

عدد المسائل: ستة	مسابقة في مادة الرياضيات المدة ساعتان	الاسم: الرقم:
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ارشادات عامة :- يسمح باستعمال آلة حاسبة غير قابلة للبرمجة او اختزان المعلومات او رسم البيانات
-يستطيع المرشح الإجابة بالترتيب الذي يناسبه دون الالتزام بترتيب المسائل الوارد في المسابقة

I- (2 points)

Consider the following numbers A, B and C:

$$A = \left(\frac{2}{3}\right)^2 + \frac{1}{3} ; B = \frac{5}{3} - \frac{2}{3} \div \left(1 + \frac{3}{2}\right) ; C = \frac{18 \times 10^8}{8 \times 10^7 \times 3.5}$$

- 1) Write, showing all the steps of calculation , each of the numbers A, B and C as a fraction in its simplest form.
- 2) Out of the found fractions, indicate that which is decimal. Justify.

II- (3 points)

Consider the following expressions:

$$E = (x+9)^2 - 25 ; G = (x+4)(x+14) - 2(x+4)^2$$

- 1) Verify that $E = (x+4)(x+14)$ and factorize G.
- 2) The adjoining diagram is that of an apartment in the form of a square with side $(x+9)$ meters $(x \geq 0)$.

It is formed of a salon, a room and a kitchen.

The room is a square with side 5 meters and the kitchen is also a square with side $(x+4)$ meters.

- a. Express ,in terms of x, the area A of the apartment and calculate the area of A_1 of the room.
- b. Determine A_2 ,the sum of areas of the salon and the kitchen.
- c. Express ,in terms of x, the area A_3 of the kitchen.
Determine x so that A_2 is the double of A_3 .



III- (3 points)

The following three questions are independent:

- 1) Solve the following equation and give the answer in the form $a\sqrt{b}$ where a and b are two integers : $\sqrt{2}(x-1) = 2(x-2) + 3\sqrt{2}$.
- 2) The measures, in cm, of sides of a triangle ABC are :
 $AB = \sqrt{7} + 1$, $BC = \sqrt{7} - 1$ and $AC = 4$.
Show that ABC is a right triangle.
- 3) An article costs 18 000LL. If its price is subject to a discount of 12%, followed by a raise of 15%, what is therefore the new price of this article?

IV- (2 points)

The owner of a bookshop proposes the following offer to his clients:

“The first five CD are rented at the rate of 600 LL each, and the others are rented at the rate of 500 LL each”.

A client has rented x CD and paid a sum less than 9 000 LL. ($x > 5$).

- 1) Show that the previous information are modeled by the following inequality:

$$500x + 500 < 9\,000.$$
- 2) Solve this inequality and find the greatest value of x .

V- (5 points)

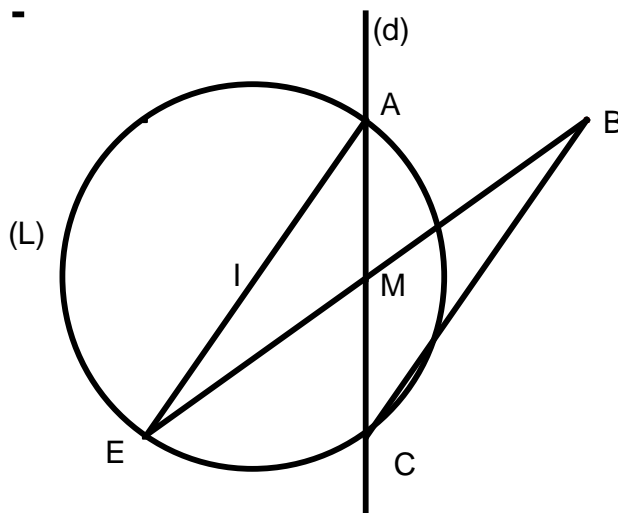
In an orthonormal system of axes $x'Ox$, $y'Oy$, consider the points $A(-1;0)$; $B(0;2)$ and $E(3;-2)$.

- 1) Plot A, B, and E in this system.
- 2) a. Prove that $BE = 5$.
 b. Let I be the midpoint of [BE]. Calculate the coordinates of I.
 c. Calculate AI and deduce that the triangle ABE is right at A.
- 3) Denote by (C) the circle circumscribed about triangle ABE and by (t) the tangent at B to (C).
 - a. Verify that the slope of (BE) is equal to $-\frac{4}{3}$.
 - b. Write the equation of (t).
 - c. (t) intersects $x'Ox$ at F. calculate, rounded to the nearest degree, the measure of the angle \widehat{BFI} .

VI- (5 points)

In the adjoining figure :

- A and B are two fixed points
- (d) is the perpendicular at A to (AB)
- C is a variable point on (d)
- M is the midpoint of [AC]
- E is the symmetric of B with respect to M
- (L) is the circle with diameter [AE] and center I.



- 1) Reproduce this figure.
- 2) Prove that the quadrilateral ABCE is a parallelogram.
- 3) Let F be the translate of B under the translation with vector \overrightarrow{CA} . Show that E, A and F are collinear.
- 4) (L) intersects (AB) at a second point G.
 - a. Prove that ACEG is a rectangle. Deduce that G is the translate of A under the translation with vector \overrightarrow{BA} .
 - b. Prove that the two triangles AGM et BGF are similar.
- 5) What is the locus of point I as C moves on (d) ?

	Part of Q.	correction	Note
I	1	$A = \frac{7}{9}$; $B = \frac{5}{3} - \frac{4}{15} = \frac{7}{5}$; $C = \frac{45}{7}$.	1.5
	2	B is decimal, (denominator is 5).	0.5
II	1	$E = (x+9+5)(x+9-5) = (x+4)(x+14)$ $G = (x+4)[x+14-2(x+8)] = (x+4)(-x+6)$	1
	2.a	$A = (x+9)^2$ $A_1 = 25$	0.5
	2.b	$A_2 = (x+9)^2 - 25$	0.5
	2.c	$A_3 = (x+4)^2$. $A_2 - 2A_3 = 0$, $G = 0$, $x = -4$ not acceptable $x = 6$ acceptable	1
III	1	$x(\sqrt{2} - 2) = 4\sqrt{2} - 4$; $x = \frac{4(\sqrt{2}-1)}{\sqrt{2}-2}$ then $x = -2\sqrt{2}$	1
	2	$(\sqrt{7}+1)^2 = 8+2\sqrt{7}$; $(\sqrt{7}-1)^2 = 8-2\sqrt{7}$ $AB^2 + BC^2 = AC^2$, then ABC is right at B.	1
	3	The discount price is 15 840LL. Then its new price after raise is 18 216 LL.	1
IV	1	$5 \times 600 + (x - 5) \times 500 < 9000$; so , $500x + 500 < 9000$.	1.25
	2	$500x < 8 500$; then $x < 17$. The greatest value of x is 16	0.75

