عدد المسائل: خمس	مسابقة في مادة الرياضيات	
	المدة: ساعتان	

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 – (2.5 points)

(Show all the steps of calculation).

1) **Given** $A = \sqrt{18} - \sqrt{8} + \sqrt{50}$.

   Show that $A = 6\sqrt{2}$.

2) **Given** $B = \dfrac{1}{\sqrt{2}+1}$.

   Show that $B = \sqrt{2} - 1$.

3) **Given** $C = \left(\sqrt{2}+1\right)^2 + 1$.

   Show that $C = 2\sqrt{2} + 4$.

4) Show that $B \times A \times C = 24$.

II – (4 points)

1) Given $P(x) = (2x+1)^2 - (2x^2 + 9x + 4)$

  a. <u>Verify</u> that $(2x+1)(x+4) = 2x^2 + 9x + 4$.

  b. <u>Show that</u> $P(x) = (2x+1)(x-3)$.

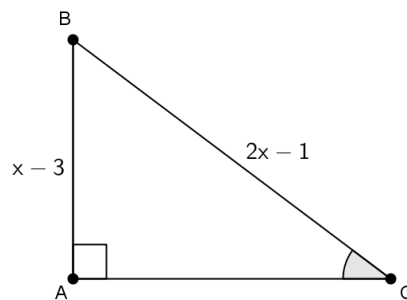 **c.** <u>Solve the equation</u> $(2x+1)(x-3) = 0$.

2) Let $H(x) = \dfrac{(2x+1)(x-3)}{4x^2 - 1}$.

  a. <u>Verify that</u> $4x^2 - 1 = (2x-1)(2x+1)$

  b. For what values of x , **is** $H(x)$ defined?

  c. <u>Show that</u> $H(x) = \dfrac{x-3}{2x-1}$

3) In the adjacent figure :

  ABC is a **right triangle at A** so that :

  $\mathbf{AB = x - 3}$ and $\mathbf{BC = 2x - 1}$ *where* $x > 3.$

  a. <u>Verify that</u> $\sin \widehat{BCA} = \dfrac{x-3}{2x-1}$

  b. <u>Is there a value of</u> x <u>so that</u> $\sin 30^0 = \dfrac{x-3}{2x-1}.$

III – (3 points)

1) <u>Solve</u> the following system : $\begin{cases} x + y = 16 \\ 2x + 3y = 38 \end{cases}$

2) The following table represents the distribution of electronic games in a shop according to their prices:

Price of an electronic game (in LL)	3 000	4 000	5 000	6 000
Number of electronic games	9	m	15	n
Total price	3 000 × 9	4 000× m		

a. <u>Complete</u> the table.

b. The **total price of all the electronic games** in this shop is:

178 000 LL.

- <u>Show that</u> this information is modeled by the following equation:

$2m + 3n = 38$.

c. Knowing that the **total number** of electronic games in this shop is **40.**

- <u>Show that</u> this information is modeled by the following equation:

$m + n = 16$.

d. Using the two equations in parts b and c:

- <u>Calculate</u> **m** and **n**.

IV- (5.5 points)

In an orthonormal system of axes $x'Ox$ and $y'Oy$, given the points

A$(0;-2)$, B$(-4;0)$ and **C$(0;3)$**.

1) a. Plot the points **A, B and C**.

    b. Show that **the equation of the line (AB) is** $y = \dfrac{-1}{2}x - 2$.

2) a. Calculate **CA** and **CB**.

    b. Show that the triangle **ABC** is **isosceles** of vertex C.

3) Let **H** be the point with coordinates $(-2;-1)$.

    a. Verify that **H** is the **midpoint of [AB].**

    b. Determine **the equation** of **the perpendicular bisector of [AB].**

4) Let **(C ')** be the circle **of diameter [BC].**

    Show that **O and H** are **on the same circle (C').**

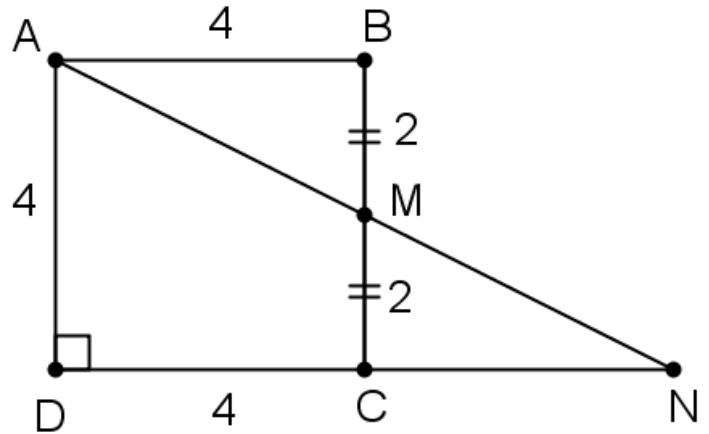   **a.** Verify that $I\left(-2;\dfrac{3}{2}\right)$ is the center of the circle (C').

    5) Show that **(IH) is parallel** to the y-axis.

V- (5 points)

In the adjacent figure :

- ABCD is a square of side 4

- M is the midpoint of [BC]

- (AM) intersects (DC) at N

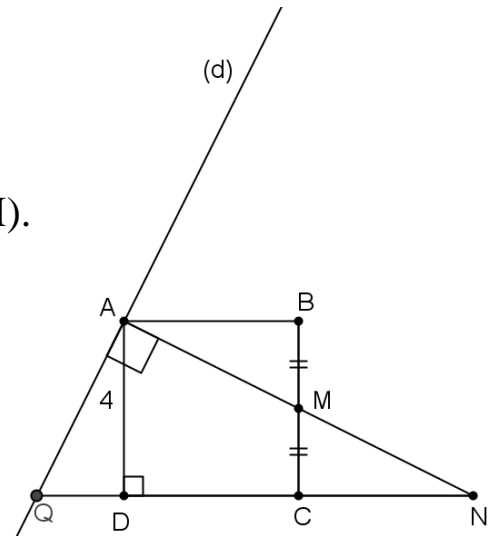1) Use the **Pythagorean theorem** in **the right triangle ABM** to

   show that **AM = $2\sqrt{5}$.**

2) a. Use **Thales' theorem** to show that $\dfrac{NC}{ND} = \dfrac{1}{2}$.

   b. Deduce that **C** is the **midpoint** of **[DN].**

3) Let (d) be the perpendicular through A to (AM).

   The lines (d) and (CD) intersect at Q.

   a. Show that $\widehat{AQD} = \widehat{NAD}$.

   b. Show that the two triangles **DAQ** and **DNA** are **similar**.

   c. Deduce that $DQ \times DN = 16$.

   d. Show that **DQ = 2**.

4) Show that the triangle **AQM** is a **right isosceles triangle** at A.