2) Measures of location and spread

2.1) Measures of central tendency

Worked example	Your turn
Calculate the mean: $$2, 3, 7, 9, 1, 8, 6, 3, 0, 1$$	Calculate the mean: $$3, 2, 5, 9, 5, 1, 7, 0$$ 4

Worked example	Your turn
Find the median: $2, 3, 7, 9, 1, 8, 6, 3, 0, 1$	Find the median: $3, 2, 5, 9, 5, 1, 7, 0$ 4

Worked example	Your turn
Find the median: $2, 3, 7, 9, 1, 8, 6, 3, 0, 1, 9$	Find the median: $3, 2, 5, 9, 5, 1, 7, 0, 2$ 3

Worked example	Your turn
Find the mode: $2, 3, 7, 9, 1, 8, 6, 3, 0, 1$	Find the mode: $3, 2, 5, 9, 5, 1, 7, 0$ 5

Worked example	Your turn

Calculate the mean height:

Height, x (cm)
0.9
1.8
2.7
3.6
4.5

Calculate the mean height:

Height, x (cm)
4.9
3.8
2.7
1.6
0.5

$\bar{x} = 2.7$

Worked example | Your turn

Calculate the mean score:

Score, x	Frequency
0	3
1	2
2	1
3	1
4	4

Calculate the mean score:

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

$\bar{x} = 2.09 \, (3 \text{ sf})$

Worked example

Find the median score:

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

Your turn

Find the median score:

Score	Frequency
0	6
1	4
2	2
3	2
4	11

3

Worked example	Your turn

Find the median score:

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

Find the median score:

Score	Frequency
0	5
1	4
2	2
3	2
4	11

3

Worked example	Your turn

Find the mode of the scores:

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

Find the mode of the scores:

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

0

Worked example

Calculate an estimate for the mean score:

Score, x	Frequency
$0 \leq x < 1$	3
$1 \leq x < 2$	2
$2 \leq x < 4$	1
$4 \leq x < 9.5$	1
$9.5 \leq x < 10$	4

Your turn

Calculate an estimate for the mean score:

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

$\bar{x} = 4.48 \, (3 \text{ sf})$

Worked example

Calculate an estimate for the mean score:

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

Your turn

Calculate an estimate for the mean score:

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

$\bar{x} = 5.67 \, (3 \text{ sf})$

Worked example	Your turn

Worked example

Write down the interval containing the median

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

Write down the interval containing the median

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

$3 < x \leq 6$

Worked example

Write down the interval containing the median

Score, x	Frequency
$0 \leq x < 1$	3
$1 \leq x < 2$	2
$2 \leq x < 4$	1
$4 \leq x < 9.5$	1
$9.5 \leq x < 10$	4

Your turn

Write down the interval containing the median

Score, x	Frequency
$0 < x \leq 1$	11
$1 < x \leq 3$	4
$3 < x \leq 6$	2
$6 < x \leq 6.5$	2
$6.5 < x \leq 10$	8

$1 < x \leq 3$

Worked example	Your turn

Write down the modal class

Score, x	Frequency
$0 \leq x < 1$	3
$1 \leq x < 2$	2
$2 \leq x < 4$	1
$4 \leq x < 9.5$	1
$9.5 \leq x < 10$	4

Write down the modal class

Score, x	Frequency
$0 < x \leq 1$	11
$1 < x \leq 3$	4
$3 < x \leq 6$	2
$6 < x \leq 6.5$	2
$6.5 < x \leq 10$	8

$0 < x \leq 1$

Worked example

Times, x, have been rounded to the nearest minute. Find an estimate for the mean time:

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

Your turn

Times, x, have been rounded to the nearest minute. Find an estimate for the mean time:

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

$$\bar{x} = 4.8125$$

Worked example	Your turn
Write down the class containing the median	Write down the class containing the median

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

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

$4 - 8$

Worked example

Write down the modal class

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

Your turn

Write down the modal class

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

$4 - 8$

Worked example

The table shows the length of time for different people to complete a task:

Person	A	B	C	D	E	F
Time (minutes)	1	3	8	2	1	9

Calculate the mean.

