Standard deviation - which represents the average of the distance between individual data values and the mean.

The formula for finding the standard deviation of the data set $\{x_1, x_2, x_2, x_2 \cdots, x_n\}$, with n elements and mean x, is shown below.

$$\text{standard deviation} = \sqrt{\frac{(x_1 - \bar{x})^2 + (x_2 - \bar{x})^2 + \cdots + (x_n - \bar{x})^2}{n}}$$

Find the standard deviation of 77, 86, 84, 93, 90.

① Find the mean $(\bar{x})$ = $\dfrac{77+86+84+93+90}{5}$ = $\dfrac{430}{5}$ =

$$\bar{x} = 86$$

②

Data Value, x	Deviation from Mean, x-x̄	Square Deviation, (x-x̄)²
77	$77 - 86 = -9$	$(-9)^2 = 81$
86	$86 - 86 = 0$	$(0)^2 = 0$
84	$84 - 86 = -2$	$(-2)^2 = 4$
93	$93 - 86 = 7$	$(7)^2 = 49$
90	$90 - 86 = 4$	$(4)^2 = 16$

③ Find the mean of Standard diviation $\dfrac{\bar{x}\sigma}{\#}$

$\bar{x}\sigma = \dfrac{81+0+4+49+16}{5} = \dfrac{150}{5} = 30$

σ

④ $\sigma = \sqrt{\#}$

$= \sqrt{30}$

$$\sigma \approx 5.5$$

5

6 Example Find the standard deviation of 21, 31, 26, 24, 28, 26.

① Find $\bar{x} = \dfrac{21+31+26+24+28+26}{6} = \dfrac{156}{6} = 26$

$$\boxed{\bar{x} = 26}$$

Data Value, x	Deviation from Mean, $x - \bar{x}$	Squared Deviation, $(x - \bar{x})^2$
21	$21 - 26 = \quad -5$	$(-5)^2 = \ 25$
24	$24 - 26 = \quad -2$	$(-2)^2 = \ 4$
26	$26 - 26 = \quad 0$	$0^2 = \ 0$
26	$26 - 26 = \quad 0$	$0^2 = \ 0$
28	$28 - 26 = \quad 2$	$2^2 = \ 4$
31	$31 - 26 = \quad 5$	$5^2 = \ 25$

③ $\bar{x}\sigma = \dfrac{25+4+0+0+4+25}{6} = \dfrac{58}{6} = 9.7$

④ $\sigma = \sqrt{9.7} \approx \boxed{3.1}$