UNIVERSITY OF MALTA

THE MATRICULATION EXAMINATION
INTERMEDIATE LEVEL

PURE MATHEMATICS
May 2015

EXAMINERS' REPORT

MATRICULATION AND SECONDARY EDUCATION
CERTIFICATE EXAMINATIONS BOARD

Pure Mathematics
Intermediate Level
May 2015

Part 1: Statistical Information

The distribution of grades awarded in the May 2015 session is given in the table below.

GRADE	A	B	C	D	E	F	Abs	Total
Number	46	59	119	86	111	147	53	621
% of Total	7.41	9.50	19.16	13.85	17.87	23.67	8.53	100

Part 2: Comments regarding candidate's performance

Q1: This question was very well attempted, most candidates scoring very high marks in it.

In (a), some made the error that $-\frac{1}{2}\log 81 - \log 10 = -\log 9$ instead of $-\log 90$.

Some candidates found difficulties in finding the value of *a* in the expression $8 = a^{\frac{3}{2}}$.

Part (b) was very well answered except for some arithmetic mistakes.

Q2: When dealing with arithmetic and geometric progressions, a good number of candidates do not write down the correct formulae for the *n*th term and S_n. In part (a) (i), some candidates did not use the equation $a + 9d = 125$ for the 10th term, but just *assumed* that the first term is -73, and went on to find the common difference completely ignoring S_{10}.

In part(ii), most candidates obtained correctly the two values of *n*, that is *n* = 14.1 and *n* = -6.5, such that $S_n > 1000$, but surprisingly concluded that the *smallest* value of *n* is -7. A small number calculated the value of *n* by trial and error. Part (b) (i) was very well attempted by most candidates. However, many did not seem to appreciate the meaning of the term *to four significant figures*. In (ii), many candidates mistakenly assumed that the number of grains on the black squares is equal to half the total number of grains on the board.

Q3: This question proved to be difficult for most candidates. Many showed a lack of understanding of the properties of the trigonometric functions and makes one wonder if these properties had been covered, as can be clearly seen from the poor arguments given in verifying that $k = \frac{2\pi}{365}$. In (ii), very few candidates used the fact that $-1 \le \cos kt \le 1$.

Many candidates wrote down the inconsistent equations $A + B = 6$, $A + B = 18$. Without the correct values of *A* and *B*, many attempts to solve (iii) and (iv) were unsuccessful.

Q4: This question was well answered by many candidates.

(i) A small number of candidates equated $\frac{dy}{dx} = 4x - 3$ to zero and concluded that the gradient of the tangent line is $x = \frac{3}{4}$.

(ii) This was a straightforward question on partial fractions and was very well done.

In (iii), however, the integral $\int \frac{2}{2x-1} dx$ was sometimes evaluated to $2\ln(2x-1)$, which is obviously incorrect.

(iv) was well answered by most candidates, although algebraic errors were sometimes made.

Q5: Solutions to this question were rather poor. Common geometrical errors were as follows:

(a) Most candidates incorrectly drew the chord CED *perpendicular* to the diameter AB. In this case, the length of this chord would be less than the given length, that is 8cm.

(b) It was incorrectly assumed that the two sides of the triangles AEC and DEB which are opposite angle E are *parallel*. The similarity of the triangles was not used correctly.

(c) In the formula $\frac{1}{2}r^2(\theta - \sin\theta)$ for the segment, the angle used was often taken incorrectly, or expressed in terms of *degrees* instead of *radians*.

Q6: a) Some candidates failed to define the terms of the binomial expansion correctly. In some cases the correct values of *a* and *n* were not obtained due to errors in algebraic manipulations even though the coefficients of *x* and x^2 were correctly defined. A trial and error method was also used by a number of candidates where the appropriate factors of *36* were used to obtain the coefficients of x^2 of the binomial expansion.

b) The number of ways of obtaining a total score of 5 in three tosses of a die should have been easily listed, but some candidates failed to do so and as a result, the probability defined was incorrect.

c) In this problem, the number of combinations for the three groups of students of different nationalities should have been multiplied together, not added together.

Q7: a) Some candidates could not differentiate the product and/or quotient of functions. Errors were made when the results of the differentiation were being simplified.

b) In some cases the total surface area of the open cylindrical waste paper bin was defined incorrectly. As a result of this, the volume needed in part (i) could not be obtained correctly.

Part (ii) was correctly attempted in most cases, although a small number of candidates did not realise that differentiation has to be performed to find the maximum volume.

Q8: a) This was generally well attempted.

b) The sketch in this part of the problem was drawn correctly in most cases. However some students found difficulty in defining the required area before integration and using the appropriate limits of integration afterwards.

Q9: a) The matrices **A** and **B** of part (i) were defined correctly by most candidates. The matrix **C** of part (ii) was obtained correctly by the majority of the candidates who had answered part (i) correctly. In (iii), the interpretation of matrix **C** was often omitted or incorrect.

In b), most of the candidates applied the method of matrix inverse correctly. However some candidates solved this part without using any matrix technique.

Q10: This was not well answered by the candidates, many of whom did not know what the transpose of a matrix is. Whilst this is not mentioned explicitly in the syllabus, the inverse of a 2 by 2 matrix involves taking the transpose of the adjoint matrix. So candidates should have been made aware of the transpose. Even so, measures were taken by the examiners so that the candidates are not disadvantaged by this question.

As a general comment, I would suggest that lecturers teaching this topic go through a brief revision of topics covered at SEC level, describing results on similar triangles, circles, and other topics which are related to the topics in the Intermediate syllabus.

Chairperson
2015 Examination Panel