2.4) Variance and standard deviation

Worked example

Calculate the variance and standard deviation:

$$2, 3, 4, 5, 6$$

Your turn

Calculate the variance and standard deviation:

$$2, 3, 4, 5, 7$$

Variance $= \sigma^2 = 2.96$

Standard deviation $= \sigma = 1.72$ (3 sf)

Worked example

Calculate the variance and standard deviation:

$$2, 3, 4, 5, 6$$

Your turn

Calculate the variance and standard deviation:

$$4, 6, 8, 10, 12$$

Variance $= \sigma^2 = 8$

Standard deviation $= \sigma = 2.83$ (3 sf)

Worked example

Calculate the variance and standard deviation:

$$2, 4, 6, 8, 10$$

Your turn

Calculate the variance and standard deviation:

$$1, 2, 3, 4, 5$$

Variance $= \sigma^2 = 2$

Standard deviation $= \sigma = 1.41$ (3 sf)

Worked example

Calculate the variance and standard deviation:

Score	Frequency
0	3
1	2
2	1
3	1
4	4

Your turn

Calculate the variance and standard deviation:

Score	Frequency
0	6
1	4
2	2
3	2
4	8

Variance $= \sigma^2 = 2.81$ (3 sf)

Standard deviation $= \sigma = 1.68$ (3 sf)

Worked example

Estimate the variance and standard deviation:

Score, x	Frequency
$0 \leq x < 1$	8
$1 \leq x < 2$	2
$2 \leq x < 4$	1
$4 \leq x < 9.5$	1
$9.5 \leq x < 10$	4

Your turn

Estimate the variance and standard deviation:

Score, x	Frequency
$0 < x \leq 1$	6
$1 < x \leq 3$	4
$3 < x \leq 6$	2
$6 < x \leq 6.5$	2
$6.5 < x \leq 10$	8

Variance $= \sigma_x^2 \approx 10.9$ (3 sf)

Standard deviation $= \sigma_x \approx 3.30$ (3 sf)

Worked example

Times, x, have been rounded to the nearest minute. Estimate the variance and standard deviation:

Time, x	Frequency
$0 - 2$	5
$3 - 5$	2
$6 - 10$	3

Your turn

Times, x, have been rounded to the nearest minute. Estimate the variance and standard deviation:

Time, x	Frequency
$0 - 3$	7
$4 - 8$	11
$9 - 10$	2

Variance $= \sigma_x^2 \approx 5.81$ (3 sf)

Standard deviation $= \sigma_x \approx 2.41$ (3 sf)

Worked example

Work out how many people had a score more than one standard deviation below the mean

Score	Frequency
0	3
1	2
2	1
3	1
4	4
5	9
6	5

Your turn

Work out how many people had a score more than one standard deviation above the mean

Score	Frequency
0	6
1	4
2	2
3	2
4	8
5	18
6	10

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Worked example

The scores, x, were recorded for 20 people.
The summary data is:

$$S_{xx} = 235$$

Calculate the standard deviation

Your turn

The scores, x, were recorded for 40 people.
The summary data is:

$$S_{xx} = 532$$

Calculate the standard deviation

$$\sigma_x = 3.65 \text{ (3 sf)}$$

Worked example

The scores, x, were recorded for 20 people.
The summary data is:

$$\sum x = 34 \, , \sum x^2 = 567$$

Calculate the mean and standard deviation.

Your turn

The scores, x, were recorded for 40 people.
The summary data is:

$$\sum x = 76 \, , \sum x^2 = 543$$

Calculate the mean and standard deviation.

Mean $= \bar{x} = 1.9$
Standard deviation $= \sigma_x = 3.16$ (3 sf)

Worked example

The scores, x, were recorded for 20 people.
The summary data is:

$$\sum x = 34 \, , \sum x^2 = 567$$

The highest score was 8.5.
The lowest score was 0.2.
Estimate the number of scores which were greater than one standard deviation above the mean.

Your turn

The scores, x, were recorded for 40 people.
The summary data is:

$$\sum x = 76 \, , \sum x^2 = 543$$

The highest score was 5.8.
The lowest score was 0.3.
Estimate the number of scores which were greater than one standard deviation above the mean.

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