مسابقة في الرياضيات الإنكليزي	المدّة : ساعتان	الإسم :	الرقم :

إرشادات عامة:

- يسمح بإستعمال ألة حاسبة غير قابلة للبرمجة
- يمكن الإجابة على ألمسائل بالترتيب االذي تريد
- يرجى الإجابة بخط واضح ومرتب
- العلامة القصوى من 30

1st exercise: (6½ pts)

In the following table, only one of the proposed answers to each question is correct. Write the number of each question and the corresponding answer, and **justify**.

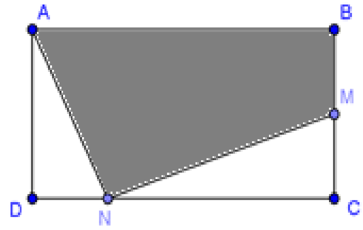
No.	Questions	Answers		
		A	B	C
1.	a is a real number such that $a=\frac{3\sqrt{5}-5}{2}$. Then the numerical value of $a(a+5)$ is …… **(1 pt)**	5	10	$\frac{9\sqrt{5}-25}{4}$
2.	Given the straight lines: $(d): y=(\sqrt{3}-5)x-1$ and $(d'): 22y-(\sqrt{3}+5)x+2=0$. Then (d) & (d') are…….. **(1 pt)**	Parallel	Perpendicular	Confounded
3.	If $x=-3\sqrt{2}$ is a root of $P(x)=x^2+a\sqrt{2}\,x+12$, then a=….. **(1pt)**	$\frac{6}{\sqrt{2}}$	$2+1.5\sqrt{2}$	5
4.	If $\sqrt{x-8}+7=8$, then $\sqrt{x}=$…….. **(1pt)**	$1+2\sqrt{2}$	$\sqrt{2}$	3
5.	The price of an item is $350\$$. After **sales,** the **new price** becomes $280\$$. The **percentage** of **reduction** is…… **(1pt)**	20%	21%	15%
6.	The point $A\left(2^{-1}-\frac{3}{5};(\sqrt{2}-1)^2+2\sqrt{2}\right)$ belongs to the straight-line of equation: **(1½ pts)**	$y=x+4$	$y=10x+2$	$y=10x+4$

2nd exercise: (7½ pts)

Consider in the orthonormal system of axes $(x'Ox$ & $y'Oy)$, the straight lines $(d): 2y+6=x$ and $(d'): y+2x=5$ and the points $B(4;-1)$ & $E(4;-3)$. **(The unit of length is the cm)**

1) Determine the relative position of (d) and (d’). ***(1pt)***
2) Draw the two straight lines (d) and (d’). ***(1 pt)***
3) Show that E belongs to (d’) and B belongs to (d) then place the points E and B. **(1 pt)**
4) (d) cuts x’Ox in D and (d’) cuts y’Oy in L. Calculate the coordinates of D and L. ***(1 pt)***
5) Designate by I the point of intersection of (d) and (d').Calculate the coordinates of I. ***(¾ pt)***
6) a) Calculate the length of [LD]. ***(½ pt)***
   b) Show that the points O, D, I and L belong to the same circle (C) whose center S and radius are to be determined. ***(1¼ pts)***
7) Show that the tangent (T) to the circle (C) at L has an equation 5y-6x-25=0. ***(1 pt)***

3rd exercise: (9 pts)



- ✓ $ABCD$ is a rectangle such that : $AB = 4cm$ and $AD = 2cm$.
- ✓ M & N are any two points on $[BC]$&$[CD]$ respectively such that $DN = BM = x$, where $0 < x < 2$. **(DO NOT DRAW)**

1) Determine $A_1(x)$, the area of triangle MCN as a function of x. **(¾ pt)**
2) $A_2(x)$ is the **area** of triangle DNA.
   a) Calculate $A_2(x)$ as a function of x .**(½pt)**
   b) Write the expanded form of $P(x)$ where $P(x) = A_1(x) + A_2(x)$.
   What does $P(x)$ represent?(¾pt)
3) a) Prove that the area of the shaded region is given by: $E(x) = \dfrac{-x^2 + 4x + 8}{2}$. **(1pt)**
   b) Develop: $Q(x) = (x-1)(x-3)$ **(¼ pt)**
   c) Calculate the value x if $E(x) = 5.5cm^2$. **(1 pt)**
4) a) Prove that the area of ANM is: $A = \dfrac{8 - x^2}{2}$. **(1pt)**
   b) Calculate the value x if the area of the triangle ANM is 3.28 cm^2. **(1 pt)**

5) The two straight-lines (MN) and (AD) intersect in I.
   a) Show that $DI = \dfrac{2x - x^2}{4 - x}$. ***(1 pt)***
   b) Calculate the numbers a and b so that $3x^2 - 7x + 4 = (x-1)(ax+b)$.***(¾ pt)***
   c) Deduce x when DI = $\dfrac{1}{3}$. ***(1 pt)***

4th exercise: (7 pts)

Consider The circle (C) of center O and diameter $[AB]$. (d), the perpendicular bisector of $[OA]$ cuts $[OA]$ at H and the circle (C) in E. Let K be the symmetric of the point O with respect to E.

1) Draw a figure. ***(½ pt)***
2) Show that (KA) is tangent to (C) at A using two methods:
   a. Converse of Thales' Theorem. ***(1 pt)***
   b. Right Triangle. ***(1 pt)***
3) Let OA = x and $KA = 3\sqrt{3}$ cm ; calculate the radius of (C) then deduce the nature of triangle AEK.***(1 ½ pts)***
4) Let M be the point on (C) such that BM = 3 cm. **(M and K are on the same side with respect to the diameter)**
   Use suitable equilateral triangles; show that the quadrilateral AEMB is an isosceles trapezoid.***(1½pts)***
5) In this part, M is a variable point on the circle (C) of radius 3 cm and designate by G the center of gravity of triangle MAB. Calculate OG then deduce the locus of G as M describes (C). ***(1½ pts)***