LEBANESE UNIVERSITY
Faculty of Education
The Dean

Entrance Exam 2013 – 2014
Teaching Licence
Mathematics Exam
Duration 2 hours

N.B: - **Calculators are allowed.**
- **No credit is awarded for an answer with no justification.**

Part A

In this part, for each exercise, indicate whether each statement is true or false and justify your answer.

Exercise 1 (3.5 pts)

We choose a real number x and add 10 to it; then we multiply the result by 3. We deduct 10 from the last result and we divide by 2 the final result. We obtain the number y.

A) If $x = 0$, then $y = 10$.

B) If x is an integer, then y is also an integer.

C) $y = \frac{3}{2}x + 10$

D) It is impossible to obtain a value of 0 for y.

E) There is one and only one value of x, such that x is equal to y.

Exercise 2 (2.5 pts)

H is the set of real numbers strictly included between 1,234 and 1,2999…..

A) 1.2345 belongs to H.

B) 1.29 belongs to H.

C) $1 + \frac{1}{3}$ belongs to H.

D) $1 + \frac{1}{4}$ belongs to H.

E) $2 - \frac{1}{2}$ belongs to H.

Exercise 3 (5 pts)

During elections, there are 3960 voters who voted for one of the candidates A, B, C. The results are represented by a pie chart. The central angles of the circular sectors are 90° for the votes obtained by candidate A, and 137° for the votes obtained by candidate B

A) C won.

B) A obtained one fourth of the votes.

C) There is less than 1% difference between the votes for B and C

D) A obtained 25 votes.

E) B had 32 votes more than C.

Exercise 4 (3 pts)

A) The sum of two even numbers is even.
B) The sum of two odd numbers is odd.
C) The product of two even numbers is even.
D) The product of two odd numbers is odd.
E) If n is an integer, then n^2+n is odd.

Exercise 5 (3 pts)

Given that $x < 0$

A) $|-x| = x$
B) $\sqrt{x^2} = x$
C) $\sqrt{(x-3)^2} = x - 3$
D) $|3 - x| = 3 - x$
E) $|x - 2| = x + 2$

Part B

In this part, for each exercise, justify your answer.

Exercise 1 (2 pts)

We pick at random a card from a deck of 52 cards. Find the probability of drawing neither an ace nor a club?

Exercise 2 (5 pts)

Consider the numbers: $x=\frac{5}{6}$ and $y=\frac{4}{9}$

A) Compare x and y
B) Calculate the sum of the inverses of x and of y.
C) Calculate the inverse of the sum of x and y.
D) Calculate the product of the opposites of x and of y.
E) Find the missing factor $x = \ldots \times y$

Exercise 3 (5 pts)

The quarterly average of a student is calculated from 5 homeworks, each graded out of 20. Alan has a average of 14.5 on 4 homeworks.

A) Could his grades be 13, 14, 15 and 16 ?
B) Could this average be obtained with one of the grades being 0?
C) If Alan gets a 17 on his fifth homework, what would his quarterly average be?

D) Alan claims: «Whatever my score would be on the fifth homework, my average would at least be equal to 12 ». Is he right?

Exercise 4 (2.5 pts)

Calculate $e^{\frac{1}{2}ln4} + e^{-ln\frac{1}{2}}$

Exercise 5 (2.5 pts)

Calculate the derivative of $f(x) = \ln(x^2 + 1) - x$, for any real x.

Exercise 6 (5 pts)

On a particular day, 2650 people visited the Louvre museum. The entrance fee is 10€ per adult and half price per child. The net income for that day was 20500€. How many adults and children visited the Louvre on that day?

Exercise 7 (7 pts)

ABCD is a rhombus with triangle ABD being equilateral. I is the midpoint of [AB], J is the midpoint of [BC], L is the midpoint of [DA], K is the midpoint of [DC].

A) Show that the triangle LBK is equilateral.

B) What is the nature of the quadrilateral IJKL ? Justify.

Exercise 8 (4 pts)

Alice wants to find the height ST of a tree. She stands at 25 meters from the foot of the tree on a level ground, her eye O being 1.60 m above ground. Her brother sticks a 2.5 m tall pole in the ground at 3.5 meters away from Alice, such that her eye O, the tip A of the pole, and the top S of the tree are aligned. She draws the figure below where (ST) and (AB) are parallel. Calculate the height of the tree.