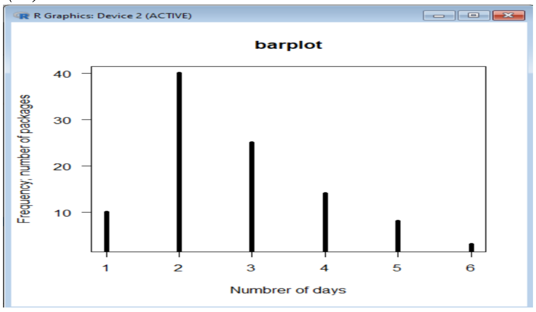
Exercice 1 *(1)* Ω*: packages,* X*: number of days taken to deliver packages; dicrete quantitative variable.*

(2)

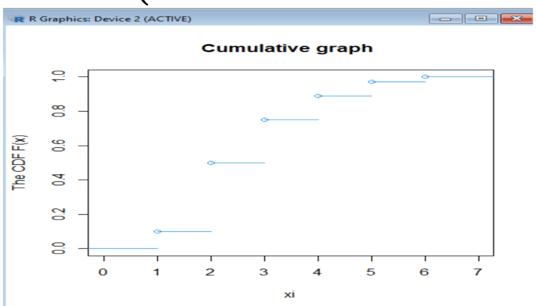
x_i	n_i	f_i	n_i^{cum}	f_i^{cum}	$n_i * x_i$	$n_i * x_i^2$
1	10	0.1	10	0.1	10	10
2	40	0.4	50	0.5	80	160
3	25	0.25	75	0.75	75	225
4	14	0.14	89	0.89	56	224
5	8	0.08	97	0.97	40	200
6	3	0.03	100	1	18	108

(3)



(4)

$$F_X(x) = \begin{cases} 0 & \text{if } x < 1, \\ 0.1 & \text{if } 1 \leq x < 2, \\ 0.5 & \text{if } 2 \leq x < 3, \\ 0.75 & \text{if } 3 \leq x < 4, \\ 0.89 & \text{if } 4 \leq x < 5, \\ 0.97 & \text{if } 5 \leq x < 6, \\ 1 & \text{if } x \geq 6. \end{cases}$$



(5) $Mo = 2$, $Me = 2$, $\bar{x} = \frac{1}{n}\sum n_i * x_i = 279/100 = 2.79$, $Var(X) = \frac{1}{n}\sum n_i * x_i^2 - \bar{x}^2 = 927/100 - 2.79^2 = 1.4859$. $\sigma = \sqrt{Var(X)} = 1.218975$.

(6) the percentage of packages taking at most 2 days$=\% \{\omega,\ X(\omega) \leq 2\} = F_X(2) = 50\%$.

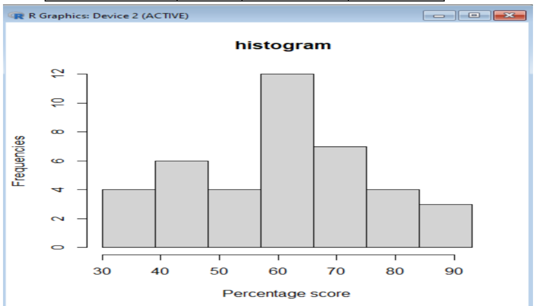
the percentage of packages taking at least 4 days$=1 - F_X(3) = 25\%$.

Exercice 2 *(1)* Ω $=$ *candidates.* X*: percentage of scores, quantitative continuous variable.*

(2) the range= max(X)-min(X)=93-30=63.l: width class; $l \geq 63/7 = 9$.

