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Probability & Statistics 1

TOPIC- Representation of data

Mean, Standard deviation and variance

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Mean, Standard deviation and variance

1 Anita made observations of the maximum temperature, t °C, on 50 days. Her results are summarised by $\Sigma t = 910$ and $\Sigma(t - \bar{t})^2 = 876$, where $\bar{t}$ denotes the mean of the 50 observations. Calculate $\bar{t}$ and the standard deviation of the observations. N-61-10 [3]

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Mean, Standard deviation and variance

2 The heights, x cm, of a group of 82 children are summarised as follows. 5-63-10

$$\Sigma(x - 130) = -287, \qquad \text{standard deviation of } x = 6.9.$$

(i) Find the mean height. [2]

(ii) Find $\Sigma(x - 130)^2$. [2]

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Mean, Standard deviation and variance

0 3 The monthly rental prices, $\$x$, for 9 apartments in a certain city are listed and are summarised as follows.

$$\Sigma(x - c) = 1845 \qquad \Sigma(x - c)^2 = 477\,450$$

The mean monthly rental price is \$2205.

(i) Find the value of the constant c. [2]

(ii) Find the variance of these values of x. [2]

(iii) Another apartment is added to the list. The mean monthly rental price is now \$2120.50. Find the rental price of this additional apartment. [2]

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4 Delip measured the speeds, x km per hour, of 70 cars on a road where the speed limit is 60 km per hour. His results are summarised by $\Sigma(x - 60) = 245$.

N-G 3-10

(i) Calculate the mean speed of these 70 cars. [2]

His friend Sachim used values of $(x - 50)$ to calculate the mean.

(ii) Find $\Sigma(x - 50)$. [2]

(iii) The standard deviation of the speeds is 10.6 km per hour. Calculate $\Sigma(x - 50)^2$. [2]

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Mean, Standard deviation and variance

05 Esme noted the test marks, x, of 16 people in a class. She found that $\Sigma x = 824$ and that the standard deviation of x was 6.5. N-02-10

(i) Calculate $\Sigma(x - 50)$ and $\Sigma(x - 50)^2$. [3]

(ii) One person did the test later and her mark was 72. Calculate the new mean and standard deviation of the marks of all 17 people. [3]

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Mean, Standard deviation and variance

0 6 The amounts of money, x dollars, that 24 people had in their pockets are summarised by $\Sigma(x - 36) = -60$ and $\Sigma(x - 36)^2 = 227.76$. Find Σx and Σx^2. N-61-12 [5]

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Mean, Standard deviation and variance

07 The following are the times, in minutes, taken by 11 runners to complete a 10 km run. N-62-11

48.3 55.2 59.9 67.7 60.5 75.6 62.5 57.4 53.4 49.2 64.1

Find the mean and standard deviation of these times. [3]

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Mean, Standard deviation and variance

0 3 The values, x, in a particular set of data are summarised by N-6/-11

$$\Sigma(x - 25) = 133, \qquad \Sigma(x - 25)^2 = 3762.$$

The mean, $\bar{x}$, is 28.325.

(i) Find the standard deviation of x. [4]

(ii) Find Σx^2. [2]

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Mean, Standard deviation and variance

09 Red Street Garage has 9 used cars for sale. Fairwheel Garage has 15 used cars for sale. The mean age of the cars in Red Street Garage is 3.6 years and the standard deviation is 1.925 years. In Fairwheel Garage, $\Sigma x = 64$ and $\Sigma x^2 = 352$, where x is the age of a car in years.

(i) Find the mean age of all 24 cars. [2]

(ii) Find the standard deviation of the ages of all 24 cars. [4]

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10 The heights, x cm, of a group of young children are summarised by S-63-12

$$\Sigma(x - 100) = 72, \qquad \Sigma(x - 100)^2 = 499.2.$$

The mean height is 104.8 cm.

(i) Find the number of children in the group. [2]

(ii) Find $\Sigma(x - 104.8)^2$. [3]

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Mean, Standard deviation and variance

11 Barry weighs 20 oranges and 25 lemons. For the oranges, the mean weight is 220 g and the standard deviation is 32 g. For the lemons, the mean weight is 118 g and the standard deviation is 12 g.

N-03-13

(i) Find the mean weight of the 45 fruits. [2]

(ii) The individual weights of the oranges in grams are denoted by x_o, and the individual weights of the lemons in grams are denoted by x_l. By first finding Σx_o^2 and Σx_l^2, find the variance of the weights of the 45 fruits. [5]

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Mean, Standard deviation and variance

12 A summary of the speeds, x kilometres per hour, of 22 cars passing a certain point gave the following information:

S-62-13

$$\Sigma(x - 50) = 81.4 \qquad \text{and} \qquad \Sigma(x - 50)^2 = 671.0.$$

Find the variance of the speeds and hence find the value of Σx^2. [4]

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Mean, Standard deviation and variance

3 Swati measured the lengths, x cm, of 18 stick insects and found that $\Sigma x^2 = 967$. Given that the mean length is $\frac{58}{9}$ cm, find the values of $\Sigma(x - 5)$ and $\Sigma(x - 5)^2$. [5]

N-67-13

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14 A summary of 30 values of x gave the following information: J-61-13

$$\Sigma(x - c) = 234, \qquad \Sigma(x - c)^2 = 1957.5,$$

where c is a constant.

