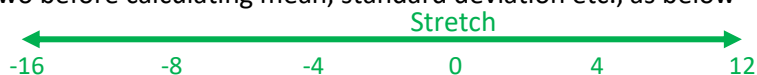# Transposed Data

992   996   998   1000   1002   1006

The data in the above data set is all centred around the number 1000. When calculating mean, standard deviation etc. with data such as this, it may be easier to first transpose the data, in this case by subtracting 1000, as below

Translate

-8   -4   -2   0   2   6

Notice that this data is all multiples of two so, if you wished, you could then divide each of these figures by two before calculating mean, standard deviation etc., as below

Stretch

-16   -8   -4   0   4   12

After calculating the mean and/or standard deviation of transposed data we then need to adjust these figures back to original data. The table below illustrates which values (measurements) are affected by data transposition…

	Translation	Stretch *by factor x*
Mean	✔	✔ *by factor x*
Variance	✘	✔ *by factor x^2*
Standard Deviation	✘	✔ *by factor x*

Try this exam question here…

1 The average maximum monthly temperatures, u degrees Fahrenheit, and the average minimum monthly temperatures, v degrees Fahrenheit, in New York City are as follows.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maximum (u)	39	40	48	61	71	81	85	83	77	67	54	41
Minimum (v)	26	27	34	44	53	63	68	66	60	51	41	30

(a) (i) Calculate, to one decimal place, the mean and the standard deviation of the 12 values of the average **maximum** monthly temperature. *(2 marks)*

(ii) For comparative purposes with a UK city, it was necessary to convert the temperatures from degrees Fahrenheit (°F) to degrees Celsius (°C). The formula used to convert f °F to c °C is:

$$c = \frac{5}{9}(f - 32)$$

Use this formula and your answers in part **(a)(i)** to calculate, **in °C**, the mean and the standard deviation of the 12 values of the average maximum monthly temperature. *(3 marks)*

(AQA Stats 1, June 2013, Qu1)

Two More Questions…

The masses, x kg, of 50 bags of flour were measured and the results were summarised as follows.

$$n = 50 \qquad \Sigma(x - 1.5) = 1.4 \qquad \Sigma(x - 1.5)^2 = 0.05$$

Calculate the mean and standard deviation of the masses of these bags of flour.

The masses, m grams, of 52 apples of a certain variety were found and summarised as follows.

$$n = 52 \qquad \Sigma(m - 150) = -182 \qquad \Sigma(m - 150)^2 = 1768$$

(i) Find the mean and variance of the masses of these 52 apples.

Transposed Data - Answers

	Mean	Variance	Standard Deviation
Original Data	999	19.67	4.43
Transposed by -1000	-1	19.67	4.43
Then halved	-0.5	4.92	2.22

The markscheme for the harder question…

1(a)(i)	Mean = **62.2 to 62.3**	B1		AWFW	(62.25)	
	SD = **17.4 to 17.6 or 16.7 to 16.9**	B1	2	AWFW	(17.519 or 16.774)	
(ii)	Mean = **16.77 to 16.84**	BF1		AWFW (16.806) F on (a)(i) only providing **45 < mean < 65**		
	SD = **9.66 to 9.78 or 9.27 to 9.39**	BF2	3	AWFW (9.733 or 9.319) F on (a)(i) only providing **10 < SD < 20**		

The other two questions…

- Mean = 1.528,
- Standard deviation = 0.014697

- Mean = 146.5,
- Variance = 21.75