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SUGGESTED SOLUTION

FYJC

SUBJECT- STATISTICS

Test Code - 6074 A

BRANCH - () (Date :)

Head Office : Shraddha, 3rd Floor, Near Chinai College, Andheri (E), Mumbai – 69.
Tel : (022) 26836666

ANSWER : 1

(a) Construct the less than cumulative frequency table as follows : **(02)**

Daily Expenditure (in Rs.)	No. of Emp (*f*)	Less than *c.f.*
350	16	16
450	19	35
550	24	59
650	28	87
750	13	100
	n = 100	

Here, n = 100 observations,
To compute the expenditure below which 75% of families include their expenditure.

i.e. to compute Q_3

$\therefore Q_3 = \left[3\left(\frac{n+1}{4}\right)\right]^{th}$ observation

$= \left[3\left(\frac{100+1}{4}\right)\right]^{th}$ observation

$= (75.75)^{th}$ observation

Q_3 = Rs. 650 ……. $\because$ $75.75 \leq 87$ (LCf)

(b) First, arrange the given data into ascending order. **(02)**

180, 200, 210, 225, 230, 250, 250, 300, 350, 350, 375, 375, 380, 400, 450

Here, n = 15 observations

$\therefore D_8 = \left[8\left(\frac{n+1}{10}\right)\right]^{th}$ observation

$= \left[8\left(\frac{15+1}{10}\right)\right]^{th}$ observation

$= (12.8)^{th}$ observation

$= 12^{th}$ observation + 0.8 [13^{th} observation – 12^{th} observation]

= 375 + 0.8 [380 – 375]

= 375 + 0.8[5]

= 375 + 4.00

= Rs. 379

(c) First, arrange the given data into ascending order. **(02)**

36, 38, 51, 63, 64, 68, 70, 72, 79, 82

Here, n = 10 observations

$\therefore P_{85} = \left[85\ \left(\frac{n+1}{100}\right)\right]^{th}$ observations

$= \left[85\ \left(\frac{10+1}{100}\right)\right]^{th}$ observations

$= (9.35)^{th}$ observation

$P_{85} = 9^{th}$ observation + 0.35 (10^{th} observation – 9^{th} observation)

= 79 + 0.35 (82 – 79)

= 79 + 0.35

= 79 + 1.05

= 80.05

ANSWER : 2

(a). Construct the frequency and less than cumulative frequency table **(03)**

Class Interval	Frequency (*f*)	Less than cumulative frequency (*l.c.f.*)
20 – 30	80	80
30 – 40	160	240
40 – 50	180	420 ← P_x
50 – 60	80	500

Since, $P_x = 45$ lies in the class 40 – 50

L = lower boundary of P_x class = 40

h = class width of P_x class = 10

f = frequency of P_x class = 180

c.f. = less than cumulative frequency of the class preceding P_x class = 240

N = total frequency = 500

$P_x = L + \frac{h}{f}\left(\frac{xN}{100} - c.f.\right)$

$45 = 40 + \frac{10}{180}\left(\frac{x \times 500}{100} - 240\right)$

$45 - 40 = \frac{10}{180}\left(\frac{x \times 500}{100} - 240\right)$

$\frac{180 \times 5}{10} = \left(\frac{x \times 500}{100} - 240\right)$

90 + 240 = 5x

330 = 5x

x = 66

66% workers have age below 45 years and 34% workers have age more than 45 years.

(b) **(03)**

Weight (in kg)	No. of employees	Less than c.f.
45 – 50	6	6
50 – 55	8	14
55 – 60	15	29
60 – 65	26	55
65 – 70	20	75
70 – 75	14	89
75 – 80	11	100
	N = 100	

To find the maximum weight of the lightest 25% of employees

i.e. To find Q_1

for Q_1 : $\frac{N}{4} = \frac{100}{4} = 25$

$\because$ 25 $\leq$ 29 (LCF)

$\therefore$ 55 – 60 be the Q_1 class

Here, L = 55, h = 5, f = 15, c.f. = 14

$\therefore$ $Q_1 = L + \frac{h}{f}\left(\frac{N}{4} - c.f.\right)$

$= 55 + \frac{5}{15}(25 - 14)$

$= 55 + \frac{1}{3} \times 11$

= 55 + 3.6666

= 55 + 3.67

= 58.67

ANSWER : 3

(a) We transform the data as follow : **(04)**

Wages (in Rs.)	No. of workers (*f*)	Less than c.f. (LCF)
8000 - 9000	5	5
9000 – 10000	18	23
10000 – 11000	46	69
11000 – 12000	34	103
12000 – 13000	34	137
13000 – 14000	13	150
14000 – 15000	9	159
15000 – 16000	1	160
16000 – 17000	0	160
	N = 160	

For $Q_1 = \frac{N}{4} = \frac{160}{4} = 40$

$\because$ $40 \leq 69$ (LCF)

$\therefore$ 10000 to 11000 be the Q_1 Class

Here, l = 10000, h = 1000, f = 46, c.f. = 23

$\therefore Q_1 = l + \frac{h}{f}\left(\frac{N}{4} - c.f.\right)$

$= 10000 + \frac{1000}{46}(40 - 23)$

$= 1000 + \frac{1000}{46} \times 17$

$= 10000 + 369.57$

$Q_1 = 10369.57$

For $Q_2 = \frac{2N}{4} = \frac{N}{2} = \frac{160}{2} = 80$

$\because$ 80 < 103 (LCF)

$\therefore$ 11000 to 12000 be the Q_2 class

Here, l = 11000, h = 1000, f = 34 c.f. = 69

$\therefore Q_2 = l + \frac{h}{f}\left(\frac{N}{2} - c.f.\right)$

$= 11000 + \frac{1000}{34}(80 - 69)$

$= 11000 + \frac{1000}{34} \times 11$

$Q_2 = 11000 + 323.53$

$\therefore$ **Q_2 = 11323.53**

For $Q_3 = \frac{3N}{4} = \frac{3 \times 160}{4} = 120$

$\because$ $120 \leq 137$ (LCF)

$\therefore$ 12000 to 13000 be the Q_3 class

Here, l = 12000, h = 1000, f = 34, c.f. = 103

$\therefore$ $Q_3 = l + \frac{h}{f}\left(\frac{3N}{4} - c.f.\right)$

$= 12000 + \frac{1000}{34}(120 - 103)$

$= 12000 + \frac{1000}{34} \times 17$

$= 12000 + 500$

Q_3 = 12,500

(b). let the missing frequencies be 'x' and 'y' **(04)**

Wages (in Rs.)	**No. of persons (f)**	**Less than c.f.**
0 – 500	7	7
500 – 1000	x	$7 + x$
1000 – 1500	25	$32 + x$
1500 – 2000	30	$62 + x$
2000 – 2500	y	$62 + x + y$
	$N = 62 + x + y$	

Given, N = 100

But $N = 62 + x + y$

$\therefore$ $62 + x + y = 100$

$\therefore$ $x + y = 38$

i.e. $y = 38 - x$ ……(i)

Also, D_3 = Rs. 1100

D_3 lies in the 1000 – 1500

$\therefore$ 1000 – 1500 be the D_3 class

Here, l = 1000, h = 500, f = 25 c.f. = $7 + x$

$\therefore D_3 = l + \frac{h}{f}\left(\frac{3N}{10} - c.f.\right)$

$1100 = 1000 + \frac{500}{25}[30 - (7 + x)]$

$100 = 20[30 - 7 - x]$

$5 = 23 - x$

$x = 18$

Sub. $x = 18$ in equation (i)

$y = 38 - 18$

$y = 20$