i. Mean
ii. Median
iii. Mode

- Mean Of grouped frequency distribution can be calculated by the following methods.

**(i) Direct Method**

Mean = $\bar{X} = \frac{\sum_{i=1}^{n} fixi}{\sum_{i=1}^{n} fi}$

Where $X_i$ is the class mark of the $i^{th}$ class interval and $f_i$ frequency of that class

**(ii) Assumed Mean method or Shortcut method**

Mean = $\bar{X} = a + \frac{\sum_{i=1}^{n} fidi}{\sum_{i=1}^{n} fi}$

Where a = assumed mean

And $d_i = X_i - a$

(iii) **Step deviation method**.

Mean = $\bar{X} = a + \frac{\sum_{i=1}^{n} fiui}{\sum_{i=1}^{n} fi} \times h$

Where a = assumed mean

h = class size

And $u_i = (X_i - a)/h$

- Median of a grouped frequency distribution can be calculated by

Median = $l + \left(\frac{\frac{n}{2} - cf}{f}\right) \times h$

Where

l = lower limit of median class

n = number of observations

cf = cumulative frequency of class preceding the median class

f = frequency of median class

h = class size of the median class.

- Mode of grouped data can be calculated by the following formula.

Mode = $l + \left(\frac{f1 - fo}{2f1 - fo - f2}\right) \times h$

Where

l = lower limit of modal class

h = size of class interval

f1 = Frequency of the modal class

fo = frequency of class preceding the modal class

f2= frequency of class succeeding the modal class

- Empirical relationship between the three measures of central tendency.
  3 Median = Mode + 2 Mean
  Or, Mode = 3 Median – 2 Mean
- Ogive
  Ogive is the graphical representation of the cumulative frequency distribution. It is of two types:
  (i) Less than type ogive.
  (ii) More than type ogive

- Median by graphical method
  The x-coordinated of the point of intersection of 'less than ogive' and 'more than ogive' gives the median.

**LEVEL – 1**

| Slno | Question | Ans |
|---|---|---|
| 1 | What is the mean of 1st ten prime numbers ? | 12.9 |

| | | |
|---|---|---|
| 2 | What measure of central tendency is represented by the abscissa of the point where less than ogive and more than ogive intersect? | Median |
| 3 | If the mode of a data is 45 and mean is 27, then median is _____. | 33 |
| 4 | Find the mode of the following<br>$X_i$: 35, 38, 40, 42, 44<br>$f_i$: 5, 9, 10, 7, 2 | Mode =40 |
| 5 | Write the median class of the following distribution.<br>Class: 0-10, 10-20, 20-30, 30-40, 40-50, 50-60, 60-70<br>Frequency: 4, 4, 8, 10, 12, 8, 4 | 30-40 |

**LEVEL – 2**

| Slno | Question | Ans |
|---|---|---|
| 1 | Calculate the mean of the following distribution<br>Class interval: 50-60, 60-70, 70-80, 80-90, 90-100<br>Frequency: 8, 6, 12, 11, 13 | 78 |
| 2 | Find the mode of the following frequency distribution<br>Marks: 10-20, 20-30, 30-40, 40-50, 50-60<br>No. of students: 12, 35, 45, 25, 13 | 33.33 |
| 3 | Find the median of the following distribution<br>Class interval: 0-10, 10-20, 20-30, 30-40, 40-50, 50-60<br>Frequency: 5, 8, 20, 15, 7, 5 | 28.5 |
| 4 | A class teacher has the following absentee record of 40 students of a class for the whole term.<br>No. of days: 0-6, 6-10, 10-14, 14-20, 20-28, 28-38, 38-40<br>No. of students: 11, 10, 7, 4, 4, 3, 1<br>Write the above distribution as less than type cumulative frequency distribution. | |
| | Answer :<br>No. of days: Less Than 6, Less Than 10, Less Than 14, Less Than 20, Less Than 28, Less Than 38, Less Than 40<br>No. of students: 11, 21, 28, 32, 36, 39, 40 | |

**LEVEL – 3**

| Slno | Question | Ans |
|---|---|---|
| 1 | If the mean distribution is 25<br>Class: 0-10, 10-20, 20-30, 30-40, 40-50<br>Frequency: 5, 18, 15, P, 6<br>Then find p. | P=16 |
| 2 | Find the mean of the following frequency distribution using step deviation method<br>Class: 0-10, 10-20, 20-30, 30-40, 40-50<br>Frequency: 7, 12, 13, 10, 8 | 25 |
| 3 | Find the value of p if the median of the following frequency distribution is 50<br>Class: 20-30, 30-40, 40-50, 50-60, 60-70, 70-80, 80-90 | P=10 |

