ليسه دي زار

الشهادة المتوسطة　　　التجربة الثانية لعام 2012 – 2013

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 40
- عدد المسائل: 5

1st exercise: (7½pts)

In this exercise, the four parts are independent.

1) Consider the following equation (E): $\frac{4^4-2^3}{2^3}=2^{2n+1}-1$.

   Calculate the value of the ***unknown n***. (1½pts)

2) In the plane referred to an orthonormal system of axes x'ox, y'oy, consider the points A(1, -1), B(3, 3) and C(1, 7).

   We admit without proof that triangle ABC is isosceles at B.

   Determine an equation of the internal bisector of angle $A\hat{B}C$. (1 ½ pts)

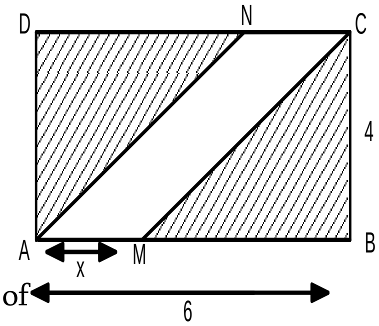
3) Consider a rectangle of perimeter 20m and length ℓ .
   a) Express the area A in terms of ℓ . Can you say that A is a linear function of ℓ ? Explain. (1½pts)
   b) Show that $A=25-(\ell-5)^2$. (½ pt)
   c) Deduce the value of ℓ for which the **area is maximum**. (1pt)

4) The area of a room is $20\,m^2$. The decorator offered a 5% discount for the tiling (تبليط) so that the total price of tiling for the room after discount is 4275$. Calculate the price of each m^2 of tiling before the discount. (1 ½ pts)

2nd exercise: (4½pts)

ABCD is a rectangle such that AB = 6cm and BC = 4cm.

M and N are two points of [AB] and [CD] respectively such that AM = CN = x.



1) Write an encirclement for **x**. (½ pt)
2) a) Calculate the area A_1 of triangle CBM then deduce the area A_2 of the parallelogram AMCN. (1 ½ pts)
   b) What type of functions are A_1 and A_2 ? Justify. (1pt)
3) Determine **x** so that the area of the parallelogram AMCN is **the double** of that of the **shaded part**. (1½pts)

3rd exercise: (12 pts)

In an orthonormal system x'ox, y'oy, consider the points A(2,-2), B(- 1, 2) and C(6, 1). $M\left(\frac{5}{2},m\right)$ is a variable point where m is a real parameter and (d) is the straight-line of equation $y=\frac{3}{4}x-\frac{7}{2}$.

1) Plot the points A, B and C. (1pt)
2) Show that (d) passes through the points A and C then draw (d). (1¼pts)
3) a) Determine the set of points M as m varies. (1 pt)
   b) Calculate $a_{(BC)}$, **the slope of (BC)** and verify that $a_{(AM)}=2m+4$. (1½pts)

c) Determine m so that the two straight-lines (BC) and (AM) are perpendicular. (1pt)

In what follows, take $m=\frac{3}{2}$ **so that** $M\left(\frac{5}{2},\frac{3}{2}\right)$

4) a) Show that M is the midpoint of [BC]. (¾ pt)
   b) Calculate the lengths BC and AM then verify that $AM=\frac{BC}{2}$. (1 ½ pts)
   c) Deduce the nature of triangle ABC. (1pt)
5) Let (Δ) be the straight-line perpendicular to (AC) and passing through the point K(3, 4).
   a) Determine the equation of (Δ). (1pt)
   b) Verify that the point $S(9,-4)$ is the point of intersection between (Δ) and the straight-line (L) having an ordinate of the origin 2 and an x-intercept 3. (2pts)

4th exercise: (8½pts)

The manager of a theatre proposes two options to his spectators:

Option 1: Pay a sum of 60 € per session.

Option 2: Pay an annual subscription of 210 € and obtain a discount of 25% on each session that costs 60 €.

1) What is the advantageous option if the spectator wants to attend 15 sessions in one year? Justify.(1½pts)
2) Designate by x the number of sessions attended in one year.
   - f(x) is the sum paid in € in option 1.
   - g(x) is the sum paid in € in option 2.

   a) Express f(x) in terms of x then show that g(x) = 45x + 210. (1 ½ pts)
   b) Complete the following table and show your work: (1 ½ pts)

X	0	2	14
f(x)			
g(x)			

   c) Represent graphically the two straight-lines (d_1) and (d_2) representing the two functions f and g respectively.

   Note: the plane is referred to an orthogonal system where:
   - On the x-axis, 2cm corresponds to 1 session.
   - On the y-axis, 1 cm corresponds to 50 €. (1 ½ pts)
3) a) Solve the equation f(x) = g(x) and interpret the obtained result. (1pt)
   b) Discuss graphically, according to the values of x, the most advantageous option for the spectator. (1 ½ pts)

5th exercise: (7 ½ pts)

Consider the circle (C) of center O and diameter AC = 10cm. D is the point of (C) such that $\overset{\frown}{CD}=60^{o}$. Let I be the orthogonal projection of D on [AC]. (DI) cuts the circle in E and **the two straight-lines (AD) and (EC) meet at F.**

1) Draw a figure in true measures. (1pt)
2) Show that (DO) and (FC) are parallel then deduce that D is the midpoint of [AF]. (1 ½ pts)
3) Calculate the lengths FC, FA and AI. (2pts)
4) **In this part, consider that D is a variable point on (C), and M is the midpoint of [AD].**
   a) What does (OM) represent for [AD]? Justify. (1pt)
   b) Deduce the locus of M as D varies on (C). (1pt)
   c) Let G be the centroid of triangle ADC. Determine the locus of G. (1pt)