Standard Deviation Question AS Paper 2 2017

A group of students carried out an investigation into social inequality between two areas of their local town. They chose an inner-city area (X) and an outer suburb (Y). Their idea was that there would be a greater amount of social deprivation in the inner-city area than the outer suburb. They conducted both primary and secondary data collection methods. One measure they focused on was level of education. They tested the hypothesis:

'There will be a greater percentage of people educated to degree level in Area Y than in Area X.'

The students used the Office for National Statistics website to collect secondary data. They selected 10 Output Areas in both the inner city and the outer suburb. For each Output Area they recorded the number of residents with qualifications at degree level and converted this to a percentage of all residents.

The results are recorded in **Figure 4**.

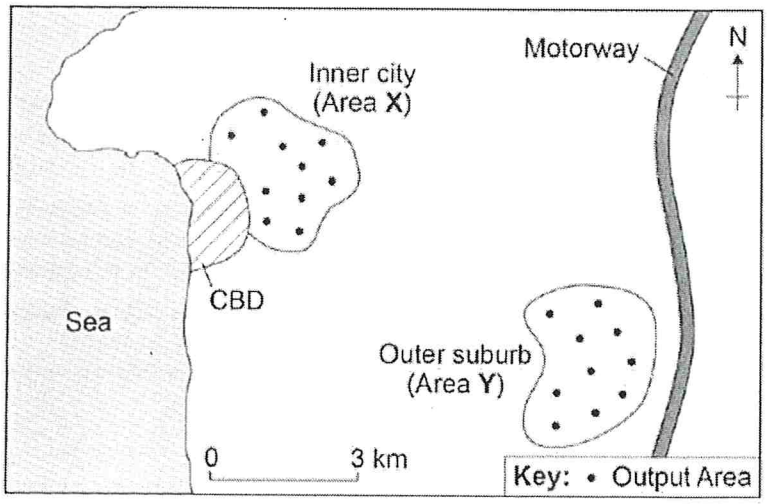
Figure 4

% residents educated to degree level			
Inner city (Area X)		Outer suburb (Area Y)	
Output Area	%	Output Area	%
A	10.0	A	11.5
B	8.3	B	9.0
C	11.0	C	21.1
D	9.0	D	13.3
E	10.7	E	19.1
F	5.7	F	14.5
G	5.4	G	12.7
H	7.5	H	7.5
I	13.1	I	9.6
J	6.2	J	7.6

An Output Area is the smallest geographical area for which census data is provided. Output Areas are based on clusters of postcodes and have similar population sizes.

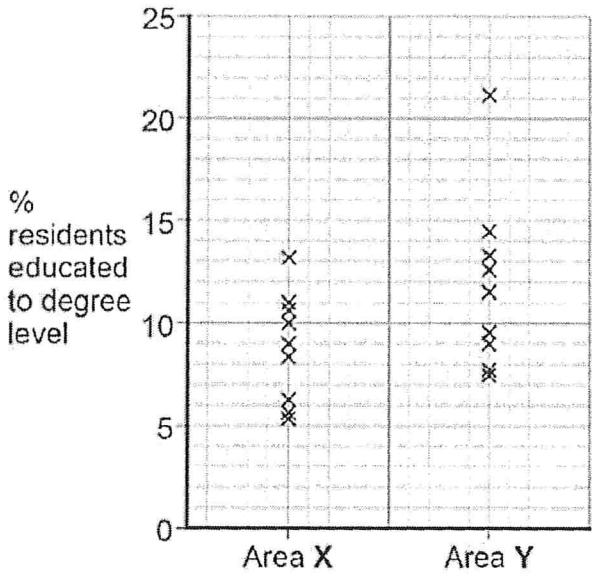
Figure 5 is a sketch map showing the locations of the Output Areas.

Figure 5



One of the students decided to present the data on a dispersion diagram to show the spread of data at each location. This is shown in **Figure 6**.

Figure 6



Two values are missing from the dispersion diagram in **Figure 6**.

Plot the values from the table below on to **Figure 6**.

[2 marks]

	% residents educated to degree level
Area X	7.5
Area Y	19.1

To analyse the data one student decided to calculate the mean values for Area X and Area Y. The student then decided to calculate the standard deviation for Area X. **Figure 7** shows how she set out the data and started her calculations.

Figure 7

% residents educated to degree level (x)	$x - \bar{x}$	$(x - \bar{x})^2$
10.0	1.31	1.72
8.3	−0.39	0.15
11.0	2.31	5.34
9.0	0.31	0.10
10.7	2.01	4.04
5.7		
5.4	−3.29	10.82
7.5	−1.19	1.42
13.1	4.41	19.45
6.2	−2.49	6.20
$\sum x = 86.9$		$\sum(x - \bar{x})^2 = 58.18$
$\bar{x} = 8.69$		

Key

x = Individual value

$\sum$ = Sum of

$\bar{x}$ = Mean

σ = Standard deviation

n = Number in the sample

Standard deviation formula $\sigma = \sqrt{\frac{\sum(x - \bar{x})^2}{n}}$

Show your working:

σ =

Complete **Figure 7** and calculate the standard deviation to **two** decimal places. Show your working in the space provided.

[4 marks]

The student then repeated the standard deviation calculation for the outer suburb (Area Y). The result is shown below.

Standard deviation for Area Y	4.39

Use the standard deviation values to contrast the two data sets.

[2 marks]