



Attempt all questions before checking the answer key. Use population variance $\sigma^2 = \Sigma f(x - \bar{x})^2 / \Sigma f$. For grouped data use class marks.

A. Very short answers - 1 mark each

1. Find the range of 4, 7, 9, 12, 18.
2. What does a standard deviation of zero imply?
3. State the SI-style units of variance and standard deviation when observations are measured in cm.
4. Does adding 5 to every observation change the standard deviation? Explain.
5. Why are deviations squared when computing variance?

B. Short answers / practice - 2 marks each

6. Find the mean deviation about the mean for 2, 4, 6, 8.
7. Find the mean and variance of 1, 3, 5, 7.
8. The variance of X is 9. Find the variance and standard deviation of $Y = 2X + 5$.
9. For values 1, 2, 3 with frequencies 2, 3, 5, find the mean.
10. Explain why two datasets with the same mean can have different dispersions. Give an example.
11. Find mean of 3, 6, 9.
12. Find variance of 2, 2, 2, 2.
13. Find standard deviation if variance is 49.
14. If SD of X is 3, find SD of $4X - 7$.
15. Find mean deviation about mean for 1, 3, 5.
16. Can variance be negative?
17. Find range of -5, -1, 4, 9.
18. Find variance of 0, 2.
19. If $\Sigma x^2 = 100$, $n = 4$ and mean = 4, find variance.

20. Does multiplying every observation by -1 change its SD?

C. Short answers - 3 marks each

21. Find mean deviation about the median for 2, 3, 5, 8, 12.
22. Find variance and standard deviation for values 2, 4, 6, 8 with frequencies 1, 2, 2, 1.

23. For classes 0-10, 10-20, 20-30 with frequencies 2, 5, 3, find mean and standard deviation using class marks.

24. The mean of 10 observations is 12 and the sum of their squares is 1530. Find variance and standard deviation.

25. A dataset's mean is 20 and standard deviation is 4. Every value is divided by 2 and then reduced by 3. Find the new mean, variance and standard deviation.

D. Long answers - 5 marks each

26. Derive $\sigma^2 = \Sigma x^2 / n - \bar{x}^2$ for ungrouped data. Use both this and the deviation formula for 3, 5, 7, 9 to check agreement.
27. For classes 0-10, 10-20, 20-30, 30-40, 40-50 with frequencies 3, 5, 8, 3, 1, find mean, variance and standard deviation. Show a complete calculation table.
28. Compare datasets A: 8, 9, 10, 11, 12 and B: 2, 6, 10, 14, 18 using their means and standard deviations. Explain which is more consistent around the common mean.
29. For values 10, 20, 30, 40 with frequencies 2, 3, 4, 1, find mean, median and mean deviations about each; compare the two deviations.
30. Ten observations were recorded with mean 15 and sum of squares 2500. One observation recorded as 20 should have been 10. Find the corrected mean, variance and standard deviation.

ANSWER KEY - Numerical / short answers

- 1) 14. 2) All observations equal. 3) Variance cm^2 ; standard deviation cm. 4) No. 5) 2. 6) 2. 7) Mean 4; variance 5. 8) Variance 36; standard deviation 6. 9) 2.3. 10) 6. 11) 0. 12) 7. 13) 12. 14) 4/3. 15) No. 16) 14. 17) 1. 18) 9. 19) No. 20) 3. 21) Variance $11/3$; standard deviation $\sqrt{11/3} \approx 1.915$. 22) Mean 16; variance 49; standard deviation 7. 23) Variance 9; standard deviation 3. 24) Mean 7; variance 4; standard deviation 2. 25) Variance 5 by both methods. 26) Mean 22; variance 111; standard deviation $\sqrt{111} \approx 10.536$. 27) Both means 10; SDs $\sqrt{2}$ and $\sqrt{32}$; A is more consistent. 28) Mean 24; median 25; mean deviations both 8. 29) Mean 14; variance 24; standard deviation $2\sqrt{6}$.