Visit QB365-SLMS - https://www.qb365.in/slms/ Complete Questions and Answers

Answers Key:

Long Answer Type Questions

1. Let the assumed mean (A) = 20 and common factor (c)=5

Calculation of Arithmetic Mean

Wages (in₹) (X)	Number of Workers (f)	dx (X-A) (A =20)	$d'x\left(\frac{dx}{c}\right)$ c=5	Product of Step Deviation and Frequency d (i.e. fd' x)	
10	4	- 10	-2	-8	
15	5	-5	-1	-5	-13
20 = A	3	0	0	0	
25	2	5	+1	+2	+12
30	5	19	+2	10	
	Σf=19				Σfd'X=-1

Here,
A=20,
c=5,
Σf=19
Σfd'X=-1
On putting these values in the formula, we get
$\bar{X} = A + \frac{\Sigma fd'x}{\Sigma f} \times c = 20 + \left(\frac{-1}{19}\right) \times 5$
=20 + (-0.26)
=19.74
Hence, required arithmetic mean ($\bar{x}$) =19.74

2. Let f_1 and f_2 be the frequencies of the class 40-50 and 60-70 respectively
Given, N = Σf = 1,000

Calculation of Missing Frequencies

Wages (in ₹) (X)	Number of Workers(f)	Cumulative Frequency (cf)
20-30	60	60
30-40	60	120
40-50	f_1	120 + f_1
50-60	200	320 + f_1
60-70	f_2	320 + f_1 + f_2
70-80	285	605 + f_1 + f_2
	N = Σf = 1,000	

Here, N = 1,000
$\therefore$ m = Size of $\left(\frac{N}{2}\right)$th item $= \left(\frac{1,000}{2}\right)$ th item = 500th item
Here, f_1 and f_2 are unknown, so we cannot find the cf equal or just greater than 500 but median = 56 is given and it lies in the interval 50-60, so median class is 50-60.
$\therefore I_1$ = 50, cf = 120+f_1, f = 200, c = 10
Now, $M = l_1 + \frac{\frac{N}{2} - cf}{f} \times c$
$\Rightarrow \quad 56 = 50 + \left(\frac{500 - 120 - f_1}{200}\right) \times 10$
$\Rightarrow \quad 56 = 50 + \left(\frac{380 - f_1}{20}\right)$
$\Rightarrow 56 - 50 = \frac{380 - f_1}{20} \Rightarrow 6 = \frac{380 - f_1}{20}$
$\Rightarrow$ 380 - f_1 = 6 × 20
$\Rightarrow f_1$ = 380 - 120 = 260
Also sum of frequencies = 1,000 (given)
$\Rightarrow$ 60 + 60 + f_1 + 200 + f_2 + 285 = 1,000
$\Rightarrow$ 605 + f_1 + f_2 = 1000
$\Rightarrow f_1 + f_2$ = 1,000 - 605

$260 + f_2 = 395$

$\therefore f_2 = 395 - 260 = 135$

$\therefore f_1 = 260$

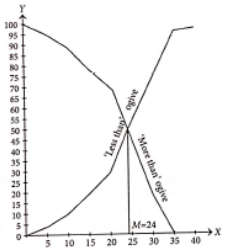
Hence, frequency of 40-50 class = 260 ; frequency of 60-70 class = 135.

3. Calculation of median by graphical method.

Converting the given distribution into 'less than' and 'more than' cumulative distributions.

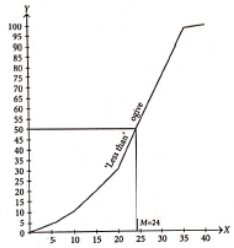
Wages	Number of Workers	Wages	Number of Workers
Less than 5	4	More than 0	100
Less than 10	10	More than 5	96
Less than 15	20	More than 10	90
Less than 20	30	More than 15	80
Less than 25	55	More than 20	70
Less than 30	79	More than 25	45
Less than 35	99	More than 30	21
Less than 40	100	More than 35	1

(i) Finding median with the help of 'less-than' and 'more-than' ogives.

