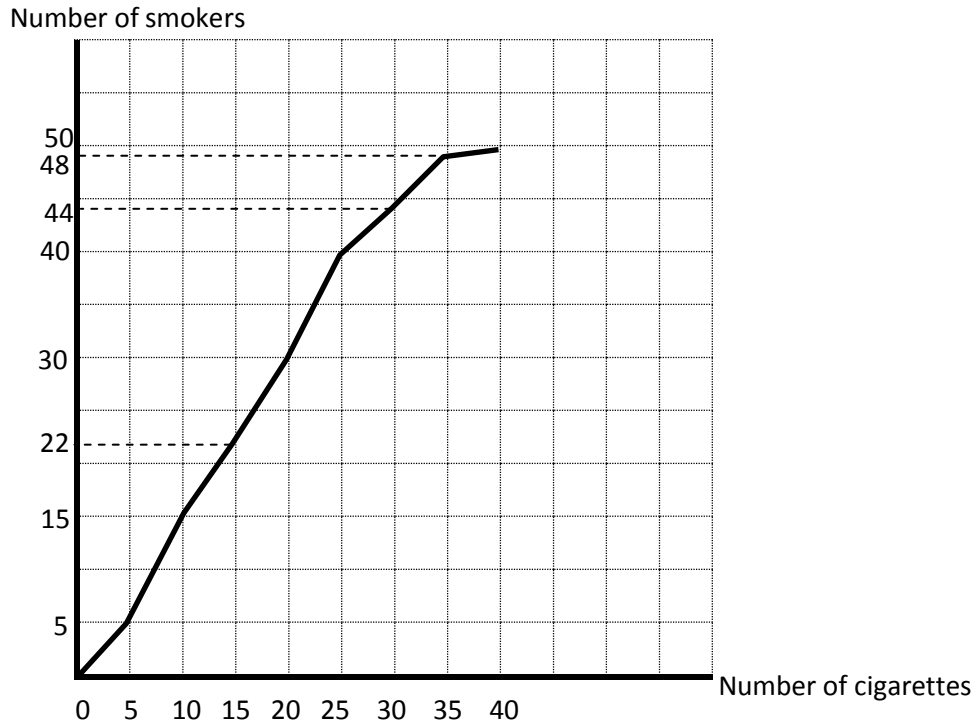


I- (10 points)

A survey was conducted on 50 smokers to study their daily consumption of cigarettes. The graph below represents the **increasing cumulative frequency polygon** of these smokers.



1) Copy and complete the following frequency table of this distribution.

Number of cigarettes	[0;5[				[20;25[			[35;40]
Number of smokers	5		7		10			2

- 2) Determine the population, and the variable and its nature.
- 3) Determine the median of this distribution and give an interpretation of the obtained answer.
- 4) Determine, **with justification**, the modal class of the above data and give an approximate value of the mode.
- 5) Calculate the mean  $\bar{x}$  of the above data and give an interpretation of the obtained answer.
- 6) Calculate the standard deviation  $\sigma$  of the above data.
- 7) One smoker is chosen at random. Consider the following events:
  - A: "The number of cigarettes consumed by the smoker is less than 35."
  - B: "The number of cigarettes consumed by the smoker is greater than or equal to 15."
 Calculate the following probabilities:  $P(A)$ ,  $P(B)$ ,  $P(A \cap B)$ , and  $P(A / B)$ .

## II- (10 points)

Consider the function  $f$  defined, on  $] -\infty , 2[ \cup ]2 , +\infty [$ , by:  $f(x) = -x + 4 - \frac{1}{x-2}$ . Let (C) be the representative curve of  $f$  in an orthonormal system  $(O; \vec{i}, \vec{j})$ .

1) Calculate  $\lim_{\substack{x \rightarrow 2 \\ x < 2}} f(x)$  and  $\lim_{\substack{x \rightarrow 2 \\ x > 2}} f(x)$ . Deduce an asymptote (D) to (C).

2)

a- Calculate  $\lim_{x \rightarrow -\infty} f(x)$  and  $\lim_{x \rightarrow +\infty} f(x)$ .

b- Show that the line (d) of equation:  $y = -x + 4$  is an asymptote to (C).

3) Show that the point  $I(2, 2)$  is a center de symmetry of (C).

4)

a- Verify that  $f'(x) = \frac{(x-1)(-x+3)}{(x-2)^2}$ .

b- Set up the table of variations of  $f$ .

