دورة سنة ٢٠٠٥ العادية	امتحانات الشهادة المتوسطة	وزارة التربية والتعليم العالي المديرية العامة للتربية دائرة الامتحانات
الاسم: الرقم:	مسابقة في الرياضيات المدة: ساعتان	عدد المسائل : سبعة

ملاحظة : يسمح 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- (1 point)

Solve the following inequality :

$$4(2x - 1) \geq 9x - 7.$$

II- (1 ½ points)

The students of a school are distributed in the following way :

- 47 % are in the elementary section.
- 27 % are in the intermediate section.
- 130 students are in the secondary section.

1) What is the percentage of students in the secondary section ?
2) Calculate the number of students of this school.

III- (2½ points)

Given the expression : $E = (2x + 3)^2 + (x - 1)(2x + 3)$.

1) Expand and reduce E .
2) Calculate the exact value of E for $x = \sqrt{2}$.
3) Factorize E.
4) Solve the equation : $(3x + 2)(2x + 3) = 0$.

IV- (2½ points)

1) Solve the following system, showing all the steps of calculation :

$$\begin{cases} x + y = 11 \\ 2x + 5y = 34 \end{cases}$$

2) A survey was made to find the number of books read by the students of a certain class. The results are grouped in the following statistical table.

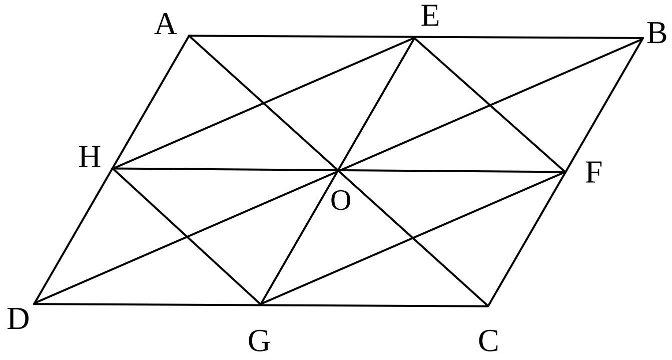
Number of read books	1	2	3	4	5	6
Number of students	5	x	4	3	y	2

We know moreover that the number of students of this class is 25 and the mean of read books is 3. Calculate x and y.

V- (2 ½ points)

Remark :

It is not required to reproduce the opposite figure.



In this figure, ABCD is a parallelogram of center O and the points E, F, G and H are the midpoints of the sides.

Reproduce and complete the following phrases.

1) The symmetrical of triangle GOD about point O is the triangle … .
2) The image (translate) of E by the translation of vector $\overrightarrow{AO}$ is the point … .
3) The point F is the image (translate) of point … by the translation of vector $\overrightarrow{DO}$.

4) $\overrightarrow{FE} + ... = \overrightarrow{FG}$.

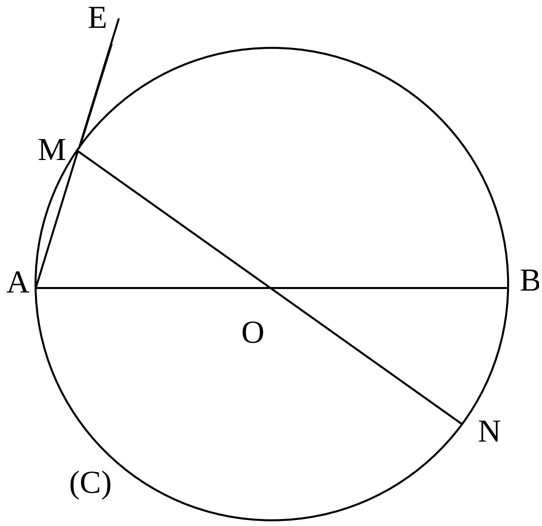
5) $\overrightarrow{AE} + \overrightarrow{AH} = ...$

6) $\overrightarrow{FE} + \overrightarrow{BC} = ...$

VI- (4 ½ points)

In the opposite figure :

- (C) is a circle of center O, [AB] is a fixed diameter of (C) such that AB = 6cm.
- [MN] is a variable diameter of (C).
- E is the symmetrical of A with respect to M.



