

عدد المسائل : <u>سبعة</u>	مسابقة في تايضاي رل ا قدام المدة: ساعتان	الاسم: الرقم:
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**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)**

Given that :  $A = \frac{8}{7} - \frac{3}{7} \times \frac{14}{6}$  and  $B = \frac{2.1 \times 10^4 \times 10^{-5}}{3 \times 10^2}$ .

- 1) Write A in the form of an irreducible fraction.
- 2) Write B in the form  $a \times 10^n$  where a and n are two integers.

**II- (1½ points)**

A bag contains a number of balls distributed in the following way:

- 10 % of the balls are red
- 15 % of the balls are white
- $\frac{2}{5}$  of the balls are green
- 42 balls are black

- 1) Find the percentage of the green balls and that of the black balls.
- 2) Calculate the total number of balls in the bag.

**III- (2½ points)**

Given that  $P(x) = 4x^2 - 9 + (x-2)(2x+3)$  and  $Q(x) = (2x+3)(x-1)$ .

- 1) Prove that  $P(x) = (2x+3)(3x-5)$ .
- 2) Solve the equation  $Q(x) = 0$ .
- 3) Let  $F(x) = \frac{P(x)}{Q(x)}$ .
  - a- For what values of x, is F(x) defined ?
  - b- Simplify F(x), then solve the equation  $F(x) = \sqrt{2}$ , and write the solution in the form  $\frac{a+b\sqrt{2}}{c}$  where a, b and c are integers.

**IV- (3 points)**

A video-club offers its customers two choices A and B. Each choice is formed of a fixed sum paid in advance which is called subscription and another sum to be paid for each rented cassette (Film).

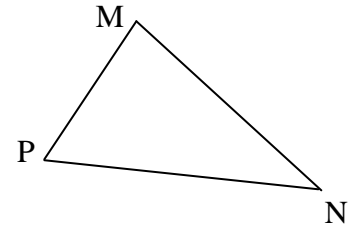
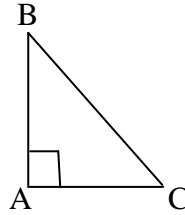
	Subscription in LL	Price in LL paid for each rented cassette
<b>Choice A</b>	60 000	900
<b>Choice B</b>	42 000	1 500

- 1) A customer who wants to rent 20 cassettes chooses choice A. How much should he pay?
- 2) Designate by x the number of cassettes that a second customer desires to rent.
  - a- Express in terms of x, the price  $S_1(x)$  that this customer should pay if he chooses choice A and the price  $S_2(x)$  that he should pay if he chooses choice B.
  - b- Starting from which number does the rented cassettes of choice A become more advantageous than choice B?  
(we advise you to start by solving the inequality  $S_1(x) \leq S_2(x)$ .)
- 3) A third customer has chosen choice B and paid 93 000LL.
  - a- What is the number of cassettes rented to this customer?
  - b- Which choice is better for him? Justify.

**V- (2½ points)**

In the opposite figure (not drawn to scale):

- ABC is a triangle right angled at A such that  $AB = 6 \text{ cm}$  and  $\tan \angle ACB = \frac{3}{2}$ .



- MNP is a triangle similar to ABC such that  $\frac{MN}{AB} = \frac{MP}{AC} = \frac{5}{4}$ .

- 1) Find rounded to the nearest degree, the measure of angle  $\angle ACB$  and write on your paper the measure of  $\angle ACB$  appearing on your calculator.
- 2) Prove that the triangle MNP is right angled at M and that  $\angle ACB = \angle MPN$ .
- 3) Calculate NP.

**VI- (3 points)**

Consider a semi-circle (C) of center O, radius R and diameter [AB]. Let M be a point on (C) distinct from A and B. The tangent at M to (C) cuts the tangent at A in point N and the tangent at B in point P. (OP) cuts [MB] in D and (ON) cuts [AM] in E.

- 1) Draw a figure.
- 2) Prove that D is the midpoint of [MB] and that E is the midpoint of [MA].
- 3) Calculate ED in terms of R.
- 4) Prove that ODME is a rectangle.
- 5) Let J be the midpoint of [DE]. Prove that, when M moves on (C), J moves on a semi-circle whose center and radius are to be determined.

**VII- (6½ points)**

Consider, in an orthonormal system of axes  $x'Ox$  and  $y'Oy$  where the unit of length is the centimeter, the points  $A(0 ; -4)$ ,  $E(0 ; 1)$ ,  $F(4 ; -1)$  and the straight line (d) of equation  $y = -\frac{1}{2}x + 1$ .

- 1) Plot the points A, E and F.
- 2) Verify by calculation, that E and F are two points of (d), then draw (d).
- 3) Prove that  $I(2 ; 0)$  is the midpoint of [EF].
- 4) We know that  $EF = 2\sqrt{5}$ .
  - a- Calculate AE and AF. Deduce that triangle AEF is isosceles of principal vertex A.
  - b- Is the straight line (AI) perpendicular to (EF)? Justify.
- 5) Let B be the symmetric of A with respect to I.
  - a- Prove that AFBE is a rhombus.
  - b- Calculate the coordinates of B.
- 6) Let (d') be the straight line passing through B and parallel to (d). Determine the equation of (d').
- 7) (AE) and (AF) intersect (d') in M and N respectively. Prove that EMNF is an isosceles trapezoid and calculate its area.



continued VI	2	D is the midpoint of [MB] because ..... E is the midpoint of [MA] because ...	$\frac{1}{2}$ $\frac{1}{4}$
	3	ED = R	$\frac{1}{2}$
	4	ODME is a rectangle because .....	$\frac{3}{4}$
	5	J moves on the semi-circle of center O and of radius $\frac{R}{2}$ .	$\frac{1}{2}$
VII	1	<p>A ; E et F</p>	$\frac{3}{4}$
	2	E is a point of (d) because ..., F is a point of (d) because ... drawing of (d).	$\frac{1}{4}$ ; $\frac{1}{4}$ ; $\frac{1}{4}$
	3	$x_I = \frac{x_E + x_F}{2} = 2$ ; $y_I = \frac{y_E + y_F}{2} = 0$ .	$\frac{1}{2}$
	4a	AE = AF = 5 AEF is an isosceles triangle of principal vertex A.	$\frac{1}{4}$ ; $\frac{1}{2}$ $\frac{1}{4}$
	4b	(AI) is perpendicular to (EF) because ...	$\frac{1}{2}$
	5a	AFBE is a rhombus because ...	$\frac{1}{2}$
	5b	B(4 ; 4)	$\frac{1}{2}$
	6	$y = -\frac{1}{2}x + b$ because the slope of (d) = slope of (d') = $-\frac{1}{2}$ $y = -\frac{1}{2}x + 6$ because (d') passes by B.	$\frac{1}{2}$ $\frac{1}{2}$
	7	EMNF is an isosceles trapezoid because ... $A_{EMNF} = \frac{(MN + EF) \times IB}{2} = \frac{6\sqrt{5} \times 2\sqrt{5}}{2} = 30\text{cm}^2$	$\frac{1}{2}$ $\frac{1}{2}$