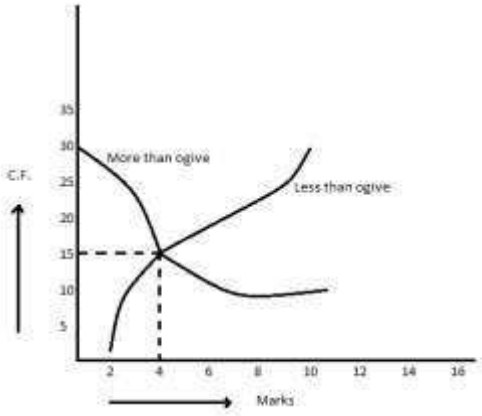
| | | |
|---|---|---|
| | Frequency: 25, 15, P, 6, 24, 12, 8 | |
| 4 | Find the median of the following data<br>Marks: Less Than 10 (0); Less Than 30 (10); Less Than 50 (25); Less Than 70 (43); Less Than 90 (65); Less Than 110 (87); Less Than 130 (96); Less than 150 (100) | 76.36 |
| | | |

**LEVEL – 4**

| Slno | Question | Ans |
|---|---|---|
| 1 | The mean of the following frequency distribution is 57.6 and the sum of the observations is 50. Find the missing frequencies $f_1$ and $f_2$.<br>Class: 0-20, 20-40, 40-60, 60-80, 80-100, 100-120, Total<br>Frequency: 7, $f_1$, 12, $f_2$, 8, 5, 50 | $f_1$ =8 and $f_2$ =10 |
| 2 | The following distribution gives the daily income of 65 workers of a factory<br>Daily income (in Rs): 100-120, 120-140, 140-160, 160-180, 180-200<br>No. of workers: 14, 16, 10, 16, 9<br>Convert the above to a more than type cumulative frequency distribution and draw its ogive. | |
| 3 | Draw less than type and more than type ogives for the following distribution on the same graph. Also find the median from the graph.<br>Marks: 30-39, 40-49, 50-59, 60-69, 70-79, 80-89, 90-99<br>No. of students: 14, 6, 10, 20, 30, 8, 12 | |

**SELF – EVALUATION**

1. What is the value of the median of the data using the graph in figure of less than ogive and more than ogive?




2. If mean =60 and median =50, then find mode using empirical relationship.
3. Find the value of p, if the mean of the following distribution is 18.

| Variate ($x_i$) | 13 | 15 | 17 | 19 | 20+p | 23 |
|---|---|---|---|---|---|---|
| Frequency ($f_i$) | 8 | 2 | 3 | 4 | 5p | 6 |

4. Find the mean, mode and median for the following data.

| Classes | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 |
|---|---|---|---|---|---|---|---|
| frequency | 5 | 8 | 15 | 20 | 14 | 8 | 5 |

5. The median of the following data is 52.5. find the value of x and y, if the total frequency is 100.

| Class Interval | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 | 90-100 |
|---|---|---|---|---|---|---|---|---|---|---|
| frequency | 2 | 5 | X | 12 | 17 | 20 | Y | 9 | 7 | 4 |

6. Draw 'less than ogive' and 'more than ogive' for the following distribution and hence find its median.

| Classes | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 |
|---|---|---|---|---|---|---|---|
| frequency | 10 | 8 | 12 | 24 | 6 | 25 | 15 |

7. Find the mean marks for the following data.

| Marks | Below 10 | Below 20 | Below 30 | Below 40 | Below 50 | Below 60 | Below 70 | Below 80 | Below 90 | Below 100 |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of students | 5 | 9 | 17 | 29 | 45 | 60 | 70 | 78 | 83 | 85 |

8. The following table shows age distribution of persons in a particular region. Calculate the median age.

| Age in years | Below 10 | Below 20 | Below 30 | Below 40 | Below 50 | Below 60 | Below 70 | Below 80 |
|---|---|---|---|---|---|---|---|---|
| No. of persons | 200 | 500 | 900 | 1200 | 1400 | 1500 | 1550 | 1560 |

9. If the median of the following data is 32.5. Find the value of x and y.

| Class Interval | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | Total |
|---|---|---|---|---|---|---|---|---|
| frequency | x | 5 | 9 | 12 | y | 3 | 2 | 40 |

## SECTION – A (F A1)

### MCQ(CARRING, 1 MARKS EACH)

Q1. Euclid's division lemma states that for any two positive integer 'a' and 'b' there exits unique integer q and r such that a=bq+r where r must satisfy.

a. 1<r<b
b. 0<r$\leq$ b
c. 0$\leq$ r<b
d. 0<r<b

Q2. If $\alpha, \beta$ are the zeroes of the polynomial $2y^2+7y+5$ then the value of $\alpha+\beta+\alpha\beta$ is .

