National 5 Mathematics

Standard Deviation - Solutions

Marks are indicated in brackets after each question number

2014 Paper 2 Question 4, (1) (3) (1)

a) i) Mean $= \dfrac{53 + 57 + 58 + 60 + 55 + 56}{6} = 56.5$

 ii) Mean $= \bar{x} = 56.5$

x	$x - \bar{x}$	$(x - \bar{x})^2$
53	-3.5	12.25
57	0.5	0.25
58	1.5	2.25
60	3.5	12.25
55	-1.5	2.25
56	-0.5	0.25
		$\sum (x - \bar{x})^2 = 29.5$

Standard Deviation $= \sqrt{\dfrac{29.5}{6-1}} = 2.4.$

b) In the new training routine, the mean is lower and the standard deviation is higher. Since the standard deviation is higher she is now less consistent despite the fact that her average time is lower.

2015 Paper 1 Question 5, (3)

$$\overline{x} = \frac{1+2+2+2+8}{5} = 3$$

x	$x - \overline{x}$	$(x - \overline{x})^2$
1	−2	4
2	−1	1
2	−1	1
2	−1	1
8	5	25
		$\sum(x - \overline{x})^2 = 32$

Standard Deviation $= \sqrt{\frac{32}{4}} = \sqrt{8}$. Since $\sqrt{8} = \sqrt{a}$, $a = 8$.

2016 Paper 2 Question 6, (4) (2)

a) Mean $= \overline{x} = \frac{13 + 16 + 10 + 22 + 5 + 12}{6} = 13$

x	$x - \overline{x}$	$(x - \overline{x})^2$
13	0	0
16	3	9
10	−3	9
22	9	81
5	−8	84
12	−1	1
		$\sum(x - \overline{x})^2 = 164$

Standard Deviation $= \sqrt{\frac{164}{5}} = 5.73$.

b) The mean has increased and the standard deviation has decreased. This means that, on average, Sophie had to wait longer on the phone than Jack, but since the standard deviation has decreased her waiting times were more consistent than they were for Jack.

2017 Paper 1 Question 12, (4)

$$\overline{x} = \frac{1 + 4 + 6 + 3 + 6}{5} = 4$$

x	$x - \overline{x}$	$(x - \overline{x})^2$
1	−3	9
4	0	0
6	2	4
3	−1	1
6	2	4
		$\sum (x - \overline{x})^2 = 18$

Standard Deviation $= \sqrt{\frac{18}{4}} = \frac{\sqrt{18}}{\sqrt{4}} = \frac{2\sqrt{3}}{2}$.

$a = 3$

$b = 2$

a) Mean $= \bar{x} = \frac{756}{6} = 126$

x	$x - \bar{x}$	$(x - \bar{x})^2$
120	-6	36
126	0	0
125	-1	1
131	5	25
130	4	16
124	-2	4
		$\sum (x - \bar{x})^2 = 82$

Standard Deviation $= \sqrt{\frac{82}{5}} = 4.0$.

b) Since the mean has decreased fewer people visited on a Sunday on average.

Since the standard deviation has increased the number of people visiting stalls on Sunday is less consistent.

2022 Paper 2 Question 5, (4) (2)

a) Mean $= \frac{29 + 27 + 24 + 31 + 22 + 19 + 30}{7} = 26$

x	$x - \bar{x}$	$(x - \bar{x})^2$
29	3	9
27	1	1
24	-2	4
31	5	25
22	-4	16
19	-5	25
30	4	16
		$\sum(x - \bar{x})^2 = 96$

Standard Deviation $= \sqrt{\dfrac{96}{6}} = 1.6$

b) On average the hockey team did more sit-ups since their mean is higher.

The netball team's number of sit-ups was more consistent since they had a lower standard deviation.

a) Mean $= \dfrac{93 + 103 + 99 + 105 + 88 + 106 + 92}{7} = 98$

x	$x - \overline{x}$	$(x - \overline{x})^2$
93	−5	25
103	5	25
99	1	1
105	7	49
88	−10	100
106	8	64
92	−6	36
		$\sum (x - \overline{x})^2 = 300$

Standard Deviation $= \sqrt{\dfrac{300}{7 - 1}} = 7.1$.

b) On average, the French rugby players weigh more than the Scottish players. The weights of the French rugby players is more consistent than the Scottish Rugby players since their standard deviation is lower.