وزارة التربية والتعليم العالي المديرية العامة للتربية دائرة الامتحانات	امتحانات الشهادة المتوسطة	دورة سنة ٢٠٠٤ الإكمالية الاستثنائية
عدد المسائل : سبعة	مسابقة في الرياضيات المدة: ساعتان	الاسم: الرقم:

ملاحظـة : يُسمح باستعمال آلة حاسبة غير قابلة للبرمجة أو لاختزان المعلومات أو لرسم البيانات
يستطيع المرشح الإجابة بالترتيب الذي يناسبه (دون الالتزام بترتيب المسائل الوارد في المسابقة)

I- (1½ point)

Given the inequality : $2x + 1 \leq 5(x - 1) + 15$.
Solve this inequality and represent the solutions on an axis of origin O.

II- (2 points)

Consider the following numbers A, B and C .

$A = \frac{1}{5} - \left(\frac{2}{5}\right)^2$, $B = (2 - \sqrt{5})^2 + 2(8 + \sqrt{20})$, $C = \frac{-1.25 \times 8 \times 10^7 \times 10^{-4}}{4 \times 10^2}$.

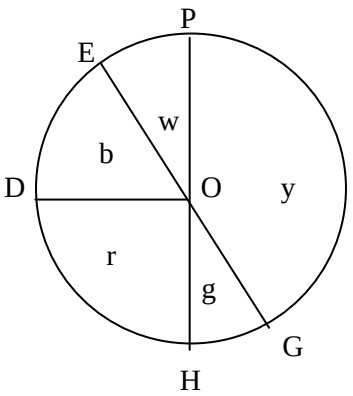
1) Calculate A, B and C showing all the steps of calculation and give each result in its simplest possible form.
2) From the numbers A, B and C, choose two opposite numbers and two numbers inverses of each other.

III-(2½ points)

1) Determine the numerical values of a and b so that the numbers 1 and 2 are the roots of the polynomial $P(x) = ax^2 + bx + 2a - 3b - 9$.
2) Given the polynomial $Q(x) = (x - 1)(x - 2)$.
   a- Show that $Q(x) - 2 = x(x - 3)$.
   b- Solve the equation $Q(x) = 2$.

IV-(3 points)

The opposite circular diagram represents the distribution of marbles in a bag according to their colours :
red : r, green : g , yellow : y , white : w , brown : b.
[EG] and [PH] are two diameters of the circle,



$\overset{\frown}{DOE} = 60°$ and $\overset{\frown}{DOH} = 90°$.

1) Calculate the angles $\overset{\frown}{EOP}$, $\overset{\frown}{POG}$ and $\overset{\frown}{GOH}$.
2) Justify that the yellow colour is the most frequent.
3) Knowing that the number of the red marbles is 270, reproduce and complete the following table and verify that the number of marbles in the bag is 1080 :

Colour	r	g	y	w	b
Frequency	270				

4) Calculate the percentage of the red marbles.

V- (3 ½ points)

ABC is a triangle right angled at A such that AB = 4cm and AC = 6cm. M is the midpoint of [AC].

1) Calculate BM.
2) Calculate, rounded to the nearest degree, the angle $\widehat{ABM}$ and deduce the angle $\widehat{BMC}$.
3) Let E be the symmetric of B with respect to M.
   a- Place E and determine the nature of quadrilateral CBAE.
   b- Calculate the area of CBAE.
4) Let G be the symmetric of B with respect to the straight line (AC).
   a- Place G and determine the nature of quadrilateral GECA.
   b- Calculate the area of quadrilateral BCEG.

VI- (2 ½ points)

Two perpendicular straight lines (d) and (d') intersect in a point O. The circle (C) of center O and radius 4 cuts (d) in A and B. Let M be a point of (C) distinct from A and let L be the midpoint of [AM]. The line (AM) cuts (d') in N.

1) Draw a figure.
2) a- What is the nature of triangle OLA ? Justify.
   b- Find the locus of L when M moves on the circle (C).
3) a- Prove that the two triangles OAN and MAB are similar.
   b- Deduce that the product AM × AN remains constant when M moves on circle (C).

VII-(5 points)

In an orthonormal system of axes x'Ox, y'Oy, consider the point C(0 ; 3) and the straight line (D) of equation $y = \frac{1}{2}x - 2$.

1) (D) cuts x'Ox in A and y'Oy in B. Calculate the coordinates of A and B, and draw (D).
2) The perpendicular (D') drawn from C to (D) cuts the straight line (D) in I.
   a- Find the equation of (D').
   b- Calculate the coordinates of I.
3) Let E be the point such that $\overrightarrow{AE} = \overrightarrow{AB} + \overrightarrow{AC}$.
   a- What is the nature of quadrilateral ABEC ?
   b- Calculate the coordinates of E.
4) Let M(0 ; m) be a point on y'Oy , where m is a positive number.
   a- Calculate the numerical value of m such that triangle ABM is right at A.
   b- For this value of m, the circle of diameter [MB] cuts again the axis x'Ox in a point H . What are the coordinates of H ? Justify.