Q1 (20 July 2021 Shift 1)

The mean of 6 distinct observations is 6.5 and their variance is 10.25. If 4 out of 6 observations are 2, 4, 5 and 7, then the remaining two observations are:

(1) 10,11

(2) 3,18

(3) 8,13

(4) 1,20

Q2 (20 July 2021 Shift 2)

If the mean and variance of six observations $7, 10, 11, 15, a, b$ are 10 and $\frac{20}{3}$, respectively,

then the value of $|a - b|$ is equal to :

(1) 9

(2) 11

(3) 7

(4) 1

Q3 (22 July 2021 Shift 1)

Consider the following frequency distribution :

Class:

Class :	$0-6$	$6-12$	$12-18$	$18-24$	$24-30$
Frequency :	a	b	12	9	5

If mean $= \frac{309}{22}$ and median $= 14$, then the value $(a - b)^2$ is equal to _____.

Q4 (25 July 2021 Shift 1)

Consider the following frequency distribution

$class:$	$10-20$	$20-30$	$30-40$	$40-50$	$50-60$
$Frequency:$	α	110	54	30	β

If the sum of all frequencies is 584 and median is 45, then $|\alpha-\beta|$ is equal to

Q5 (25 July 2021 Shift 2)

The first of the two samples in a group has 100 items with mean 15 and standard deviation 3. If the whole group has 250 items with mean 15.6 and standard deviation $\sqrt{13.44}$, then the standard deviation of the second sample is :

(1) 8

(2) 6

(3) 4

(4) 5

Q6 (27 July 2021 Shift 1)

If the mean and variance of the following data:

$6, 10, 7, 13, a, 12, b, 12$

are 9 and $\frac{37}{4}$ respectively, then $(a-b)^2$ is equal to:

(1) 24

(2) 12

(3) 32

(4) 16

Q7 (27 July 2021 Shift 2)

Let the mean and variance of the frequency distribution

$x: \quad x_1=2 \quad x_2=6 \quad x_3=8 \quad x_4=9$

$\mathbf{f}:$ 4 4 α β

be 6 and 6.8 respectively. If x_3 is changed from 8 to 7 , then the mean for the new data will be:

(1) 4

(2) 5

(3) $\frac{17}{3}$

(4) $\frac{16}{3}$

Answer Key

Q1 (1) **Q2** (4) **Q3** (4) **Q4** (164)

Q5 (3) **Q6** (4) **Q7** (3)

Q1

Let other two numbers be a, (21-a)

Now,

$10.25 = \frac{(4+16+25+49+a^2+(21-a)^2)}{6} - (6.5)^2$

(Using formula for variance)

$\Rightarrow 6(10.25) + 6(6.5)^2 = 94 + a^2 + (21-a)^2$

$\Rightarrow \mathrm{a}^2 + (21-\mathrm{a})^2 = 221$

$\therefore a = 10$ and $(21-a) = 21-10 = 11$

So, remaining two observations are 10,11 .

$\Rightarrow$ Option (1) is correct.

Q2

$10 = \frac{7+10+11+15+a+b}{6}$

$\Rightarrow \mathrm{a}+\mathrm{b} = 17$

$\frac{20}{3} = \frac{7^2+10^2+11^2+15^2+\mathrm{a}^2+\mathrm{b}^2}{6} - 10^2$

$a^2 + b^2 = 145$

Solve (i) and (ii) $\mathrm{a} = 9,\ \mathrm{b} = 8$ or $\mathrm{a} = 8,\ \mathrm{b} = 9$

$|\mathrm{a}-\mathrm{b}| = 1$

Q3

Class	*Frequency*	$\mathbf{X_i}$	$\mathbf{F_i x_i}$
$0-6$	a	3	3a
$6-12$	b	9	9 b
$12-18$	12	15	180
$18-24$	9	21	189
$24-30$	5	27	135
	$\mathbf{N = 26 + a + b)}$		$\mathbf{(504 + 3a + 9b)}$

Mean $= \frac{3a+9b+180+189+135}{a+b+26} = \frac{309}{22}$

$\Rightarrow 66a + 198b + 11088 = 309a + 309b + 8034$

$\Rightarrow 243\mathrm{a} + 111\ \mathrm{b} = 3054$

$\Rightarrow 81\mathrm{a} + 37\ \mathrm{b} = 1018$

Now, Median $= 12 + \frac{\frac{\mathrm{a+b+26}}{2} - (\mathrm{a+b})}{12} \times 6 = 14$