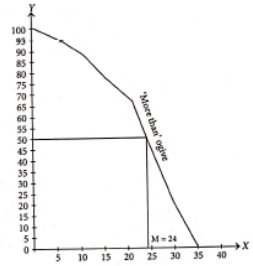


(ii) Finding median with the help of 'less than' ogive

M = Size of (n/2) th item = Size of (100/2)th item = Size of 50 th item



(iii) Finding median with the help of 'more than' ogive M = 50 th item



4. Construction of Price Index Number

Commodity	Base Year		Current Year		p_1q_0	p_0q_0	p_1q_1	p_0q_1
	Price(p_0)	Quantity(q_0)	Price(p_1)	Quantity(q_1)				
A	2	40	3	20	120	80	60	40
B	1.5	30	2.5	40	75	45	100	60
C	1	50	1.5	30	75	50	45	30
D	2.5	20	2	80	40	50	160	200
					$\Sigma p_1q_0 = 310$	$\Sigma p_0q_0 = 225$	$\Sigma p_1q_1 = 365$	$\Sigma p_0q_1 = 330$

(i) Laspeyre's Method

$P_{01} = \frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times 100 = \frac{310}{225} \times 100 = 137.8$

(ii) Paasche's Method

$P_{01} = \frac{\Sigma p_1 q_1}{\Sigma p_0 q_1} \times 100 = \frac{365}{330} \times 100 = 110.6$

QB 365 TM Study Material
QUESTION BANK 365

(iii) Fisher's Method

$P_{01} = \sqrt{\frac{\Sigma p_1 q_1}{\Sigma p_0 q_0} \times \frac{\Sigma p_1 q_1}{\Sigma p_0 q_1}} \times 100 = \sqrt{\frac{310}{225} \times \frac{365}{330}} \times 100 = \sqrt{1.378 \times 1.106} \times 100 = 1.23 \times 100 = 123$

5. **Calculation of Missing Frequency**

Wages (₹)	Number of Workers (f)	Mid-value (m)	fm
100-200	12	150	1,800
200-300	8	250	2,000
300-400	20	350	7,000
400-500	32	450	1,4400
500-600	x	550	550x
600-700	8	650	5,200
700-800	5	750	3,750
	Σf = 85 + x		Σfm = 34,150 + 550x

We know that, $\bar{X} = \frac{\Sigma fm}{\Sigma f}$

$\Rightarrow 425 = \frac{34,150+550x}{85+x}$

$\Rightarrow$ 425 (85 +x) =34,150 +550x

36,125 + 425x =34,150 +550x

$\Rightarrow$ 36,125 -34,150 =550x–425x

1975 = 125x

$\Rightarrow \frac{1,975}{125} = x = 15.8$ or 16

Hence, missing frequency is 16.

6. (i) Let the missing frequency be f_1.

Arithmetic Mean = 28 (given)

Calculation of Missing Frequency

Profit Per Retail Shop (in ₹)	Number of Retail Shops	Mid-value (m)	fm
0-10	12	5	60
10-20	18	15	270
20-30	27	25	675
30-40	f_1	35	$35f_1$
40-50	17	45	765
50-60	6	55	330
	$\Sigma f = 80 + f_1$		$\Sigma fm = 2,100 + 35f_1$

$\bar{X} = \frac{\Sigma fm}{\Sigma f}$

or $28 = \frac{2,100+35f_1}{80+f_1}$

or 2,240 + $28f_1$ = 2,100 + $35f_1$

or 2,240 - 2,100 = $35f_1$ - $28f_1$

or 140 = $7f_1$

f_1 = 20

Hence, the missing frequency is 20.