(i) Find the standard deviation of these values of x. [2]

(ii) Given that the mean of these values is 86, find the value of c. [2]

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Mean, Standard deviation and variance

15 A sample of 36 data values, x, gave $\Sigma(x-45) = -148$ and $\Sigma(x-45)^2 = 3089$. S-62-11

(i) Find the mean and standard deviation of the 36 values. [3]

(ii) One extra data value of 29 was added to the sample. Find the standard deviation of all 37 values. [4]

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Mean, Standard deviation and variance

16 A traffic camera measured the speeds, x kilometres per hour, of 8 cars travelling along a certain street, with the following results.

N – 63–14

62.7 59.6 64.2 61.5 68.3 66.9 62.0 62.3

(i) Find $\Sigma(x - 62)$. [1]

(ii) Find $\Sigma(x - 62)^2$. [1]

(iii) Find the mean and variance of the speeds of the 8 cars. [3]

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Mean, Standard deviation and variance

17 (a) Amy measured her pulse rate while resting, x beats per minute, at the same time each day on 30 days. The results are summarised below. N-6/-15

$$\Sigma(x - 80) = -147 \qquad \Sigma(x - 80)^2 = 952$$

Find the mean and standard deviation of Amy's pulse rate. [4]

(b) Amy's friend Marok measured her pulse rate every day after running for half an hour. Marok's pulse rate, in beats per minute, was found to have a mean of 148.6 and a standard deviation of 18.5. Assuming that pulse rates have a normal distribution, find what proportion of Marok's pulse rates, after running for half an hour, were above 160 beats per minute. [3]

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18 Kadijat noted the weights, x grams, of 30 chocolate buns. Her results are summarised by

$$\Sigma(x-k) = 315, \qquad \Sigma(x-k)^2 = 4022,$$

where k is a constant. The mean weight of the buns is 50.5 grams.

(i) Find the value of k. [2]

(ii) Find the standard deviation of x. [2]

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Mean, Standard deviation and variance

19 120 people were asked to read an article in a newspaper. The times taken, to the nearest second, by the people to read the article are summarised in the following table.

Time (seconds)	1 – 25	26 – 35	36 – 45	46 – 55	56 – 90
Number of people	4	24	38	34	20

Calculate estimates of the mean and standard deviation of the reading times. [5]

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Mean, Standard deviation and variance

20 The table shows the mean and standard deviation of the weights of some turkeys and geese.

	Number of birds	Mean (kg)	Standard deviation (kg)
Turkeys	9	7.1	1.45
Geese	18	5.2	0.96

5-61-15

(i) Find the mean weight of the 27 birds. [2]

(ii) The weights of individual turkeys are denoted by x_t kg and the weights of individual geese by x_g kg. By first finding Σx_t^2 and Σx_g^2, find the standard deviation of the weights of all 27 birds. [5]

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2 1 The heights of school desks have a normal distribution with mean 69 cm and standard deviation σ cm. It is known that 15.5% of these desks have a height greater than 70 cm.

S-63-11

(i) Find the value of σ. [3]

When Jodu sits at a desk, his knees are at a height of 58 cm above the floor. A desk is comfortable for Jodu if his knees are at least 9 cm below the top of the desk. Jodu's school has 300 desks.

(ii) Calculate an estimate of the number of these desks that are comfortable for Jodu. [5]

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23 A farmer finds that the weights of sheep on his farm have a normal distribution with mean 66.4 kg and standard deviation 5.6 kg.

N-61-14

(i) 250 sheep are chosen at random. Estimate the number of sheep which have a weight of between 70 kg and 72.5 kg. [5]

(ii) The proportion of sheep weighing less than 59.2 kg is equal to the proportion weighing more than y kg. Find the value of y. [2]

Another farmer finds that the weights of sheep on his farm have a normal distribution with mean μ kg and standard deviation 4.92 kg. 25% of these sheep weigh more than 67.5 kg.

(iii) Find the value of μ. [3]

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2 4 Twelve values of x are shown below.

1761.6	1758.5	1762.3	1761.4	1759.4	1759.1
1762.5	1761.9	1762.4	1761.9	1762.8	1761.0

Find the mean and standard deviation of $(x - 1760)$. Hence find the mean and standard deviation of x. [4]

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