(2)

Classes	n_i	f_i	n_i^{cum}
$[30, 39[$	*4*	*0.1*	*4*
$[39, 48[$	*6*	*0.15*	*10*
$[48, 57[$	*3*	*0.075*	*13*
$[57, 66[$	*12*	*0.3*	*25*
$[66, 75[$	*7*	*0.175*	*32*
$[75, 84[$	*3*	*0.075*	*35*
$[84, 93]$	*5*	*0.125*	*40*



(4) $Mo \in [57, 66[\,, Mo = 57 + \frac{(12-3)}{(12-3)+(12-7)} * 9 = 62.78571.$

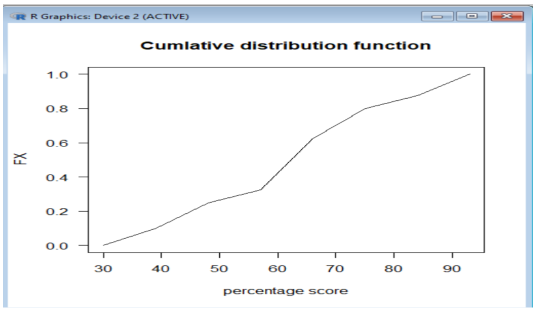
Let draw the frequency table

class	c_i	N_i	$n_i * c_i$	$n_i * c_i^2$
$[30, 39[$	*34.5*	*4*	*138.0*	*4761.00*
$[39, 48[$	*43.5*	*6*	*261.0*	*11353.50*
$[48, 57[$	*52.5*	*3*	*157.5*	*8268.75*
$[57, 66[$	*61.5*	*12*	*738.0*	*45387.00*
$[66, 75[$	*70.5*	*7*	*493.5*	*34791.75*
$[75, 84[$	*79.5*	*3*	*238.5*	*18960.75*
$[84, 93]$	*88.5*	*5*	*442.5*	*39161.25*

$\bar{x}$=*2469/40=61.725.* $Var(X) = 162684/40 - 61.725^2 = 257.1244.$

(5) The CDF F_X;

$$F_X(t) = \begin{cases} 0 \ \textit{if } t < 30, \\ 0.1 \times \frac{t-30}{9} \ \textit{if } 30 \leq t \leq 39, \\ 0.1 + 0.15 \times \frac{t-39}{9} \ \textit{if } 39 \leq t \leq 48, \\ 0.25 + 0.075 \times \frac{t-48}{9} \ \textit{if } 48 \leq t \leq 57, \\ 0.325 + 0.3 \times \frac{t-57}{9} \ \textit{if } 57 \leq t \leq 66, \\ 0.625 + 0.175 \times \frac{t-66}{9} \ \textit{if } 66 \leq t \leq 75, \\ 0.8 + 0.075 \times \frac{t-75}{9} \ \textit{if } 75 \leq t \leq 84, \\ 0.875 + 0.125 \times \frac{t-84}{9} \ \textit{if } 84 \leq t \leq 93, \\ 1 \ \textit{if } t \geq 93. \end{cases}$$



$Me \in [57, 66[$; $Me = 57 + \frac{0.5-0.325}{0.625-0.325} \times 9 = 62.25$

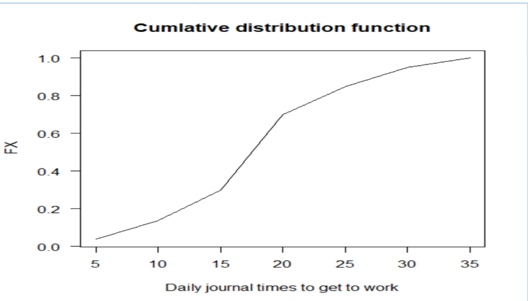
Exercice 3 *1) Population: the 200 days , variable X:number of rooms occupied each day , sample size=200, range =120-0=120 .*

2)

class	c_i	n_i	f_i	f_i^{cum}	$n_i * c_i$	$n_i * c_i^2$
$[0, 20[$	10	10	10/200	10/200	100	1000
$[20, 40[$	30	32	32/200	42/200	960	28800
$[40, 60[$	50	62	62/200	104/200	3100	155000
$[60, 80[$	70	50	50/200	154/200	3500	245000
$[80, 100[$	90	28	28/200	182/200	2520	226800
$[100, 120[$	110	18	18/200	200/200	1980	217800