(ii) **Calculation of Median**

Groups	Frequency	Cumulative Frequency
0-10	12	12
10-20	18	30
20-30	27	57
30-40	f_1	77
40-50	17	94
50-60	6	100
	Σf = 100	

Σf = N = 100

So, the Median class (m) = Size of $\left(\frac{N}{2}\right)$ th item

= 50 th item

50th item lies in the 57th cumulative frequency and the corresponding class is 20-30.

$$\text{Median} = l_1 + \frac{\frac{N}{2} - cf}{f} \times c = 20 + \frac{\frac{100}{2} - 30}{27} \times 10$$
$$= 20 + \frac{50 - 30}{27} \times 10$$
$$= 20 + \frac{20}{27} \times 10 = 27.4$$

7. **Calculation of Quartiles**

QB TM 365 Study Material
QUESTION BANK 365

Daily Income	Exclusive Group	Number of Workers (f)	Cumulative Frequency (cf)
10-14	9.5-14.5	5	5
15-19	14.5-19.5	10	15
20-24	19.5-24.5	15	30
25-29	24.5-29.5	20	50
30-34	29.5-34.5	10	60
35-39	34.5-39.5	5	65
		N = Σf = 65	

(i) To find the highest income of lowest 50% workers, we calculate second quartile, i.e. median (M)

$m =$ Size of $\left(\frac{N}{2}\right)$ th item $= \left(\frac{65}{2}\right)$ th item

= 32.5 th item

32.5th item lies in class 24.5-29.5

$M = l_1 + \frac{\frac{N}{2} - cf}{f} \times c$

$= 24.5 + \frac{32.5-30}{20} \times 5$

$= 24.5 + \frac{2.5}{20} \times 5 = 24.5 + 0.6$

⇒ M=25.1

(ii) To find the minimum income earned by the top 25% workers, we calculate upper quartile (Q_3).

∴ Q_3 = Size of 3 $\left(\frac{N}{4}\right)$ th item

$= \left(\frac{3\times65}{4}\right)$ th item $= 48.75$ th item

48.75 th item lies in class interval 24.5-29.5

$\therefore Q_3 = l_1 + \frac{\frac{3}{4}N - cf}{f} \times c$

$= 24.5 + \frac{48.75-30}{20} \times 5$

$= 24.5 + \frac{18.75\times5}{20} = 24.5 + 4.7$

⇒ Q_3= 29.2

(ii) To find the maximum income earned by lowest 25% workers, we calculate lower quartile (Q_1)

$\therefore Q_1 =$ Size of $\left(\frac{N}{4}\right)$ th item

$= \left(\frac{65}{4}\right)$ th item

=16.25th item

16.25th item lies in class interval 19.5-24.5

$Q_1 = l_1 + \frac{\frac{N}{4} - cf}{f} \times c$

$= 19.5 + \frac{16.25-15}{15} \times 5$

$= 19.5 + \frac{1.25\times5}{15} = 19.5 + 0.42$

⇒ Q_1 =19.92

QB 365 TM Study Material
QUESTION BANK 365

8. (i) Conversion of cumulative frequency distribution into normal frequency distribution

Marks Obtained by the Students	Number of Students	Marks	Frequency
Less than 5	3	0-5	3
Less than 10	12	5-10	12 -3 =9
Less than 15	22	10-15	22 -12= 10
Less than 20	35	15-20	35 -22 = 13
Less than 25	42	20-25	42-35 =7
Less than 30	60	25-30	60 -42 = 18
Less than 35	71	30-35	71-60 = 11
Less than 40	80	35-40	80-71 =9

The students who have obtained more than or equal to 35 marks are 9.

(ii) Calculation of mode from the following data

Marks	Frequency
0-5	3
5-10	12 -3 =9
10-15	22-12= 10
15-20	35-22=13
20-25	42 35 =7
25-30	60-42= 18
30-35	71 -60 = 11
35-40	80 -71=9

Mode $(M_0) = l_1 + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times c$

By observation method modal class is 25-30.