Your turn

The table shows the length of time for different people to complete a task:

Person	A	B	C	D	E	F
Time (minutes)	7	3	8	2	1	3

Calculate the mean.

4 minutes

Worked example

The table shows the length of time for different people to complete a task:

Person	A	B	C	D	E	F
Time (minutes)	1	3	8	2	1	9

Find the median:

Your turn

The table shows the length of time for different people to complete a task:

Person	A	B	C	D	E	F
Time (minutes)	7	3	8	2	1	3

Find the median:

3 minutes

Worked example

The table shows the length of time for different people to complete a task:

Person	A	B	C	D	E	F
Time (minutes)	1	3	8	2	1	9

Write down the mode.

Your turn

The table shows the length of time for different people to complete a task:

Person	A	B	C	D	E	F
Time (minutes)	7	3	8	2	1	3

Write down the mode.

3 minutes

Worked example	Your turn
The mean maths score of 10 pupils in class A is 26. The mean maths score of 40 pupils in class B is 57. a) Find the overall mean of all the pupils' marks. b) The teacher realises they mismarked one student's paper; he should have received 90 instead of 95. Explain the effect on the mean and median.	The mean maths score of 20 pupils in class A is 62. The mean maths score of 30 pupils in class B is 75. a) Find the overall mean of all the pupils' marks. b) The teacher realises they mismarked one student's paper; he should have received 100 instead of 95. Explain the effect on the mean and median. a) 69.8 b) Mean increased, median unaffected.

2.2) Other measures of location

Worked example

Estimate the median:

Score, x	Frequency
$0 \leq x < 1$	3
$1 \leq x < 2$	2
$2 \leq x < 4$	1
$4 \leq x < 9.5$	1
$9.5 \leq x < 10$	4

Your turn

Estimate the median:

Score, x	Frequency
$0 < x \leq 1$	11
$1 < x \leq 3$	4
$3 < x \leq 6$	2
$6 < x \leq 6.5$	2
$6.5 < x \leq 10$	8

2.25

Worked example

Times, x, have been rounded to the nearest minute. Estimate the median:

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 median:

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

4.86 (3 sf)

Worked example

Estimate the median:

Height (m)	Frequency
$0.55 \leq h < 0.6$	33
$0.6 \leq h < 0.65$	54
$0.65 \leq h < 0.7$	15
$0.7 \leq h < 0.75$	30
$0.75 \leq h < 0.8$	18

Your turn

Estimate the median:

Height (m)	Frequency
$0.55 \leq h < 0.6$	55
$0.6 \leq h < 0.65$	45
$0.65 \leq h < 0.7$	30
$0.7 \leq h < 0.75$	15
$0.75 \leq h < 0.8$	5

$0.62 \, m$ (2 dp)

Worked example	Your turn
Find the lower quartile: $2, 3, 7, 9, 1, 8, 6, 3, 0, 1, 9$	Find the lower quartile: $3, 2, 5, 9, 5, 1, 7, 0, 2$ 2

Worked example	Your turn
Find the upper quartile: $2, 3, 7, 9, 1, 8, 6, 3, 0, 1, 9$	Find the upper quartile: $3, 2, 5, 9, 5, 1, 7, 0, 2$ 5

Worked example	Your turn
Find the lower quartile: $2, 3, 7, 9, 1, 8, 6, 3, 0, 1, 9, 12$	Find the lower quartile: $3, 2, 5, 9, 5, 1, 7, 0$ 1.5

Worked example	Your turn
Find the upper quartile: $2, 3, 7, 9, 1, 8, 6, 3, 0, 1, 9, 12$	Find the upper quartile: $3, 2, 5, 9, 5, 1, 7, 0$ 6

Worked example

Estimate the lower quartile:

Score, x	Frequency
$0 \leq x < 1$	3
$1 \leq x < 2$	2
$2 \leq x < 4$	1
$4 \leq x < 9.5$	1
$9.5 \leq x < 10$	4

Your turn

Estimate the lower quartile:

