct set of values of x consisted of two intervals and in some cases only one of these intervals was provided.

Question 5. Part (a) was attempted by the majority of candidates but only a few of them obtained the correct values of a and b. The expression for the area of the two squares in part (b) was obtained correctly by a few candidates only. Using the given expression for the area, most candidates then obtained the correct values of x for parts (i) and (ii).

Question 6. Generally well attempted by the candidates. In parts (a) and (b) most candidates obtained the correct equations of the two lines. Some used the change in x over the change in y for the gradient. In part (c) many made arithmetic mistakes in solving simultaneously the equations of the two lines to find the point of intersection D. Since triangle ADC in part (d) is right angled, the area is simply

$\frac{1}{2}(AD)(AC)$, but a few used the formula $\frac{1}{2}ab\sin C$. Four candidates used a determinant to find the area.

Question 7. Most candidates managed to simplify the equation in part (a) and obtained $(\cos x)^2 + 3\cos x = 0$, but many found difficulties in finding the values of $\cos x$. There were many incorrect values for the range of $f(x)$ in part (b)(i). Most candidates did not take into consideration that $-1 \leq \cos x \leq 1$. The graph of the function in (b)(ii) was generally poor, although some managed to obtain from the graph the correct values of the maximum and minimum values of $f(x)$. Part (b)(iii) proved to be difficult and many did not attempt this part. A number of students showed a very limited understanding of “rate of change of a function”.

Question 8. Very well answered by many candidates. Most candidates interpreted the matrix $\mathbf{A}$ in part (a)(i) as a rotation of 180^o about the origin, instead of a reflection in the line $y = -x$. Part (a)(ii) was correctly answered by almost all candidates. Although some candidates made many arithmetic errors in finding the product of the two matrices in part (b)(i), most students found no difficulties in showing that $\mathbf{PQ} = \mathbf{I}$ and in deducing that $\mathbf{Q}^{-1} = \mathbf{P}$. Part (b)(ii) was very well attempted although a very small number solved the three equations simultaneously ignoring the instruction *hence*.

Question 9. Most solutions to this question showed that calculus skills are very poor. Part(a): Only a very small number of candidates really understood part (a) of the question. A significant number of candidates wrote down that if area of circle is Am^2, then $\frac{dA}{dr} = 2Am$. Part (b) was generally well attempted. The difficulty in part (c) was the integral $\displaystyle\int \frac{2}{(t+1)^3}\,dt$. Some of the answers offered were $6\ln(t+1)$ and $\dfrac{(t+1)^{-4}}{-3}$. Another frequent error was $\int \frac{1}{2}\,dA = A\ln 2$. Part (d) was poorly attempted. Most candidates assumed that $\frac{dr}{dt} = 0.081$ and went on to find r.

Question 10. The solutions offered by candidates generally showed a very limited understanding of probability. Part (a) received generally very poor attempts. Counting principles seem to present problems. This was simply finding the number of ways in which 6 different things can be arranged i.e. $6!$ followed by the number of ways in which the 5 rock DVDs can be arranged next to each other i.e. $5!$. Many candidates did not realize which overlapping area in the Venn diagram corresponded to a given particular set of points in part (b). It is clear from the solutions offered that candidates are unfamiliar with Venn diagrams, otherwise the three required results could be derived without any difficulties.