# 30 Standard Deviation and Variance Practice Questions

Notes for SHS • Topic 76 • Fictional mathematics teaching resources

### Question 1 — Level 1: Definition of variance

Explain what variance measures and state its units when x is in minutes.

Hint: Think of squared deviations.

### Question 2 — Level 1: Definition of SD

Explain the relationship between variance and standard deviation.

Hint: Use the nonnegative square root.

### Question 3 — Level 1: Range vs SD

For 3, 5, 7, calculate range and population SD.

Hint: Find the mean first.

### Question 4 — Level 1: Signed deviation

If the mean score is 75 and a student scores 60, find the deviation.

Hint: Subtract mean from score.

### Question 5 — Level 1: Squared deviation

Square a deviation of -7.

Hint: Parenthesize the negative value.

### Question 6 — Level 1: Calculate mean

Find mean of 4, 6 and 8.

Hint: Add and divide by three.

### Question 7 — Level 1: Sum of squares

Find sum of squared deviations for 4, 6, 8.

Hint: Their mean is 6.

### Question 8 — Level 1: Population variance

Treat 4, 6, 8 as complete population; find variance.

Hint: Divide sum of squares by 3.

### Question 9 — Level 1: Population SD

Find population SD of 4,6,8.

Hint: Take sqrt of population variance.

### Question 10 — Level 1: Interpret low SD

Compare data 10,10,10 with 7,10,13; describe SD.

Hint: Both means are 10.

### Question 11 — Level 2: Sample variance

Find sample variance of 2,4,6,8,10.

Hint: Mean 6, sum of squares 40.

### Question 12 — Level 2: Sample SD

Find sample SD of 2,4,6,8,10.

Hint: Square root of sample variance.

### Question 13 — Level 2: Population and sample denominators

Eight scores have squared deviation total 900; compute both variances.

Hint: Population N=8; sample n−1=7.

### Question 14 — Level 2: Negative observations

For −4,−2,0,2,4 calculate population variance and SD.

Hint: Mean=0.

### Question 15 — Level 2: Decimal values

Find population SD for 1.0,1.5,2.0.

Hint: Mean=1.5.

### Question 16 — Level 2: Zero variance

Find sample and population SD for 9,9,9,9.

Hint: All deviations zero.

### Question 17 — Level 2: Same mean, unequal spread

Compare population variances of A=8,9,10,11,12 and B=0,5,10,15,20.

Hint: Both means =10.

### Question 18 — Level 2: Frequency variance

Scores 50:2,60:3,70:4,80:1. Find population variance.

Hint: Mean=64; weight squares by f.

### Question 19 — Level 2: Frequency SD

Using the same frequency table, find conventional sample SD.

Hint: There are 10 observations.

### Question 20 — Level 2: Outlier effect

Find population SD of [48,50,52,49,51] before and after adding 99.

Hint: Use full recalculated means.

## Question 21 — Level 3: Grouped variance approximation

Classes 40–49:2,50–59:3,60–69:4,70–79:1. Estimate population variance from midpoints.

Hint: Use midpoints 44.5,54.5,64.5,74.5.

## Question 22 — Level 3: Grouped SD approximation

Find population-style grouped SD for same intervals.

Hint: Take sqrt of midpoint variance.

## Question 23 — Level 3: Computational identity

For 2,4,6,8,10 use $\Sigma x^2/N-\mu^2$ to find population variance.

Hint: $\Sigma x^2=220$; mean=6.

## Question 24 — Level 3: Unknown observation

Three observations have mean 6. Two are 4 and 6; find third and population variance.

Hint: Recover sum from mean.

## Question 25 — Level 3: Data correction

Original four observations 4,6,8,10; value 10 corrected to 12. Find revised population variance.

Hint: Replace, do not append.

## Question 26 — Level 3: Coefficient of variation

Data have positive ratio-scale mean 50 units and SD 5; calculate CV.

Hint: CV=SD/mean.

## Question 27 — Level 3: SD versus SE

An IID sample has n=25 and sample SD 10; estimate SE of sample mean.

Hint: s/sqrt(n).

## Question 28 — Level 3: Spreadsheet verification

Give Excel population and sample variance/SD formulas for B2:B9.

Hint: VAR.P VAR.S STDEV.P STDEV.S.

## Question 29 — Level 3: NumPy ddof

What changes between np.std(data,ddof=0) and ddof=1? Use 2,4,6,8,10.

Hint: Denominator n−ddof.

## Question 30 — Level 3: Integrated question

For 3,5,5,7: calculate mean, sumsq, population and sample variance and SD.

Hint: Mean 5, n=4.