1. Quartile deviation is nearly equal to

    a. 2/ 5 σ

    b. 2/ 3 σ

    c. 2 σ

    d. 3/ 2 σ

2. For a symmetrical distribution $Q_1 = 20$ and $Q_{3.} = 40$. The median of the data is

    a. 40

    b. 10

    c. 30

    d. 20

3. Coefficient of correlation between the observations (1, 6) , (2 , 5) , (3 , 4) , (4 , 3) , (5 , 2) , (6 , 1) is

    a. 1

    b. 0

    c. none of these

    d. - 1

4. If Cov(X,Y) = 0 , then $\rho\left(X, Y\right) =$

    a. ± 1

    b. 0

c. - 1

d. 1

5. If the mean of 3,4,x,7,10, is 6 , then the value of x is

   a. 5

   b. 4

   c. 7

   d. 6

6. Fill in the blanks:

   The mean deviation of the data 3, 10, 10, 4, 7, 10, 5 from the mean is _____.

7. Fill in the blanks:

   The measure of dispersion which is easiest to understand and easiest to calculate is called _____.

8. Calculate the mean deviation from the median of the following frequency distribution:

Height in inches	58	59	60	61	62	63	64	65	66
No. of students	15	20	32	35	35	22	20	10	8

9. An analysis of monthly wages paid to the workers in two firms A and B belonging to the same industry give the following results:

	Firm A	Firm B
Number of workers	500	600
Average monthly wages	Rs. 186	Rs. 175
Variance of distribution of wages	81	100

Calculate the variability of individual wages.

10. Calculate the mean deviation about the median of the following frequency distribution:

x_i	5	7	9	11	13	15	17
f_i	2	4	6	8	10	12	8

11. The marks obtained by 7 students are 8, 9, 11, 13, 14, 15, 21. Find the variance and standard deviation of these marks.

12. Calculate the mean deviation about median age for the age distribution of 100 persons gives below:

Age	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55
Number	5	6	12	14	26	12	16	9

13. Find the mean deviation about the mean for the data in

x_i	5	10	15	20	25
f_i	7	4	6	3	5

14. Find the mean and standard deviation for the following data:

Class interval	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	3	2	4	6	5	5	5	2	8	5

15. Calculate the mean and standard deviation for the following table, given the age distribution of a group of people:

Age:	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of persons:	3	51	122	141	130	51	2

Solution

1. (b) 2/ 3 σ

   Explanation:

   Quartile deviation $\frac{Q_3-Q_1}{2}$ is approximately 2/3 times the standard deviation.

2. (c) 30

   Explanation:

   For symmetric distribution, $median = \frac{Q_1+Q_3}{2} = \frac{20+40}{2} = 30$

3. (d) - 1

   Explanation:

   $$use, r(x,y) = \frac{\frac{1}{n}\sum\limits_{i=1}^{n}(X_i-\bar{X})(Y_i-\bar{Y})}{\sqrt{\frac{1}{n}\sum\limits_{i=1}^{n}(X_i-\bar{X})^2}\sqrt{\frac{1}{n}\sum\limits_{i=1}^{n}(Y_i-\bar{Y})^2}}$$

4. (b) 0

   Explanation: Here,

   $$\rho(x,y) = \frac{\text{cov}(x,y)}{\sigma_x\,\sigma_y} = \frac{0}{\sigma_x\,\sigma_y} = 0$$

5. (d) 6

   Explanation: mean $= \frac{3+4+x+7+10}{5} = \frac{24+x}{5}$
   $\Rightarrow 6 = \frac{24+x}{5}$
   $\Rightarrow 30 = 24 + x$
   $\Rightarrow 30 - 24 = x$
   $\Rightarrow$ x = 6

6. 2.57

7. range

8. To find out the mean deviation we need to make the following table:

x_i	f_i	Cumulative Frequency	$|d_i| = |x_i - 61|$	$f_i |d_i|$
58	15	15	3	45
59	20	35	2	40
60	32	67	1	32
61	35	102	0	0
62	35	137	1	35
63	22	159	2	44
64	20	179	3	60
65	10	189	4	40
66	8	197	5	40
	N = 197			Total = 336

$N = 197, \frac{N}{2} = 98.5$

Now to find median, we will locate this value is the cumulative frequency column and choose the value greater than it and see the corresponding value of x_i

Thus, Corresponding value for median is 61.

Mean Deviation $= \frac{336}{197} = 1.705$

9. Variance of distribution of wages in firm A = 81, Average monthly wages of firm A, $\overline{x}_1$ = Rs. 186

CV of firm A = $100 \times \frac{\sigma_1}{\overline{x}_1}$ = $100 \times \frac{\sqrt{81}}{186}$ = $100 \times \frac{9}{186}$ = 4.84

Variance of distribution of wages in firm B = 100, Average monthly wages of firm B, $\overline{x}_2$ = Rs.175

CV of firm B = $100 \times \frac{\sigma_2}{\overline{x}_2}$ = $100 \times \frac{\sqrt{100}}{175}$ = $\frac{100 \times 10}{175}$ = 5.71

Since, coefficient of variation of wages for firm B is greater than coefficient of variation for firm A, so firm B has greater variability in individual wages.

10. First to find mean deviation we need to make the following table,

x_i	f_i	Cumulative Frequency	$\lvert d_i \rvert = \lvert x_i - 13 \rvert$	$f_i \lvert d_i \rvert$
5	2	2	8	16
7	4	6	6	24
9	6	12	4	24
11	8	20	2	16
13	10	30	0	0
15	12	42	2	24
17	8	50	4	32
	N = 50			Total = 136

$\frac{N}{2} = 25$

Now, to find median we will locate this value in column of cumulative frequency and choose the value just greater than it and x_i corresponding to that value will be our median.