5) Draw (D), (d), and (C).

6) Solve the inequality  $f(x) > 4$ .

**GOOD WORK!**

**Mid-year Exam  
Answer Key  
Humanities and Literature**

Questions		Réponses									Notes																														
<b>I-</b>	1	Nombre de cigarettes	[0 ;5[	[5 ;10[	[10 ;15[	[15 ;20[	[20 ;25[	[25 ;30[	[30 ;35[	[35 ;40]	1																														
		Nombre de fumeurs	5	10	7	8	10	4	4	2																															
	2	Population: les 50 fumeurs Caractère : nombre de cigarettes consommées par jour. Nature : quantitative.									1																														
	3	Graphiquement , la droite d'équation $y = 25$ coupe le polygone donné en un point d'abscisse $x$ telle que $x=17$ Interprétation: 25 personnes de ces fumeurs fument un nombre de cigarettes $\geq 17$ .									1.5																														
	4	[5;10[ et [20;25[ sont les classes modales .les classes les plus fréquentes Mode 1 = $\frac{5+10}{2} = 7.5$ et mode 2 = $\frac{20+25}{2} = 22.5$									1																														
	5	$\bar{x} = 17.1$ ; le nombre moyenne de cigarettes consommés par jour est 17 cigarettes									1																														
	6	$\sigma = 9.63$									0.5																														
	7	$p(A) = \frac{48}{50} = 0.96$ ; $p(B) = \frac{28}{50} = 0.56$ ; $p(A \cap B) = \frac{26}{50} = 0.52$ et $p(A/B) = \frac{p(A \cap B)}{p(B)} = 0.93$									2																														
<b>II-</b>	1	$\lim_{\substack{x \rightarrow 2 \\ x < 2}} f(x) = +\infty$ ; $\lim_{\substack{x \rightarrow 2 \\ x > 2}} f(x) = -\infty$ ; (D): $x = 2$ .									1.5																														
	2.a-	$\lim_{x \rightarrow -\infty} f(x) = +\infty$ ; $\lim_{x \rightarrow +\infty} f(x) = -\infty$									1																														
	2.b-	$\lim_{x \rightarrow -\infty} [f(x) - y(a)] = \lim_{x \rightarrow -\infty} \frac{-1}{x-2} = 0$ ; $\lim_{x \rightarrow +\infty} [f(x) - y(a)] = 0$									1																														
	3	$D_f$ est centré en $x = 2$ $f(4-x) + f(x) = 4 = 2b$ Donc I(2,2) est un centre de symétrie									1.5																														
	4	$f'(x) = -1 + \frac{1}{(x-2)^2} = \frac{(x-1)(-x+3)}{(x-2)^2}$									2																														
	5	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%; text-align: center;">X</td> <td style="width: 10%; text-align: center;">-∞</td> <td style="width: 10%; text-align: center;">1</td> <td style="width: 10%; text-align: center;">2</td> <td style="width: 10%; text-align: center;">3</td> <td style="width: 10%; text-align: center;">+∞</td> </tr> <tr> <td style="text-align: center;">f'(x)</td> <td style="text-align: center;">-</td> <td style="text-align: center;">0</td> <td style="text-align: center;">+</td> <td style="text-align: center;">+</td> <td style="text-align: center;">0 -</td> </tr> <tr> <td style="text-align: center;">f(x)</td> <td style="text-align: center;">+∞</td> <td style="text-align: center;">↘</td> <td style="text-align: center;">4</td> <td style="text-align: center;">↗</td> <td style="text-align: center;">+∞</td> </tr> <tr> <td></td> <td></td> <td></td> <td style="text-align: center;">-∞</td> <td style="text-align: center;">↖</td> <td style="text-align: center;">0</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">↘</td> <td style="text-align: center;">-∞</td> </tr> </table>									X	-∞	1	2	3	+∞	f'(x)	-	0	+	+	0 -	f(x)	+∞	↘	4	↗	+∞				-∞	↖	0					↘	-∞	2
	X	-∞	1	2	3	+∞																																			
f'(x)	-	0	+	+	0 -																																				
f(x)	+∞	↘	4	↗	+∞																																				
			-∞	↖	0																																				
				↘	-∞																																				
6	graph									2																															
7	$] -\infty, 1[ \cup ] 1, +\infty [$									1																															