STATISTICS (Q 7, PAPER 2)

2002

7 (a) Calculate the mean of the following numbers:

1, 0, 1, 5, 2, 3, 9.

(b) The following cumulative frequency table refers to the ages of 70 guests at a wedding:

Age (in years)	< 20	< 40	< 60	< 90
Number of guests				

(i) Copy and complete the following frequency table:

Age (in years)	0 – 20	20 – 40	40 – 60	60 – 90
Number of guests	6	23	44	70

[Note: 20 – 40 means 20 years old or more but less than 40 etc.]

(ii) Using mid-interval values, calculate the mean age of the guests.

(iii) What is the greatest number of guests who could have been over 65 years of age?

(c) The grouped frequency table below refers to the marks obtained by 85 students in a test:

Marks	0 – 40	40 – 55	55 – 70	70 – 100
Number of students	16	18	27	24

[Note: 40 – 55 means 40 marks or more but less than 55 etc.]

(i) What percentage of students obtained 55 marks or higher?

(ii) Name the interval in which the median lies.

(iii) Draw an accurate histogram to represent the data.

SOLUTION

7 (a)

The **MEAN** or **AVERAGE** of a set of numbers is calculated by adding the numbers together and dividing by the number of numbers.

$$\text{Mean} = \frac{\text{Sum of the numbers}}{\text{Number of numbers}}$$

The mean is denoted by $\bar{x}$.

$$\bar{x} = \frac{1+0+1+5+2+3+9}{7}$$

$$\Rightarrow \bar{x} = \frac{21}{7} = 3$$

$$\bar{x} = \frac{x_1 + x_2 + \ldots\ldots\ldots\ldots + x_N}{N} = \frac{\text{Sum of the Numbers}}{\text{Number of Numbers}} = \frac{\sum x}{N} \quad \ldots\ldots\ldots (1)$$

7 (b) (i)

Age (in years)	0 – 20	20 – 40	40 – 60	60 – 90
Number of guests	6	17	21	26

7 (b) (ii)

Draw up a frequency table using the mid-interval values. To get a mid-interval value add the two numbers together and divide by 2.
Ex. Class interval: 20 – 40

Mid-interval value: $\frac{20+40}{2}=30$

x	f	fx
10	6	60
30	17	510
50	21	1050
75	26	1950
	70	3570

$$\bar{x}=\frac{f_1x_1+f_2x_2+.....+f_Nx_N}{f_1+f_2+.....+f_N}=\frac{\sum fx}{\sum f} \quad ..... \ (2)$$

Mean age: $\bar{x}=\frac{\sum fx}{\sum f}=\frac{3570}{70}=51$

7 (b) (iii)

There are 26 people aged between 60 and 90 years. Therefore, the greatest number of people aged over 65 years of age could be 26.

7 (c) (i)

The number of students who received 55 marks or higher = 27 + 24 = 51

Therefore, percentage of student obtaining a mark of 55 or higher $=\frac{51}{85}\times 100\%=60\%$

7 (c) (ii)

The median is the mark obtained by the middle student (the 42nd./43rd. student). This student lies in the 55 – 70 interval.
[34 students (16 + 18) have received less than 55 marks. 61 students (16 + 18 + 27) have received less than 70 marks. Therefore, the 42nd./43rd. student lies in the 55 – 70 interval.]

7 (c) (iii)

Marks	0 – 40	40 – 55	55 – 70	70 – 100
Number of students	16	18	27	24

Each column in the table is represented by a rectangular box. The area of the box corresponds to the frequency (no. of students).

Area (No. of students) = Base × Height = Frequency

Look at the marks. Look at the intervals. They are all divisible by 5. Make the interval 0 – 5 a base of one unit. Therefore the interval 0 – 40 has a base of 8 units. Divide the base into the area (frequency) to get the height of a box.

Draw a new table:

Interval (Marks)	0 – 40	40 – 55	55 – 70	70 – 100
Frequency (No. of students)	16	18	27	24
Base	8	3	3	6
Height	2	6	9	4

Drawing the histogram:
Horizontal (*x*-axis) axis (Marks): Look at the intervals. The marks go from 0 to 100. The smallest interval (Base 1) is 5.
Vertical (*y*-axis) axis (No. of students): Always start at zero. The biggest number is the maximum height (i.e. 9).