Value corresponding to 25 is Median = 13

$\text{M. D.} = \frac{136}{50} = 2.72$

11. Here, $\overline{x} = \frac{8+9+11+13+14+15+21}{7} = \frac{91}{7} = 13$

We make the table from the given data.

Marks (x_i)	$x_i - \overline{x}$	$(x_i - \overline{x})^2$
8	-5	25
9	-4	16
11	-2	4
13	0	0
14	1	1

15	2	4
21	8	64
Total		114

Here, n = 7, $\sum\left(x_i - \overline{x}\right)^2$ = 114

$\therefore \sigma^2 = \frac{1}{n}\sum\left(x_i - \overline{x}\right)^2 = \frac{114}{7}$ = 16.29

Also, standard deviation of marks, $\sigma = \sqrt{16.29}$ = 4.04

Hence, variance is 16.29 and standard deviation is 4.04.

12.

Age	Exclusive class intervals	Mid values x_i	f_i	c.f.	$\|x_i - 38\|$	$f_i\|x_i - 38\|$
16-20	15.5-20.5	18	5	5	20	100
21-25	20.5-25.5	23	6	11	15	90
26-30	25.5-30.5	28	12	23	10	120
31-35	30.5-35.5	33	14	37	5	70
36-40	35.5-40.5	38	26	63	0	0
41-45	40.5-45.5	43	12	75	5	60
46-50	45.5-50.5	48	16	91	10	160
51-55	50.5-55.5	53	9	100	15	135
			100			735

$\frac{N}{2} = \frac{100}{2} = 50 \therefore$ Median class is 35.5 - 40.5

Median $= 35.5 + \frac{50-37}{26} \times 5 = 35.5 + 2.5 = 38$

M.D. about median $= \frac{1}{N}\sum_{i=1}^{n} f_i\,|x_i - M| = \frac{1}{100} \times 735 = 7.35$

13.

x_i	f_i	$f_i x_i$	$\|x_i - 14\|$	$f_i\|x_i - 14\|$
5	7	35	9	63
10	4	40	4	16

15	6	90	1	6
20	3	60	6	18
25	5	125	11	55
	25	350		158

Mean $(\bar{x}) = \frac{1}{N} \sum f_i x_i = \frac{1}{25} \times 350 = 14$

Mean deviation about mean $= \frac{1}{N} \sum_{i=1}^{n} f_i |x_i - \bar{x}|$

$= \frac{1}{25} \times 158 = 6.32$

14. We make the table from the given data:

Class marks	Mid value (x_i)	$d_i = x_i - a = x_i - 45$	f_i	$f_i d_i$	d_i^2	$f_i d_i^2$
0-10	5	-40	3	-120	1600	4800
10-20	15	-30	2	-60	900	1800
20-30	25	-20	4	-80	400	1600
30-40	35	-10	6	-60	100	600
40-50	45	0	5	0	0	0
50-60	55	10	5	50	100	500
60-70	65	20	5	100	400	2000
70-80	75	30	2	60	900	1800
80-90	85	40	8	320	1600	12800
90-100	95	50	5	250	2500	12500
			$\sum f_i = 45$	$\sum f_i d_i = 460$		$\sum f_i d_i^2 = 38400$

Let a = 45.

$\therefore$ Mean $= a + \dfrac{\sum f_i d_i}{\sum f_i}$

$= 45 + \dfrac{460}{45}$

$= 45 + 10.22 = 55.22$

$\therefore$ Standard deviation $= \sqrt{\dfrac{\sum f_i d_i^2}{\sum f_i} - \left(\dfrac{\sum f_i d_i}{\sum f_i}\right)^2}$

$= \sqrt{\dfrac{38400}{45} - (10.22)^2}$

$= \sqrt{853.33 - 104.45}$

$= \sqrt{748.88}$

$= 27.36$

15. Here A = 55, h = 10

Calculation of Mean and Standard Deviation

Age	mid-values (x_i)	Number of persons (f_i)	$u_i = \dfrac{x_i - 55}{10}$	$f_i\, u_i$	u_i^2	$f_i\, u_i^2$
20-30	25	3	-3	-9	9	27
30-40	35	51	-2	-102	4	204
45-50	45	122	-1	-122	1	122
50-60	55	141	0	0	0	0
60-70	65	130	1	130	1	130
70-80	75	51	2	102	4	204
80-90	85	2	3	6	9	18
		$N = \sum f_i = 500$		$\sum f_i u_i = 5$		$\sum f_i u_i^2 = 705$

Here, N = $\Sigma\ f_i$ = 500, $\Sigma\ f_i\ u_i$ = 5, $\Sigma\ f_i\ u_i^2$ = 705

$\therefore \overline{X}$ = A + h $\left(\frac{1}{N}\Sigma f_i u_i\right)$ = 55 + 10 $\left(\frac{5}{500}\right)$ = 55.1

and, σ^2 = h^2 $\left\{\left(\frac{1}{N}\Sigma f_i u_i^2\right) - \left(\frac{1}{N}\Sigma f_i u_i\right)^2\right\}$

$\Rightarrow \sigma^2$ = 100 $\left\{\frac{705}{500} - \left(\frac{5}{500}\right)^2\right\}$ = 100 $\times$ 1.4099 = 140.99

$\Rightarrow$ Standard Deviation, $\sigma = \sqrt{140.99}$ = 11.8739