

الاسم:
الرقم:

مسابقة في مادة الرياضيات
المدة ساعة

عدد المسائل: ثلاث

ملاحظة : يسمح بإستعمال 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 - (5 points)

A craftsman manufactures two sizes of dolls, small and big.
The small doll costs 9 000LL for raw material and 37 500 LL for labor.
The big doll costs 21 000 LL for raw material and 22 500 LL for labor.
The craftsman paid 1 620 000 LL for the raw material and 2 850 000 LL for labor.

- 1- Calculate the number of dolls of each size that he can manufacture.
- 2- The small doll is sold for 60 000 LL and the big doll for 70 000 LL.
Determine, if the whole production is completely sold, the profit achieved by this craftsman.

II - (5 points)

In a certain university there are 200 students, each of them is studying either engineering or medicine or law. These students are distributed as shown in the following table:

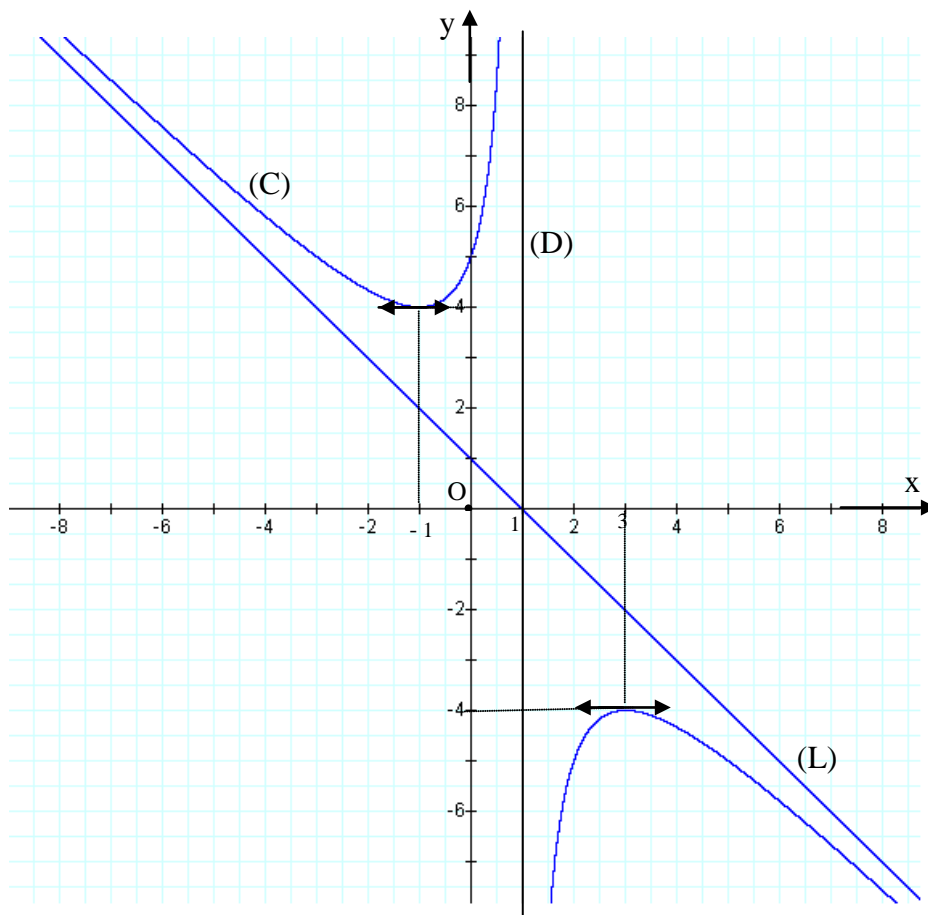
	Engineering	Medicine	Law
Girls	22	25	31
Boys	46	40	36

A student is chosen randomly from these 200 students.
Calculate the probability of each of the following events:

- 1- A: "The chosen student is a boy studying medicine".
- 2- B: "The chosen student is a boy knowing that he is studying medicine".
- 3- C: "The chosen student is not studying engineering knowing that she is a girl".
- 4- D: "The chosen student is studying law or is a boy".

III - (10 points)

The curve (C) drawn below is the graphical representation of a function f .
The straight lines (L) and (D) are the asymptotes of (C).



Use the above graphical representation to:

- 1)
 - a) Determine the domain of f .
 - b) Find $\lim_{\substack{x \rightarrow 1 \\ x < 1}} f(x)$ and $\lim_{\substack{x \rightarrow 1 \\ x > 1}} f(x)$, and write an equation of the line (D).
- 2)
 - a) Find $f(0)$ and $f(3)$.
 - b) Find $f'(-1)$ and $f'(3)$.
- 3) Solve each of the following inequalities:
 - a) $f(x) > 0$
 - b) $f(x) \leq 1$
 - c) $f'(x) > 0$.
- 4) Write an equation of the line (L).
- 5) Set up the table of variations of f .
- 6) The function f is given by $f(x) = ax + 1 + \frac{b}{x - c}$. Show that $a = -1$, $b = -4$ and $c = 1$.
- 7) Find an equation of the tangent to (C) at the point of abscissa 0.

I- (5 points)

Part of the Q	Answer	Mark
1	Let x be the number of small dolls manufactured, and y be the number of big dolls: $\begin{cases} 9000x + 21000y = 1620000 \\ 37500x + 22500y = 2850000 \end{cases}$ Using a calculator we get $x = 40$ and $y = 60$. 40 small dolls and 60 big dolls.	3
2	Cost of producing a small doll is: $9000+37500=46500$ LL Cost of producing a big doll is: $21000+22500=43500$ LL Profit achieved is : $40(60000 - 46500) + 60(70000 - 43500) = 2130000$ LL.	2

II – (5 points)

Part of the Q	Answer	Mark
1	$P(A) = \frac{40}{200} = 0.2$	1
2	$P(B) = \frac{40}{65} = 0.615$	1
3	$P(C) = \frac{25 + 31}{78} = \frac{56}{78} = 0.71$	1.5
4	$P(D) = \frac{46 + 40 + 36 + 31}{200} = 0.765$	1.5

III – (10 points)

Part of the Q	Answer	Mark
1.a	$\mathbb{R} - \{1\}$ or $]-\infty; 1[\cup]1; +\infty[$	0.5
1.b	$\lim_{x \rightarrow 1^-} f(x) = +\infty, \lim_{x \rightarrow 1^+} f(x) = -\infty$ VA is (D): $x=1$	1
2.a	$f(0) = 5, f(3) = -4$	0.5
2.b	$f'(-1) = 0$ and $f'(3) = 0$	0.5
3.a	$f(x) > 0$ when (C) is above axis of abscissas, so $x \in]-\infty; 1[$	1
3.b	$f(x) \leq 1$ then (C) has to be below line $y=1$, consequently $x \in]1; +\infty[$	1
3.c	$f'(x) > 0$ when f is increasing, $x \in]-1; 1[\cup]3; +\infty[$	1
4	(L) passes in points (0;1) and (1;0); equation is $y = -x + 1$	1
5		1.5
6	$x=1$ is VA so $c=1$. $f(0) = 5$ then $b = -4$. $f(3) = -4$, thus $a = -1$	1
7	$f'(0) = 3$; an equation of tangent: $y - 5 = 3(x - 0)$ or $y = 3x + 5$	1