3) $\bar{x} = 12160/200 = 60.8$ *; the average of occupied rooms is 61;*
$Var(X) = 874400/200 - 60.8^2 = 675.36$.
$\sigma = 675.36^{0.5} = 25.99$.
4) The highest number of rooms occupied is Mo*;*
$Mo \in [40, 60[$, $Mo = 40 + 20 * \frac{(62-32)}{(62-32)+(62-50)} = 54.28$.
5) $F_X(x) = \frac{10}{200} + \frac{32}{200}(\frac{x-20}{20})$
Let N be the number of days when more than 30 rooms were occupied;
$N = 200 * (1 - F_X(30)) = 174$

Exercice 4 *1)*



2)Let N be the number of staff taking between 10 and 30 minutes to get to work,
$N = 80 * (F_X(30) - F_X(100)) = 76 - 11 = 65$.
3)

class	c_i	n_i	f_i	$n_i * c_i$
$[0, 5[$	2.5	3	3/80	7.5
$[5, 10[$	7.5	11-3=8	8/80	60.0
$[10, 15[$	12.5	24-11=13	13/80	162.5
$[15, 20[$	17.5	56-24=32	32/80	560.0
$[20, 25[$	22.5	68-56=12	12/80	270.0
$[25, 30[$	27.5	76-68=8	8/80	220.0
$[30, 35]$	32.5	80-76=4	4/80	130.0

4) $\bar{x} = 1410/80 = 17.625$.
$Mo \in [15, 20[$, $Mo = 15 + 5 * \frac{(32-13)}{(32-13)+(32-12)} = 17.44$.
$Me \in [15, 20[$, $Me = 15 + 5 * \frac{40-24}{56-24} = 17.5$

Exercice 5 *1)*

Class	n_i
$[0, 20[$	$20 \times 2 = 40$
$[20, 60[$	$40 \times 3 = 120$
$[60, 120[$	$60 \times 4 = 240$
$[120, 200]$	$80 \times 1 = 80$

1) The total number of hard drives represented;$n = \sum n_i = 480$.
2) to stimate the number of hard drives that use less than 50 GB; $\hat{n} = (50 - 20) * 3 + 40 = 130$.
3) $25\% = \% \{\omega,\ X(\omega) > k\}$, *then* $75\% = \% \{\omega,\ X(\omega) \leq k\}$
$F_X(k) = 0.75$.

Class	n_i	f_i	f_i^{cum}
$[0, 20[$	*40*	*0.0833*	*0.0833*
$[20, 60[$	*120*	*0.25*	*0.3333*
$[60, 120[$	*240*	*0.5*	*0.8333*
$[120, 200]$	*80*	*0.1667*	*1*

The CDF F_X*;* $F_X(t) = \begin{cases} 0 \ \textit{if}\ t < 0, \\ 0.0833 \times \frac{t}{20} \ \textit{if}\ 0 \leq t \leq 20, \\ 0.0833 + 0.25 \times \frac{t-20}{40} \ \textit{if}\ 20 \leq t \leq 60, \\ 0.3333 + 0.5 \times \frac{t-60}{60} \ \textit{if}\ 60 \leq t \leq 120, \\ 0.8333 + 0.1667 \times \frac{t-120}{80} \ \textit{if}\ 120 \leq t \leq 200, \\ 1 \ \textit{if}\ t \geq 200 \end{cases}$

we have to solve the equation:
$0.3333 + 0.5 \times \frac{k-60}{60} \Rightarrow k = 110$.

Exercice 6 *Let* m *denotes de mean price;* $m = \frac{\sum t + \sum \nu}{16+24}$,
$\sum t = 24 \times 1.1 + 1.44 = 27.84$, $\sum \nu = 16 \times 1.2 + 0.56 = 19.76$.
$m = 1.19$.