

Cambridge International AS & A Level

Mathematics

9709/52

Paper 5 Probability & Statistics 1

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Question No(6)

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Question No (6)

Teams of 15 runners took part in a charity run last Saturday. The times taken, in minutes, to complete the course by the runners from the Falcons and the runners from the Kites are shown in the table.

Falcons	38	39	42	44	46	48	50	51	52	56	58	59	64	69	76
Kites	32	40	40	45	47	48	52	54	58	59	59	60	61	63	65

(a) Draw a back-to-back stem-and-leaf diagram to represent this information, with the Falcons on the left-hand side.

(b) Find the median and the interquartile range of the times for the Falcons.

Let x and y denote the times, in minutes, of a runner from the Falcons and a runner from the Kites respectively. It is given that

$$\sum x = 792, \quad \sum x^2 = 43504, \quad \sum y = 783, \quad \sum y^2 = 42223.$$

(c) Find the mean and the standard deviation of the times taken by all 30 runners from the two teams.

Solution:

(a)

now we shall split data into stem(tens) and a leaf(ones).
we observe from data that,
smallest value is 32 and
greatest value is 76

$\swarrow$ stem $\searrow$ leaf
 $\swarrow$ stem $\searrow$ leaf

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Stem-and leaf diagram.

First we shall write stems of data, after that leaf on Left and Right side for Kites and Falcons.

	Falcons	stem	Kites
(2)	9 8	3	2
(4)	8 6 4 2	4	0 0 5 7 8
(6)	9 8 6 2 1	5	2 4 8 9 9
(2)	6 4	6	0 1 3 5
(1)	6	7	

Key: 2|4|0 means 42 minutes for Falcons and 40 for Kites.

(b) Find The median and the interquartile range of the times for the Falcons.

Solution

NO of data in Falcons, $n = 15$

Formula for median

$$Q_2 = \text{median} = \left(\frac{n+1}{2}\right)^{\text{th}} \text{ term}$$

$$= \left(\frac{15+1}{2}\right)^{\text{th}} \text{ term}$$

$$= 8^{\text{th}} \text{ term}$$

observe the 8th term in Falcon data which is 51.

$$\text{median} = Q_2 = 51$$

In order to calculate the interquartile range (IQR), we need to calculate the middle value of lower half (below median).

From stem-and-leaf diagram, lower half (below median) is

38, 39, 42, 44, 46, 48, 50

middle value of lower half (Q_1) = 44.

Now we calculate the middle value of upper half (Q_3)

From diagram upper half (above median)

52, 56, 58, 59, 59, 69, 76

middle value of upper half (Q_3) = 59

Interquartile range,

$$IQR = Q_3 - Q_1$$

$$= 59 - 44$$

$$IQR = 15$$

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© Let x and y denote the times, in minutes, of a runner from the Falcons and a runner from the Kites respectively.

It is given that

$$\Sigma x = 792, \Sigma x^2 = 43504, \Sigma y = 783, \Sigma y^2 = 42223$$

Find the mean and standard deviation of the times taken by all 30 runners from the two teams.

Solution

Given data

Falcons: $\Sigma x = 792, \Sigma x^2 = 43504$ (15 runners)

Kites: $\Sigma y = 783, \Sigma y^2 = 42223$ (15 runners)

total runners 30

$$n = 30$$

$$\text{Mean} = \frac{\Sigma x + \Sigma y}{n}$$

$$= \frac{792 + 783}{30}$$

$$\text{mean} = 52.5$$

$$\text{standard deviation}$$

$$\sigma = \sqrt{\frac{\sum x^2 + \sum y^2}{n} - (\text{Mean})^2}$$

$$\sigma = \sqrt{\frac{43504 + 4223}{30} - (52.5)^2}$$

$$\sigma = \sqrt{\frac{85727}{30} - 2756.25}$$

$$= \sqrt{2857.566 - 2756.25}$$

$$= \sqrt{101.316}$$

$$\sigma = 10.1$$

So mean = 52.5, standard deviation, $\sigma = 10.1$