$\Rightarrow \frac{13}{2} - \left(\frac{\mathrm{a+b}}{4}\right) = 2$

$\Rightarrow \frac{\mathrm{a+b}}{4} = \frac{9}{2}$

$\Rightarrow a + b = 18] \rightarrow (2)$

From equation $(1)\&(2)\ \mathrm{a} = 8,\ \mathrm{b} = 10$

$\therefore (a - b)^2 = (8 - 10)^2$

Q4

$\because$ Sum of frequencies $= 584$

$\Rightarrow \alpha + \beta = 390$

Now, Median is at $\frac{584}{2} = 292^{\mathrm{th}}$

$\because$ Median $= 45$ (lies in class $40 - 50$)

$\Rightarrow \alpha + 110 + 54 + 15 = 292$

$\Rightarrow \alpha = 113, \beta = 277$

$\Rightarrow |\alpha - \beta| = 164$

Q5

$\mathrm{n}_1 = 100$ $\quad$ $\mathrm{m} = 250$

$\overline{\mathrm{X}}_1 = 15$ $\quad$ $\overline{\mathrm{X}} = 15.6$

$\mathrm{V}_1(\mathrm{x}) = 9$ $\quad$ $\mathrm{Var}(\mathrm{x}) = 13.44$

$\sigma^2 = \frac{\mathrm{n}_1\sigma_1^2 + \mathrm{n}_2\sigma_2^2}{\mathrm{n}_1 + \mathrm{n}_2} + \frac{\mathrm{n}_1\mathrm{n}_2}{(\mathrm{n}_1 + \mathrm{n}_2)^2}\left(\overline{\mathrm{x}}_1 - \overline{\mathrm{x}}_2\right)^2$

$\mathrm{n}_2 = 150, \overline{\mathrm{x}}_2 = 16,\ \mathrm{V}_2(\mathrm{x}) = \sigma_2$

$13.44 = \frac{100 \times 9 + 150 \times \sigma_2^2}{250} + \frac{100 \times 150}{(250)^2} \times 1$

$\Rightarrow \sigma_2^2 = 16 \Rightarrow \sigma_2 = 4$

Q6

Mean $= \frac{6+10+7+13+a+12+b+12}{8} = 9$

$60 + a + b = 72$

$a + b = 12$

variance $= \frac{\sum x_i^2}{n} - \left(\frac{\sum x_i}{n}\right)^2 = \frac{37}{4}$

$\sum x_i^2 = 6^2 + 10^2 + 7^2 + 13^2 + a^2 + b^2 + 12^2 + 12^2$

$= a^2 + b^2 + 642$

$\frac{a^2+b^2+642}{8} - (9)^2 = \frac{37}{4}$

$\frac{a^2+b^2}{8} + \frac{321}{4} - 81 = \frac{37}{4}$

$\frac{a^2+b^2}{8} = 81 + \frac{37}{4} - \frac{321}{4}$

$\frac{a^2+b^2}{8} = 81 - 71$

$\therefore a^2 + b^2 = 80 \quad \ldots(2)$

From $(1) a^2 + b^2 + 2ab = 144$

$80 + 2ab = 144 \quad \therefore 2ab = 64$

$(a-b)^2 = a^2 + b^2 - 2ab = 80 - 64 = 16$

Q7

Given $32 + 8\alpha + 9\beta = (8 + \alpha + \beta) \times 6$

$\Rightarrow 2\alpha + 3\beta = 16$

Also, $4 \times 16 + 4 \times \alpha + 9\beta = (8 + \alpha + \beta) \times 6.8$

$\Rightarrow 640 + 40\alpha + 90\beta = 544 + 68\alpha + 68\beta$

$\Rightarrow 28\alpha - 22\beta = 96$

$\Rightarrow 14\alpha - 11\beta = 48$

from (i) \& (ii)

$\alpha = 5 \& \beta = 2$

so, new mean $= \frac{32+35+18}{15} = \frac{85}{15} = \frac{17}{3}$