



CHAPTER 7: STATISTICS



Paper 2

Solution to Question 23

- (a) It is given that the mean of the set of data is p .

$$\begin{aligned} \text{Thus, } \frac{2+m+3m+8+14+16}{6} &= p \\ 4m+40 &= 6p \\ 3p-2m &= 20 \quad \dots\dots (1) \end{aligned}$$

If 2 is subtracted from each value of the data, then the values of the data become 0, $m-2$, $3m-2$, 6, 12, 14.

$$\begin{aligned} \text{The median of the new set of data} &= \frac{3m-2+6}{2} \\ &= \frac{3m+4}{2} \end{aligned}$$

It is given that the median of the new set of data is $\frac{5p}{8}$.

$$\begin{aligned} \text{Thus, } \frac{3m+4}{2} &= \frac{5p}{8} \\ 12m+16 &= 5p \\ 5p-12m &= 16 \quad \dots\dots (2) \end{aligned}$$

$$\begin{aligned} 6 \times (1): \quad 18p-12m &= 120 \quad \dots\dots (3) \\ (3) - (2): \quad 18p-5p &= 120-16 \\ 13p &= 104 \\ p &= 8 \end{aligned}$$

Substitute $p = 8$ into (1).

$$\begin{aligned} 3(8)-2m &= 20 \\ 2m &= 4 \\ m &= 2 \end{aligned}$$

- (b) The values of the new set of data are 0, 0, 4, 6, 12, 14.

$$\begin{aligned} \bar{x} &= \frac{0+0+4+6+12+14}{6} = 6 \\ \Sigma x^2 &= 0^2+0^2+4^2+6^2+12^2+14^2 = 392 \\ \text{The variance, } \sigma^2 &= \frac{392}{6} - 6^2 = 29.33 \end{aligned}$$

Solution to Question 27

(a) **Chickens given feed X**

Mass gain, (kg)	Frequency, f	x	fx	fx^2
0 – 0.2	1	0.1	0.1	0.01
0.3 – 0.5	3	0.4	1.2	0.48
0.6 – 0.8	7	0.7	4.9	3.43
0.9 – 1.1	7	1.0	7.0	7.00
1.2 – 1.4	2	1.3	2.6	3.38
	$\Sigma f = 20$		$\Sigma fx = 15.8$	$\Sigma fx^2 = 14.3$

$$\begin{aligned} \text{Mean, } \bar{x} &= \frac{\Sigma fx}{N} \\ &= \frac{15.8}{20} \\ &= 0.79 \end{aligned}$$

$$\begin{aligned} \text{Variance, } \sigma^2 &= \frac{\Sigma fx^2}{N} - \bar{x}^2 \\ &= \frac{14.3}{20} - 0.79^2 \\ &= 0.0909 \end{aligned}$$

Chickens given feed Y

Mass gain, (kg)	Frequency, f	x	fx	fx^2
0 – 0.2	2	0.1	0.2	0.02
0.3 – 0.5	2	0.4	0.8	0.32
0.6 – 0.8	8	0.7	5.6	3.92
0.9 – 1.1	5	1.0	5.0	5.00
1.2 – 1.4	3	1.3	3.9	5.07
	$\Sigma f = 20$		$\Sigma fx = 15.5$	$\Sigma fx^2 = 14.33$

$$\begin{aligned} \text{Mean, } \bar{x} &= \frac{\Sigma fx}{N} \\ &= \frac{15.5}{20} \\ &= 0.775 \end{aligned}$$

$$\begin{aligned} \text{Variance, } \sigma^2 &= \frac{\Sigma fx^2}{N} - \bar{x}^2 \\ &= \frac{14.33}{20} - 0.775^2 \\ &= 0.1159 \end{aligned}$$

Since feed X produces a higher mean mass gain and a smaller variance than feed Y, feed X produces better results.

- (b) When there is no extreme value in any set of data, the variance is a better measure of dispersion. This is because the variance takes into account the variation of each value from the mean, whereas the interquartile range is calculated based on only two values. Since the data shown by feed X and feed Y do not contain any extreme value, the mean and the interquartile range are less ideal to be used to compare the results of feed X and feed Y. Hence, the mean and variance are better measures to compare the results of feed X and feed Y.

 **Paper 1**

1. A set is made up of numbers 5, 2, 7 and p . Given that the mean of the set is 5, find its variance.

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2. A set consists of 10 values of x . It has a variance of 24 and a value of Σx^2 equal to 400. Find the mean of the set.
3. 1, $2m - 3$, 6, $m + 5$ and 12 is a set of five integers arranged in an ascending order. Given that the interquartile range of the set is 8, find its mean.

 **Paper 2**

1. The table shows the frequency distribution of the times taken by a group of athletes in a race.

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Time (s)	Number of athletes
100 – 109	1
110 – 119	3
120 – 129	6
130 – 139	12
140 – 149	m
150 – 159	1

- (a) It is given that the median time of the athletes is 132 s. Calculate the value of m .
- (b) Using a scale of 2 cm to 10 s on the horizontal axis and 2 cm to 2 athletes on the vertical axis, draw a histogram to represent the frequency distribution of the times. Find the modal time.
- (c) What is the modal time if the time of each athlete is decreased by 10 s?

2. The table shows the frequency distribution of points scored by a group of contestants in a quiz.

Point	Frequency
0 – 4	10
5 – 9	5
10 – 14	4
15 – 19	4
20 – 24	2

- (a) Calculate
- the median of the points of the group.
 - the mean of the points of the group.
- (b) If n participants from the class interval of 0 – 4 are taken out, the mean of the points of the group is increased by 1.65 points. Find
- the value of n .
 - the variance of the points of the group after n participants from the class interval of 0 – 4 are taken out.
3. The table shows the frequency distribution of marks of a group of students in a test.

Marks	Frequency
40 – 44	2
45 – 49	6
50 – 54	m
55 – 59	5
60 – 64	n
65 – 69	1

The lower quartile mark and the mean mark of the group are 47 and 52.5 respectively.

- Find the values of m and n .
- Hence, calculate the variance of the marks of the group.