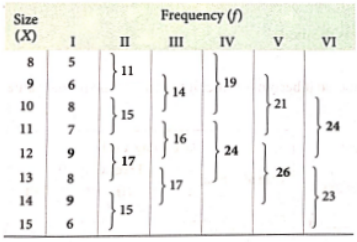
So, l_1,= 25, f_1=18, f_0=7, f_2 =11

$M_0 = 25 + \frac{18-7}{36-7-11} \times 5 = 25 + \frac{11}{18} \times 5$

$M_0 = 25 + \frac{55}{18} = 25 + 3.05 = 28.05$

9. Two items 12 and 14 have the highest frequency of 9. So, grouping of frequencies is essential.

Grouping Table



Size (X)	Frequency (f) I	II	III	IV	V	VI
8	5	} 11				
9	6		} 14	} 19		
10	8	} 15			} 21	
11	7		} 16	} 24		} 24
12	9	} 17			} 26	
13	8		} 17			} 23
14	9	} 15				
15	6					

Now, prepare analysis table

Analysis Table

Column No.	8	9	10	11	12	13	14	15
I					✓		✓	
II					✓	✓		
III						✓	✓	
IV				✓	✓	✓		
V					✓	✓	✓	
VI			✓	✓	✓			
Total	-	-	1	2	5	4	3	-

The size (x) = 12 has maximum number of tick marks (5 times). So, mode = 12.

Tick (✓) marks have been put on the following basis

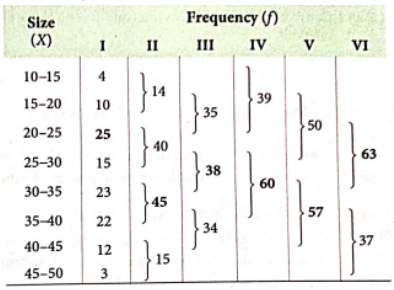
• In column 1, the maximum frequency 9 corresponds to two values viz. 12 and 14. So, a tick mark is put before these values. class

• In column 2, the maximum total of 17 is obtained by adding frequencies 9 and 8. These frequencies correspond to values 12 and 13.

Hence, a tick mark is put before these values in column 2 of the analysis table. In the same way, tick marks can be put in subsequent columns.

10. By inspection, the modal class is not clear. Although, class interval 20-25 has the highest frequency (25), yet greatest concentration of items is around class interval 30-35 (with frequency of 23). Hence, we will prepare a grouping table and then analysis table to determine the modal class

Grouping Table



Size (X)	Frequency (f) I	II	III	IV	V	VI
10–15	4	} 14				
15–20	10		} 35	} 39		
20–25	25	} 40			} 50	
25–30	15		} 38	} 60		} 63
30–35	23	} 45			} 57	
35–40	22		} 34			} 37
40–45	12	} 15				
45–50	3					

Analysis Table

Column Number	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50
I			✓					
II					✓	✓		
III				✓	✓			
IV				✓	✓	✓		
V					✓	✓	✓	
VI			✓	✓	✓			
Total	-	-	2	3	5	3	1	-

It is clear from the analysis table that modal class is 30-35 and frequency of this class is 23.

Now, Mode $(M_o) = l_1 + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times c$

$\therefore l_1 = 30, f_1 = 23, f_0 = 15, f_2 = 22, c = 5$

$M_o = 30 + \frac{23-15}{2\times23-15-22} \times 5 = 30 + \frac{8}{9} \times 5 = 34.44$

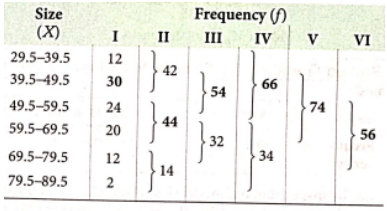
11. Here, inclusive class interval will be converted to exclusive class interval and thereafter mode will be determined.

Marks	Number of Students ()
29.5-39.5	12
39.5-49.5	30
49.5-59.5	24
59.5-69.5	20
69.5-79.5	12
79.5-89.5	2

QB365 Study Material
QUESTION BANK 365

By inspection, the modal class is not clear. Although, class interval 49.5-59.5 has the highest frequency 30, yet greatest concentration of items is around class interval 59,5-69.5 (with frequency of 24). Therefore, we will find mode by the method of grouping.