Score, x	Frequency
$0 < x \leq 1$	11
$1 < x \leq 3$	4
$3 < x \leq 6$	2
$6 < x \leq 6.5$	2
$6.5 < x \leq 10$	8

0.61 (2 sf)

Worked example

Estimate the upper quartile:

Score, x	Frequency
$0 \leq x < 1$	3
$1 \leq x < 2$	2
$2 \leq x < 4$	1
$4 \leq x < 9.5$	1
$9.5 \leq x < 10$	4

Your turn

Estimate the upper quartile:

Score, x	Frequency
$0 < x \leq 1$	11
$1 < x \leq 3$	4
$3 < x \leq 6$	2
$6 < x \leq 6.5$	2
$6.5 < x \leq 10$	8

7.05 (2 sf)

	Worked example	Your turn

Worked example

Times, x, have been rounded to the nearest minute. Estimate the lower quartile:

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 lower quartile:

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

2.5

Worked example

Times, x, have been rounded to the nearest minute. Estimate the upper quartile:

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 upper quartile:

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

5.72 (3 sf)

Worked example

Estimate the 27th percentile:

Score, x	Frequency
$0 \leq x < 1$	3
$1 \leq x < 2$	2
$2 \leq x < 4$	1
$4 \leq x < 9.5$	1
$9.5 \leq x < 10$	4

Your turn

Estimate the 72nd percentile:

Score, x	Frequency
$0 < x \leq 1$	11
$1 < x \leq 3$	4
$3 < x \leq 6$	2
$6 < x \leq 6.5$	2
$6.5 < x \leq 10$	8

6.6925

	Worked example	Your turn

Worked example

Times, x, have been rounded to the nearest minute. Estimate the 63rd percentile:

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 36th percentile:

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

3.59

2.3) Measures of spread

Worked example	Your turn
Calculate the interquartile range: 2, 3, 7, 9, 1, 8, 6, 3, 0, 1, 9	Calculate the interquartile range: 3, 2, 5, 9, 5, 1, 7, 0, 2 3

Worked example	Your turn
Calculate the interquartile range: $2, 3, 7, 9, 1, 8, 6, 3, 0, 1, 9, 12$	Calculate the interquartile range: $3, 2, 5, 9, 5, 1, 7, 0$ 4.5

Worked example

Estimate the interquartile range:

Score, x	Frequency
$0 \leq x < 1$	3
$1 \leq x < 2$	2
$2 \leq x < 4$	1
$4 \leq x < 9.5$	1
$9.5 \leq x < 10$	4

Your turn

Estimate the interquartile range:

Score, x	Frequency
$0 < x \leq 1$	11
$1 < x \leq 3$	4
$3 < x \leq 6$	2
$6 < x \leq 6.5$	2
$6.5 < x \leq 10$	8

6.43 (3 sf)

Worked example

Times, x, have been rounded to the nearest minute. Estimate the interquartile range:

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 interquartile range:

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

3.22 (3 sf)

Worked example

Estimate the 20th – 80th interpercentile range:

Score, x	Frequency
$0 \leq x < 1$	3
$1 \leq x < 2$	2
$2 \leq x < 4$	1
$4 \leq x < 9.5$	1
$9.5 \leq x < 10$	4

Your turn

Estimate the 10th – 90th interpercentile range:

Score, x	Frequency
$0 < x \leq 1$	11
$1 < x \leq 3$	4
$3 < x \leq 6$	2
$6 < x \leq 6.5$	2
$6.5 < x \leq 10$	8

8.57 (3 sf)

	Worked example	Your turn

Worked example

Times, x, have been rounded to the nearest minute. Estimate the $5^{th} - 95^{th}$ interpercentile range:

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 $15^{th} - 85^{th}$ interpercentile range:

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

6.55 (3 sf)

2.4) Variance and standard deviation

Worked example	Your turn
Calculate the variance and standard deviation: $$2, 3, 4, 5, 6$$	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	Your turn
Calculate the variance and standard deviation: $$2, 3, 4, 5, 6$$	Calculate the variance and standard deviation: $$4, 6, 8, 10, 12$$ Variance $= \sigma^2 = 8$ Standard deviation $= \sigma = 2.83$ (3 sf)