1) Reproduce this figure.
2) a- Prove that (OM) and (BE) are parallel.
   b- Prove that (BM) is the perpendicular bisector of [AE] .
   c- Prove that triangle ABE is isosceles of principal vertex B.
   d- Prove that when M moves on (C), the point E moves on a fixed circle whose center and length of radius are to be determined.
3) Let I be the intersection point of the straight lines (EN) and (AB).
   a- Prove that the two triangles ION and IBE are similar and deduce that : IB = 2 × IO.
   b- Calculate IO and IB.
   c- Is I the center of gravity of triangle MBN ? Justify.
   d- (EN) cuts (MB) in F. Prove that (OF) is perpendicular to (MB).

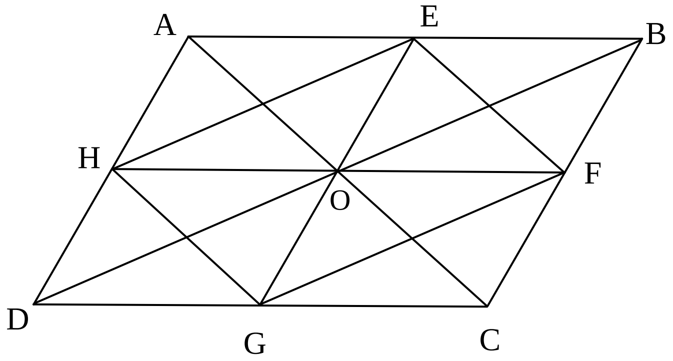
VII- (5 ½ points)

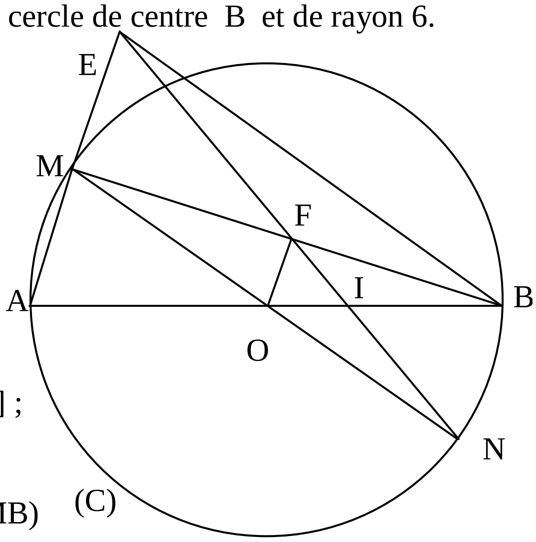
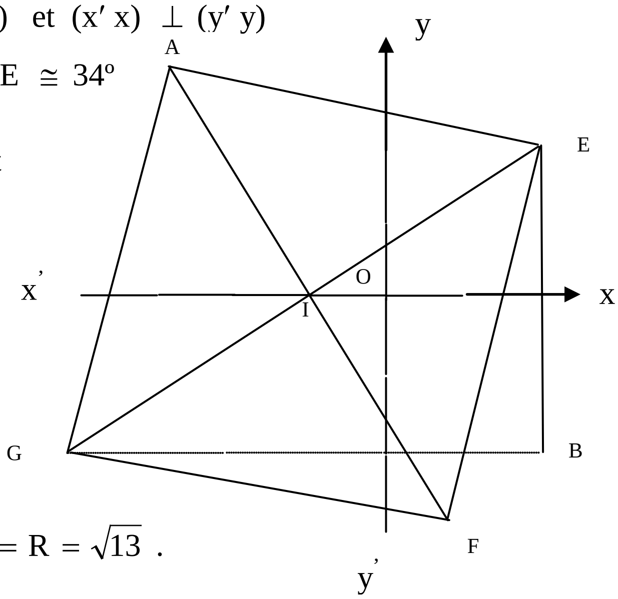
Consider in an orthonormal system of axes x′ O x , y′ O y, the points :

A(– 3 ; 3), B(2 ; – 2), G(– 4 ; – 2) and E(2 ; 2).

1) Plot the points A, B, G and E.
2) a- Justify that the straight line (BE) is parallel to (y′ y) and that the straight line (BG) is parallel to (x′ x).
   b- Prove that the triangle BGE is right angled at B.
   c- Calculate $\tan \widehat{BGE}$ and calculate, rounded to the nearest degree, the angle $\widehat{BGE}$.
3) Designate by (C) the circle circumscribed about triangle BGE, prove that its center is the point I(– 1 ; 0), and calculate the exact value of its radius.
4) Prove that A is a point of the circle (C).
5) a- Find the equation of the straight line (GE).
   b- Prove that (GE) and (AI) are perpendicular.
   c- Let F be the point such that $\overrightarrow{AE} + \overrightarrow{AG} = \overrightarrow{AF}$.
   Prove that the quadrilateral AGFE is a square.