Grouping Table



Size (X)	Frequency (f)					
	I	II	III	IV	V	VI
29.5–39.5	12	42				
39.5–49.5	30		54	66	74	
49.5–59.5	24	44				56
59.5–69.5	20		32			
69.5–79.5	12	14		34		
79.5–89.5	2					

Analysis Table

				Frequency (f)		
Column Number	29.5-39.5	39.5-49.5	49.5-59.5	59.5-69.5	69.5-79.5	79.5-89.5
I		✓				
II			✓	✓		
III		✓	✓			
IV	✓	✓	✓			
V		✓	✓	✓		
VI			✓	✓	✓	
Total	1	4	5	3	1	-

From the analysis table, the modal class is 49.5-59.5. The frequency of this group is 24. So,

Mode $(M_o) = l_1 + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times c$

But in this case, f_1(24) is less than f_0. (30). It means (f_1 - f_0) will be negative and because of this modal value will lie outside the group.

In such cases, mode is calculated by the following formula,

$M_o = l_1 + \frac{f_2}{f_0 + f_2} \times c$

$\Rightarrow \quad M_o = 49.5 + \frac{20}{30+20} \times 10 = 49.5 + 0.4 \times 10$

$\Rightarrow M_o = 49.5 + 4$

$\Rightarrow M_o = 53.5$

12. (i) Microeconomic analysis offers insights into such disparate efforts as making business decisions or formulating public policies. Macroeconomics is more abstruse. It describes relationship among aggregates so big as to be hard to apprehend, such as national income, savings and the overall price level. The field is conventionally divided into the study of national economic growth in the long-run, the analysis of short-run departures from equilibrium and the formulation of policies to stabilise the national economy, i.e. to minimise fluctuations in growth and prices. Those policies can include spending and taxing actions by the government or monetary policy actions by the central bank.

(ii) The problem in which an economy has to assign the scarce available resources in a way that the maximum wants of the society are fulfilled is known as the allocation of resources.

The need to allocate the resources arises because of the limited availability of resources and unlimited wants of society. Therefore, the basic aim behind the allocation of resources is to economise the use of available resources and utilise them in the best possible efficient manner.

Simply put, an economy has to allocate the resources and choose from different options of goods (What to produce) choose from different production techniques (How to produce) and decide the end consumer of the goods (For whom to produce).

13. (i)

Wheat (in kg) (Y)	Rice (in kg) (X)	MRT (△Y/△X)
100	0	-
90	1	(90 -100)/(1 - 0) = 10 : 1
70	2	(70 – 90)/(2 - 1) = 20 : 1
40	3	(40 – 70)/(3 - 2) = 30 : 1
00	4	(00 - 40)/(4 - 3) = 40 : 1

Note MRT is considered in absolute terms only.

As in the above case MRT is increasing, PPF will be concave to the origin.

(ii)

Guns (in units) (x)	Butter (in units) (Y)	MRT (△Y/△X)
0	100	-
1	90	(60 - 100)/(1 - 0) = 40 : 1
2	70	(30 – 60)/(2 - 1) = 30 : 1
3	40	(10 - 30)/(3 - 2) = 20 : 1
4	00	(00 – 10)/(4 - 3) = 10 : 1

Note MRT is considered in absolute terms only.

As in the above case MRT is decreasing, PPF will be convex to the origin.

(iii)

Bread (in kg) (X)	Biscuits (in kg) (Y)	MRT (△Y/△X)
10	200	-
20	160	(160 – 200)/(20 – 10) = 4 : 1
30	120	(120 - 160)/(30 - 20) = 4 : 1
40	80	(80 - 120)/(40 – 30) = 4 : 1
50	40	(40 - 80)/(50 – 40) = 4 : 1
60	00	(00 – 40)/(60 - 50) = 4 : 1

Note MRT is considered in absolute terms only.
As in the above case MRT is constant, PPF will be a straight line.

14.

Output (units)	Marginal Revenue (₹)	Marginal Cost (₹)
1	8	10
2	8	8
3	8	7
4	**8**	**8**
5	8	9

Producer is in equilibrium at 4th unit of output, because at an output level 2nd and 4th, the MR and MC are equal, i.e. profit maximisation.
But the producer is in equilibrium at 4th unit only where MR=MC, ie. ₹8 and MC is rising(MC> MR) afterwards which means at 4th unit of output, both the conditions are satisfied

QB365™ Study Material
QUESTION BANK 365