Worked example	Your turn
Calculate the variance and standard deviation: $$2, 4, 6, 8, 10$$	Calculate the variance and standard deviation: $$1, 2, 3, 4, 5$$ Variance $= \sigma^2 = 2$ Standard deviation $= \sigma = 1.41 \,(3 \text{ sf})$

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

Your turn

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

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 $= \sigma_x^2 \approx 10.9 \, (3 \text{ sf})$

Standard deviation $= \sigma_x \approx 3.30 \, (3 \text{ sf})$

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

10

Worked example	Your turn
The scores, x, were recorded for 20 people. The summary data is: $$S_{xx} = 235$$ Calculate the standard deviation	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	Your turn
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.	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 $= \sigma_x = 3.16 \,(3 \text{ sf})$

Worked example	Your turn
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.	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.
	5

2.5) Coding

Worked example	Your turn
Prove that if all values of x are multiplied by 5, the variance increases by a scale factor of 25	Prove that if all values of x are multiplied by 3, the variance increases by a scale factor of 9

$$\sigma^2 = \frac{\Sigma(3x)^2}{n} - \left(\frac{\Sigma(3x)}{n}\right)^2$$

$$= \frac{\Sigma 9x^2}{n} - \left(\frac{3\Sigma x}{n}\right)^2$$

$$= \frac{9 \cdot \Sigma x^2}{n} - 9\left(\frac{\Sigma x}{n}\right)^2$$

$$= 9\left(\frac{\Sigma x^2}{n} - \left(\frac{\Sigma x}{n}\right)^2\right)$$

Worked example	Your turn
Scores, x:	Scores, x:

Scores, x:

$$2090, 2080, 2070, 2060, 2050$$

a) Use the coding $y = x - 2000$ to code this data
b) Calculate the mean and standard deviation of the coded data
c) Use your answer to b) to calculate the mean and standard deviation of the original data

Scores, x:

$$1010, 1020, 1030, 1040, 1050$$

a) Use the coding $y = x - 1000$ to code this data
b) Calculate the mean and standard deviation of the coded data
c) Use your answer to b) to calculate the mean and standard deviation of the original data

a) y: $10, 20, 30, 40, 50$
b) $\bar{y} = 30$, $\sigma_y = 14.1$ (3 sf)
c) $\bar{x} = 1030$, $\sigma_x = 14.1$ (3 sf)

Worked example	Your turn
Scores, x: $\qquad 2090, 2080, 2070, 2060, 2050$ a) Use the coding $y = 2x$ to code this data b) Calculate the mean and standard deviation of the coded data c) Use your answer to b) to calculate the mean and standard deviation of the original data	Scores, x: $\qquad 1010, 1020, 1030, 1040, 1050$ a) Use the coding $y = 3x$ to code this data b) Calculate the mean and standard deviation of the coded data c) Use your answer to b) to calculate the mean and standard deviation of the original data a) y: $3030, 3060, 3090, 3120, 3150$ b) $\bar{y} = 3090$, $\sigma_y = 42.4$ (3 sf) c) $\bar{x} = 1030$, $\sigma_x = 14.1$ (3 sf)

Worked example	Your turn

Scores, x:

$$2090, 2080, 2070, 2060, 2050$$

a) Use the coding $y = \frac{x}{5}$ to code this data
b) Calculate the mean and standard deviation of the coded data
c) Use your answer to b) to calculate the mean and standard deviation of the original data

Scores, x:

$$1010, 1020, 1030, 1040, 1050$$

a) Use the coding $y = \frac{x}{10}$ to code this data
b) Calculate the mean and standard deviation of the coded data
c) Use your answer to b) to calculate the mean and standard deviation of the original data

a) y: $101, 102, 103, 104, 105$
b) $\bar{y} = 103$, $\sigma_y = 1.41$ (3 sf)
c) $\bar{x} = 1030$, $\sigma_x = 14.1$ (3 sf)

Worked example	Your turn
Scores, x:	Scores, x:

Scores, x:
$$2090, 2080, 2070, 2060, 2050$$

a) Use the coding $y = \frac{x-2000}{10}$ to code this data
b) Calculate the mean and standard deviation of the coded data
c) Use your answer to b) to calculate the mean and standard deviation of the original data

Scores, x:
$$1010, 1020, 1030, 1040, 1050$$

a) Use the coding $y = \frac{x-1000}{10}$ to code this data
b) Calculate the mean and standard deviation of the coded data
c) Use your answer to b) to calculate the mean and standard deviation of the original data

a) $y: 1, 2, 3, 4, 5$
b) $\bar{y} = 3$, $\sigma_y = 1.41$ (3 sf)
c) $\bar{x} = 1030$, $\sigma_x = 14.1$ (3 sf)

Worked example	Your turn
Scores, x: $2090, 2080, 2070, 2060, 2050$ a) Use the coding $y = \frac{x}{10} - 200$ to code this data b) Calculate the mean and standard deviation of the coded data c) Use your answer to b) to calculate the mean and standard deviation of the original data	Scores, x: $1010, 1020, 1030, 1040, 1050$ a) Use the coding $y = \frac{x}{10} - 100$ to code this data b) Calculate the mean and standard deviation of the coded data c) Use your answer to b) to calculate the mean and standard deviation of the original data a) $y: 1, 2, 3, 4, 5$ b) $\bar{y} = 3$, $\sigma_y = 1.41$ (3 sf) c) $\bar{x} = 1030$, $\sigma_x = 14.1$ (3 sf)

Worked example	Your turn
Scores, x, of 20 people were recorded.	Scores, x, of 40 people were recorded.

Worked example:

Scores, x, of 20 people were recorded.

The data was coded using $y = \frac{x-10}{5}$ and the following summations were obtained:
$$\sum y = 23 \, , \sum y^2 = 147.6$$
Calculate the standard deviation of the actual scores.

Your turn:

Scores, x, of 40 people were recorded.

The data was coded using $y = \frac{x-5}{10}$ and the following summations were obtained:
$$\sum y = 32 \, , \sum y^2 = 764.1$$
Calculate the standard deviation of the actual scores.

$$\sigma_x = 42.97 \,(2 \text{ dp})$$

Scores, x, of 20 people were recorded.
The data was coded using $y = 5x - 10$ and the following summations were obtained:
$$\sum y = 23 , \sum y^2 = 147.6$$
Calculate the standard deviation of the actual scores.

Scores, x, of 40 people were recorded.
The data was coded using $y = 10x - 5$ and the following summations were obtained:
$$\sum y = 32 , \sum y^2 = 764.1$$
Calculate the standard deviation of the actual scores.

$$\sigma_x = 0.4297 \text{ (4 dp)}$$

Worked example	Your turn
A teacher standardises scores, x, of his class by adding 10 to each score and then reducing the score by 8%. The following summary statistics are calculated for the standardised scores, y: $$n = 30, \bar{y} = 23.4, S_{yy} = 5.6$$ Calculate the mean and standard deviation of the original scores	A teacher standardises scores, x, of his class by adding 8 to each score and then reducing the score by 10%. The following summary statistics are calculated for the standardised scores, y: $$n = 25, \bar{y} = 43.2, S_{yy} = 6.5$$ Calculate the mean and standard deviation of the original scores Mean $= \bar{x} = 40$ Standard deviation $= \sigma_x = 0.567$ (3 sf)

Worked example	Your turn
A person was recording times, x, in a race. They then realised the stopwatch was slow and all times were actually 3 minutes more than the recorded times. Explain the effect on: a) The mean b) The standard deviation c) The median d) The range e) The lower quartile f) The interquartile range	A person was recording times, x, in a race. They then realised the stopwatch was slow and all times were actually 5 minutes less than the recorded times. Explain the effect on: a) The mean b) The standard deviation c) The median d) The range e) The lower quartile f) The interquartile range a) Decreases by 5 b) No effect c) Decreases by 5 d) No effect e) Decreases by 5 f) No effect