الشهادة المتوسطة   التجربة الثالثة لعام 2010 - 2011

مسابقة في الرياضيات الانكليزي	المدّة : ساعتين	الإسم :	الرقم :

إرشادات عامة:
- يسمح بإستعمال ألة حاسبة غير قابلة للبرمجة
- يمكن الإجابة على ألمسائل بالترتيب الذي تريد
- يرجى الإجابة بخط واضح ومرتب
- العلامة القصوى من 30
- عدد المسائل: 5

1st exercise: (5pts)

In the table below, only one among the proposed answers to each question is correct. Write down the number of each question and give, **with justification**, the answer corresponding to it.

No.	Questions	Answers A	Answers B	Answers C
1.	If α is an acute angle such that $Cos\alpha = \frac{2\sqrt{2}}{3}$ then $Sin\alpha =$	$\frac{1}{3}$	$-\frac{1}{3}$	$\frac{\sqrt{2}}{9}$
2.	$\overrightarrow{AM} + \overrightarrow{KA} + \overrightarrow{DK} + \overrightarrow{BD} + \overrightarrow{MB} =$	$\overrightarrow{AB}$	$\overrightarrow{AD}$	$\vec{0}$
3.	The negative integers that are solutions of the inequality $\frac{3x+2}{5} - \frac{2x+1}{3} \leq \frac{x+4}{3}$ are:	The negative integers strictly less than “-3”	-3, -2, -1, and 0	-4, -3, -2, -1
4.	Given $A = \frac{1.5 \times 8 \times 120 \times 10^{-1}}{7.5 \times 4.8}$ and $B = \sqrt{\frac{30}{70}} \times \sqrt{\frac{7}{48}}$ then	A = B	A is the inverse of B	A is the opposite of B
5.	If a straight-line of equation y = ax + b is increasing and cuts the positive y-axis then	a > 0 and b > 0	a < 0 and b < 0	a < 0 and b > 0

2nd exercise: (5pts)

Upon studying the number of daily hours spent by each of the 25 students of Grade 9 on the internet, we obtained the following results organized in the table below:

Number of daily hours	1	2	3	4	5
Number of students	2	y	9	x	3

1) Determine the studied character and its nature. (½ pt)
2) a) Explain what x and y represent in the above table and interpret one of them. (½ pt)
   b) Deduce a relation between x and y. (½ pt)
3) Calculate x and y knowing that the mean number of daily hours spent on the internet is 3.2. (1pt)
   For the remaining parts, let x = 7 and y = 4
4) Set up the table of increasing cumulative frequency in percentage and interpret any value. (¾ pt)
5) Is it true that 76% of the students use the internet at least 3 hours daily? **Justify**. (¾ pt)
6) Calculate the central angles and draw the circular diagram for this statistical distribution. (1pt)

3rd exercise: (4 ½ pts)

Given the following two polynomials:

$E(x) = (2m-3)x^2 + (m-1)x - 5m + 4$ and $G(x) = a(2x-1)^2 - cx^2 + (3a-b)x - 4a - 3$.

1) Calculate m so that "- 2" is a root of the polynomial E(x). (¾ pt)

In the remaining parts take m =2

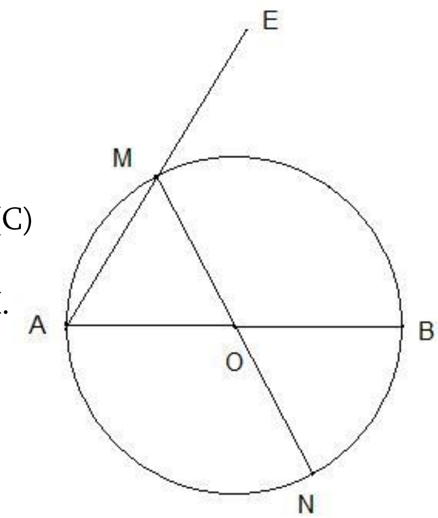
2) a) Expand G(x), then show that: G(x) = $(4a - c)x^2 - (a + b)x - 3a - 3$. (1 ¼ pts)
   b) Calculate a, b and c so that E(x) and G(x) are identical polynomials. (¾ pt)
3) Consider the polynomial F(x) = (x + 3) (x -2) + (2x – 1) (2 – x) + $2x^2$ – 8.
   a) Factorise F(x) and verify that F(x) = (x – 2) (x + 8). (¾ pt)
   b) Let $A(x) = \dfrac{(x+3)(\sqrt{8} - x\sqrt{2})}{F(x)}$
   Give all the values of x, for which A(x) is not defined, then simplify A(x). (1pt)

<u>4th exercise: (8pts)</u>

In the plane of an orthonormal system x'ox, y'oy, where the unit of length is the centimeter, consider the points A(0 ; - 4), B(- 2 ; 0) and C(-1 ; 3) and the straight-line (d) of equation y = 3x + 6.

1) a) Plot the points A, B and C. (¾ pt)
   b) Verify that B and C belong to straight-line (d), then draw (d). (1pt)
2) a) Determine the equation of the altitude (AH) in triangle ABC. (H is the orthogonal projection of A on (BC)). (¾ pt)
   b) Given $(AH): y = -\frac{1}{3}x - 4$. Calculate the coordinates of H, then deduce the distance from point A to (d) and the area of triangle ABC. (1 ½ pts)
   c) Determine the coordinates of the point M, the symmetric of A with respect to (BC). (¾ pt)
3) Let (Ω) be the circle of center A and tangent to (BC). Show that E(3; -5) belongs to (C). (¾ pt)
4) Let F be the translate of C by the vector translation $\overrightarrow{CA} + \overrightarrow{CM}$.
   a) Justify that CAFM is a Rhombus. (¾ pt)
   b) Calculate the coordinates of F. (¾ pt)
5) Given $AC = \sqrt{50}$ and $AH = \sqrt{10}$.
   Calculate tan $C\hat{A}H$ then deduce $H\hat{C}A$ to the nearest 10^{-1}. (1pt)

<u>5th exercise: (7 ½ pts)</u>



In the adjacent figure, (C) is a circle of centre O. [AB] is a fixed diameter of (C) such that AB = 6cm.

[MN] is a variable diameter of (C). E is the symmetric of A with respect to M.

(Note: don't reproduce the figure).

1) a) Prove that (OM) and (BE) are parallel. (¾ pt)
   b) Prove that (BM) is the perpendicular bisector of [AE]. (¾ pt)
   c) Find the locus of E as M varies on the circle (C). (¾ pt)
2) (EN) cuts (AB) in I.
   a) Prove that that the two triangles ION and IBE are similar and deduce that IB = 2 × IO. (1 ½ pts)
   b) Calculate IO and IB. (1pt)
   c) Is I the center of gravity of triangle MBN? Justify. (¾ pt)
3) **In this part, suppose that AM = 3cm.**
   a) Calculate BM and deduce the area **S** of triangle BAE. (1pt)
   b) Show that **2 S = EA × EB × Sin** $B\hat{E}A$. (1pt)