Mean and Standard Deviation

Any collection of numerical data will have a mean: $\bar{x} = \dfrac{1}{n}\sum_{i=1}^{n} x_i$ and a standard deviation: $s = \sqrt{\dfrac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2}$

For small collections the calculation is simple. For example the mean of: 2, 7, 3, 1, 2 is 3 and the standard deviation is 2.3.

For larger collections the data may be grouped, the number of items within each group being given as the frequency (f).

Example

Find the mean and standard deviation of the following grouped data:

x	1	2	3	4	5	6
f	3	7	10	14	8	2

Complete a table with columns for x, f, fx, $(x - \bar{x})$, $(x - \bar{x})^2$ and $f(x - \bar{x})^2$ and with space for the calculated results

x	f	fx	$(x - \bar{x})$	$(x - \bar{x})^2$	$f(x - \bar{x})^2$
1	3	3	2.52	6.3504	19.0512
2	7	14	1.52	2.3104	16.1728
3	10	30	0.52	0.2704	2.704
4	14	56	0.48	0.2304	3.2256
5	8	40	1.48	2.1904	17.5232
6	2	12	2.48	6.1504	12.3008
	44	155			70.9776
$\bar{x} = \frac{155}{44} = 3.52$			$s = \sqrt{\frac{70.9776}{43}} = 1.28$		

Thus from these calculations, the mean is **3.52** and the standard deviation is **1.32** (to 2 decimal places).

Exercises - Find the mean and standard deviation of the following collections of data:

1

x	12	13	14	15	16	17
f	90	150	240	290	160	70

2

x	12	17	22	27	32
f	2	8	14	10	6

3

x	10	25	35	45	55	65	75	85
f	8	30	90	103	79	64	21	5