توزيع علامات مسابقة الرياضيات

Questions		Eléments de réponses	Notes
I-		$8x - 4 \geq 9x - 7$; $-x \geq -3$ alors $x \leq 3$	¼ + ½ + ¼
II-	1)	$100 - (47 + 27) = 26$ soit 26 %	¾
	2)	$\frac{26}{100} = \frac{130}{N}$ alors $N = \frac{130 \times 100}{26} = 500$	¾
III-	1)	$E = 4x^2 + 9 + 12x + 2x^2 + 3x - 2x - 3$ $= 6x^2 + 13x + 6$	¼ ¼
	2)	$E\left(\sqrt{2}\right) = 6\left(\sqrt{2}\right)^2 + 13\sqrt{2} + 6 = 18 + 13\sqrt{2}$	½
	3)	$E = (2x + 3)(2x + 3 + x - 1)$ $= (2x + 3)(3x + 2)$	½ ¼
	4)	$2x + 3 = 0$ alors $x = -\frac{3}{2}$ ou $3x + 2 = 0$ alors $x = \frac{-2}{3}$	¾
IV-	1)	$\begin{cases} -2x - 2y = -22 \\ 2x + 5y = 34 \end{cases}$, $3y = 12$ alors $y = 4$ et $x = 7$.	½ , ¼ + ¼
	2)	$5 + x + 4 + 3 + y + 2 = 25$; $\frac{1 \times 5 + 2 \times x + 3 \times 4 + 4 \times 3 + 5 \times y + 6 \times 2}{25} = 3$ $x + y = 11$ $2x + 5y = 34$ alors $x = 7$ et $y = 4$.	½ ; ½ ½
V-	1) 2) 3) 4) 5) 6)	EOB F G $\overrightarrow{FE} + \overrightarrow{EG} = \overrightarrow{FG}$ $\overrightarrow{AE} + \overrightarrow{AH} = \overrightarrow{AO}$ $\overrightarrow{FE} + \overrightarrow{BC} = \overrightarrow{FG}$ 	¼ ¼ ½ ½ ½ ½

Questions		Eléments de réponses	Notes
VI	1)	Figure	¼
	2) a-	Théorème des milieux … O milieu de [AB] et M milieu de [AE]	½
	b-	BMA = 90º et M milieu de [AE]	½
	c-	B appartient à la médiatrice de [AE]	¼
	d-	B fixe BE = BA = 6 alors E décrit le cercle de centre B et de rayon 6.	½
	3) a-	(ON) // (BE) ou …	½
		$\frac{IO}{IB} = \frac{ON}{BE} = \frac{3}{6} = \frac{1}{2}$ alors IB = 2IO	½
	b-	IB = 2IO ; IO = 1 et IB = 2	¼ + ¼
	c-	[BO] médiane et $\frac{IO}{BO} = \frac{1}{3}$ ou …	½
	d-	[MI] médiane alors F milieu de [MB] ; (OF) // (MA)	½
		Théorème des milieux alors (OF) $\perp$ (MB)	
		 	
VII	1)	Placer A, B, G et E	½
	2) a-	$x_B = x_E = 2$, $y_B = y_G = -2$	¼ + ¼
	b-	(BG) // (x′ x) ; (BE) // (y′ y) et (x′ x) $\perp$ (y′ y)	½
	c-	tan BGE = $\frac{BE}{BG} = \frac{2}{3}$; BGE $\cong$ 34º	½ + ½
	3)	$x_I = \frac{x_G + x_E}{2} = -1$ et	¼ + ¼
		 	
		$y_I = \frac{y_G + y_E}{2} = 0$, IE = R = $\sqrt{13}$.	
	4)	IA = $\sqrt{13}$ = R.	½
	5) a-	a = $\frac{2}{3}$ et b = $\frac{2}{3}$ équation de (GE) : $y = \frac{2}{3}x + \frac{2}{3}$.	¾
	b-	$a_{(AI)} = \frac{y_I - y_A}{x_I - x_A} = -\frac{3}{2}$ alors $a_{(AI)} \times a_{(GE)} = -1$ donc (AI) $\perp$ (GE)	½
	c-	$\overrightarrow{AE} + \overrightarrow{AG} = \overrightarrow{AF}$ donc AGFE est un parallélogramme GAE = 90º (AI) $\perp$ (GE) alors AGFE est un carré.	¾