a. -1
b. -2
c. 1
d. 2

Q3. The value of c for which the pair of equations cx-y=2 and 6x-2y=3 will have infinitely many solution is

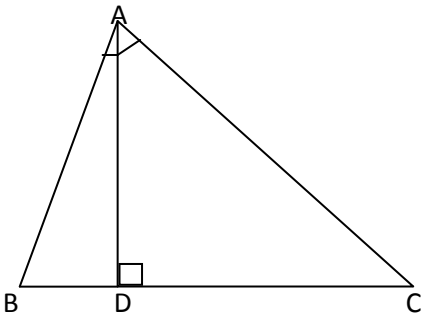
a. 3
b. -3
c. -12
d. No value

Q4. If in the two triangles ABC and PQR, $\frac{AB}{QR}=\frac{BC}{PR}=\frac{CA}{PQ}$ then

a. ΔPQR~ ΔCAB
b. ΔPQR~ ΔABC
c. ΔCBA~ ΔPQR
d. ΔBCA~ ΔPQR

Q5. In fig.1 ∠BAC=$90^0$ and AD⊥BC then,

a. $BD.CD=BC^2$
b. $AB.AC=BC^2$
c. $BD.CD=AD^2$
d. $AB.AC=AD^2$




## SECTION B

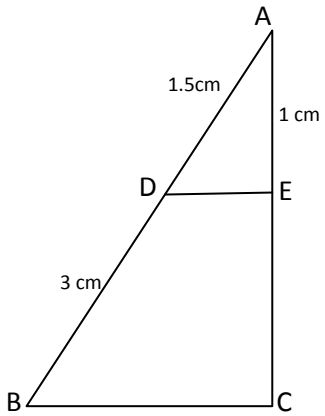
### (EACH QUESTION CARRY 2 MARKS)

Q6. Use Euclid's Division Algorithm to find the HCF of 135 and 225.

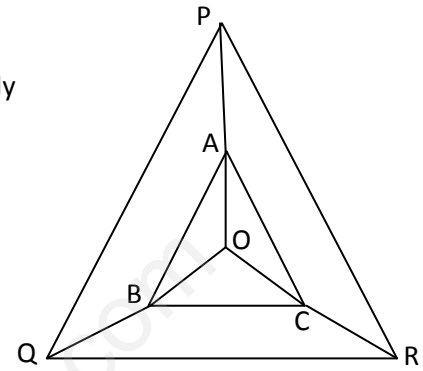
Q7. Write a quadratic polynomial the sum and product of whose zeroes are 3,-2.

Q8. Find the number of solution of the following pair of linear equations:
X+2y-8=0 2x+4y=16

Q9. In fig:2, BC||DE.Find EC




Q10. In adjoining fig: A,B and C are points on OP,OQ and OR respectively Such that AB||PQ and AC||PR show that BC||QR




Q11. Solve that equation by substitution method
8x+5y=9
3x+2y=4

## SECTION C
**(EACH QUESTION CARRIES 3 MARKS)**

Q12. Find all the zeroes of the polynomial $3x^4+6x^2-2x^2-10x-5$, if two of its zeroes are $\sqrt{\frac{5}{3}}$ and $-\sqrt{\frac{5}{3}}$

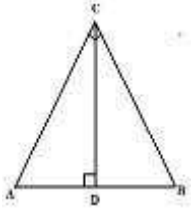
Q13. Prove that $\sqrt{5}$ is irrational.

Q14. Solve the following pair of equations by reducing them to a pair of linear equation:

$$\frac{1}{3x+y}+\frac{1}{3x-y}=\frac{3}{4} \text{ and } \frac{1}{2(3x+y)}-\frac{1}{2(3x-y)}=\frac{1}{8}$$

Q15. In an equilateral triangle prove that three times the square of one side is equal to four times the square of one of its altitudes i.e $4AD^2=3AB^2=3BC^2=3CA^2$.

Q16. ABC is an isosceles triangle right angled at C. Prove that $AB^2=2AC^2$.



**SECTION D**

**(EACH QUESTION CARRIES 4 MARKS)**

Q17. State 'Basic Proportionality theorem' or ' Thales Theorem' and prove it.

OR

Area of two similar triangles are in ratio of the squares of the corresponding sides.

Q18. Five years ago Nuri was thrice as old as Sonu. Ten years later Nuri will be twice as old as Sonu. How old are Nuri and Sonu?

ANSWERS

1. (a)
2. (a)
3. (d)
4. (a)
5. (c)
6. 45
7. $X^2$-3x-2
8. Infinitely many solutions
9. 2 cm
10. 
11. X= -2 , Y=5
12. -1,-1
13. 
14. X=1 and Y=1

18. Nuri's present age= 50 years, Sonu=20 years