

ارشادات عامة: - يسمح باستخدام آلة حاسبة غير قابلة للبرمجة او اختزان المعلومات او رسم البيانات.

- يستطيع المرشح الاجابة بالترتيب الذي يناسبه دون الالتزام بترتيب المسائل الواردة في المسابقة.

- عدد المسائل 6 وجميعها إلزامية.

- العلامة القصوى 30.

1st exercise: (4 ½ pts)

1) Given the following two numbers:

$$A = \left(\frac{3}{8}\right)^2 - \frac{1}{8} ; B = (3 - \sqrt{5})^2 + 2(25 + \sqrt{45})$$

By writing all the steps of calculations:

a- Calculate A and show that $A = \left(\frac{1}{8}\right)^2$. (¾ pt)

b- Calculate B and show that $B = 8^2$. (¾ pt)

c- Deduce that $A \times B = 1$. (½ pt)

2) Let x be a real number defined by: $x = \sqrt{8 - 2\sqrt{7}} - \sqrt{8 + 2\sqrt{7}}$.

a- Compare $8 - 2\sqrt{7}$ and $8 + 2\sqrt{7}$. Deduce the sign of x. (1pt)

b- Calculate x^2 and show that $x^2 = 4$. Deduce the value of x. (1 ½ pts)

2nd exercise: (2 ½ pts)

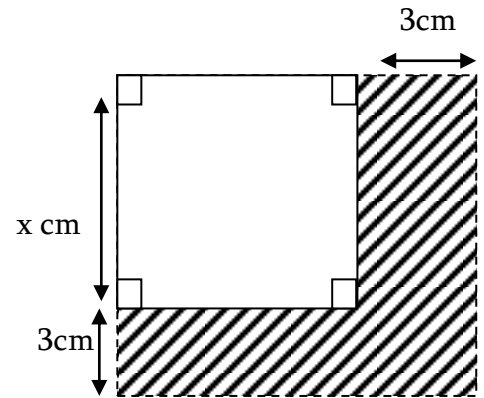
Consider a square whose side measures x cm. the side is increased by 3cm.

1) Determine, among the 3 algebraic expressions given below, the expression that expresses the increase in area of the square:

$$(x^2 + 3^2)^2 - x^2 ; x^2 - (x + 3)^2 ; (x + 3)^2 - x^2. (1pt)$$

2) Show that the obtained expression can be written as: $3(2x + 3)$.

Deduce the value of x when the increase in area is 33cm^2 . (1 ½ pts)



3rd exercise: (3 ½ pts)

Consider the two polynomials: $f(x) = 4x^2 - 1 + (2x - 1)^2 - (2 - 4x)(x + 2)$; $g(x) = (3x + 1)^2 - (x + 2)^2$

1) Develop and reduce f(x). (¾ pt)

2) Show that $f(x) = 2(2x - 1)(3x + 2)$. (¾ pt)

3) Write g(x) in the form of a product of two factors of the first degree. (¾ pt)

4) Let $h(x) = \frac{f(x)}{g(x)}$

a- For what values of x, h(x) is defined. (½ pt)

b- Simplify h(x), then solve the equation $h(x) = 2$. (¾ pt)

4th exercise: (7pts)

A video-club proposes two options to its clients:

Option A: pay a sum of 40\$ each month and 2\$ for each videotape rented.

Option B: pay 12\$ for each videotape rented.

1) Let:

x be the number of videos rented,

Y_A be the sum paid in option A,

Y_B be the sum paid in option B.

a- Express in each of the two options, the sum paid in terms of x . (1pt)

b- Recopy and complete the following table: (1pt)

x	3	4	5
Y_A			
Y_B			

2) Represent graphically these two options in the same system.

(1cm on the x -axis represents 1 video tape; 1 cm on the y -axis represents 10\$) (1 ½ pts)

3) What is the advantageous option if the client wants to rent in a month:

a. 3 videotapes? (½ pt)

b. 5 videotapes? (½ pt)

4) Determine the value of x , so that option A is more advantageous than option B. (1pt)

5) A person chooses option B and paid 156\$. How many videotapes did he rent? Is he right for choosing option B? Justify. (1 ½ pts)

5th exercise: (5 ½ pts)

ABC is an isosceles triangle at vertex A. The altitude issued from A cuts [BC] at H. (see figure below)

Given $BC = 6\text{cm}$ and $AH = 4\text{cm}$.

Let M be a point of [BH] such that $BM = x$. The parallel to (AH) through M cuts (AB) at P and (AC) at Q.

1) a- Calculate BH and give an encirclement for x . (1pt)

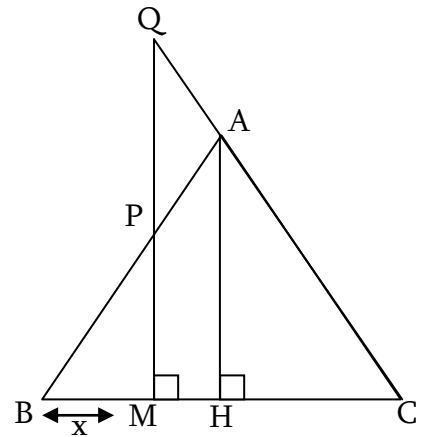
b- Show that: $\frac{MP}{AH} = \frac{x}{3}$. Deduce MP in terms of x . (1pt)

2) a- Express MC in terms of x . (½ pt)

b- Show that $MQ = \frac{4}{3}(6 - x)$. (1pt)

c- Find the value of x so that $MQ = 3MP$. (1pt)

d- In this case, precise the position of P on [AB]. (1pt)



6th exercise: (7pts)

In an orthonormal system $x'ox, y'oy$, consider the two straight-lines (d) and (d') of respective equations

(d): $y = -2x + 5$ and (d'): $y = \frac{1}{2}x$ and the two points $A(-1;7)$ and $B(-2;-1)$

1) Draw (d) and (d') then plot A and B. (1 ½ pts)

2) Show that the point $I(2,1)$ is the point of intersection of (d) and (d'). (¾ pt)

3) Verify by calculation that A belongs to (d) and that (d') passes through B. (1pt)

4) Given: $AI = \sqrt{45}$; $BI = \sqrt{20}$; $AB = \sqrt{65}$.

a- Deduce that the triangle ABI is right at I. (¾ pt)

b- Let J be the center of the circle circumscribed about the right triangle ABI. Calculate the radius of the circle and determine the coordinates of J. (1pt)

5) a- Write the equation of the straight-line (Δ) passing through J and parallel to (d'). (1pt)

b- (Δ) cuts (d) at L. Find the coordinates of L. (1pt)