

إرشادات عامة: - يسمح باستعمال آلة حاسبة غير قابلة للبرمجة أو اختزان المعلومات أو رسم البيانات.  
- يستطيع المرشح الإجابة بالترتيب الذي يناسبه دون الالتزام بترتيب المسائل الواردة في المسابقة.

## مسابقة في مادة الرياضيات

المدة: ساعتان

(إنكليزي)

الاسم: .....

الرقم: .....

**I - (2 points)**

The questions of this exercise are **independent**.

Answer by **True (T)** or **False (F)**.

Justify the answer.

1)  $\frac{1}{3} - \frac{1}{3} \times \frac{6}{7} = 0$ .

2)  $(3 + \sqrt{5})^2 - 14 = 6\sqrt{5}$ .

3) The **five** grades over 20 of a student are: 10 ; 12 ; 13 ; 16 and 19.

The **average** grade is: 14.

4) The table 

x	$\sqrt{2}$
$\sqrt{2}$	4

 is a **proportionality** table for  $x = \frac{1}{2}$ .

**II - (3.5 points)**

Given:

$$A(x) = (3x - 2)^2 - (2x - 1)(3x - 2)$$

1) a. Verify that  $A(x) = (3x - 2)(x - 1)$ .

b. Solve  $(3x - 2)(x - 1) = 0$ .

2) Let  $B(x) = 9x^2 - 4$ .

Factorize  $B(x)$ .

3) Let  $F(x) = \frac{(3x - 2)(3x + 2)}{(3x - 2)(x - 1)}$

a. For what values of  $x$ , is  $F(x)$  defined?

b. Simplify  $F(x)$ .

c. Does the equation  $F(x) = -12$  admit a solution?

Justify.

**III- (3.5 points)**

1) Solve the following system: 
$$\begin{cases} 2x + 5y = 50\,000 \\ 2x + 3y = 38\,000 \end{cases}$$

2) At the museum,

**2** adults and **5** kids buy tickets and pay **50 000 LL**;

**4** adults and **6** kids pay **76 000 LL**.

Designate by:

**x** the price of a ticket for an adult;

**y** the price of a ticket for a kid.

**a.** Show that the previous information can be modeled by the system given in question **1**).

**b.** Find the price of the ticket of an adult and that of a kid.

**3)** For a group of **30** kids and **4** adults, the director of this museum decided

to offer a **reduction** of **25%** on the total amount paid for the tickets.

Calculate then the amount paid.

**IV- (5.5 points)**

In an orthonormal system of axes  $x'ox$  and  $y'oy$ , consider the points

**A**(-1; 0) and **B**(1; 4).

Let **(d)** be the line of equation  $y = 2x + 2$ .

1)a. Verify that **A** and **B** are two points on line (d).

b. Plot the points **A** and **B**.

c. Draw **(d)**.

2)Let **I** be the point of intersection of **(d)** with the axis  $y'oy$ .

a. Calculate the **coordinates** of **I**.

b. Verify that **I** is the **midpoint** of **[AB]**.

3)Let **(d')** be the perpendicular bisector of **[AB]**.

Verify that the equation of **(d')** is  $y = -\frac{1}{2}x + 2$ .

4) Consider the point **M**(4; 0).

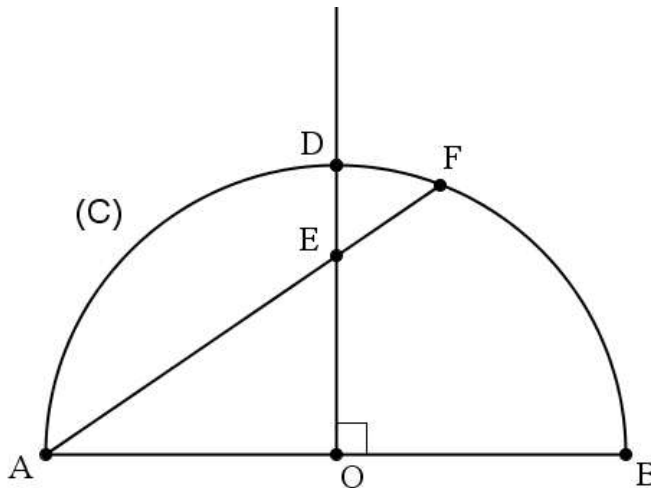
Show that the triangle **MAB** is **isosceles** of vertex **M**.

5) Let **K** be the **translate** of **B** under the **translation** with vector  $\overrightarrow{MA}$ .

Show that quadrilateral **MBKA** is a **rhombus**.

**V- (5.5 points)**

In the figure below:



- (C) is a semicircle of diameter [AB], with center O and radius **6 cm**.
- The perpendicular bisector of [AB] intersects (C) at D.
- E is a point on segment [OD] so that **OE = 4 cm**.
- The line (AE) intersects (C) at F.

1) Reproduce the figure.

2) Verify that  $AE = 2\sqrt{13}$  cm.

3) a. Prove that AFB is a **right** triangle at F.

b. Prove that the two triangles AOE and AFB are **similar**.

c. Write the ratio of similitude.

d. Deduce the value of  $AE \times AF$ .

4) The line (BF) intersects line (OD) at K.

The line (BE) intersects line (AK) at I.

a. What does E represent for the triangle AKB?

b. Prove that (BI) is **perpendicular** to (AK).

c. Deduce that I is a point on (C).

5) The tangent at A to (C) intersects the line (BE) en S.

a. Show that E is the midpoint of [BS].

b. Deduce that  $BS = 4\sqrt{13}$  cm.