

UNIT 8 *Statistical Diagrams*

Activities

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 - 8.2 Estimation of Mean Distances
 - 8.3 Correlation
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ACTIVITY 8.1

Shortest Journey

A car parts supplier is based in Brighton. One day a driver has to deliver parts to:

- Bristol*
- Oxford*
- Taunton*
- Exeter*
- Southampton*

1. Use the table shown to determine the shortest route if:
 - (a) he must *return to Brighton* at the end of the day,
 - (b) he can *finish his journey at any of the places* he must visit.

| | | | | | | | | | | | | | | | | | | | |
|-----|----------|-----|-----|-----|-----|-----|-----|-----|----|--|--|--|--|--|--|--|--|--|--|
| | BRIGHTON | | | | | | | | | | | | | | | | | | |
| 169 | | | | | | | | | | | | | | | | | | | |
| 120 | 171 | | | | | | | | | | | | | | | | | | |
| 82 | 206 | 124 | | | | | | | | | | | | | | | | | |
| 175 | 84 | 251 | 244 | | | | | | | | | | | | | | | | |
| 59 | 120 | 60 | 77 | 200 | | | | | | | | | | | | | | | |
| 169 | 233 | 63 | 173 | 313 | 116 | | | | | | | | | | | | | | |
| 109 | 74 | 81 | 146 | 154 | 56 | 144 | | | | | | | | | | | | | |
| 218 | 125 | 292 | 287 | 44 | 241 | 353 | 195 | | | | | | | | | | | | |
| 66 | 77 | 131 | 152 | 109 | 80 | 193 | 66 | 152 | | | | | | | | | | | |
| 160 | 51 | 218 | 224 | 34 | 167 | 280 | 121 | 75 | 93 | | | | | | | | | | |

Distances in miles

2. On another day the driver has to make deliveries in:

- Dover*
- Southampton*
- Norwich*
- Cambridge*
- Oxford*

again starting from Brighton.

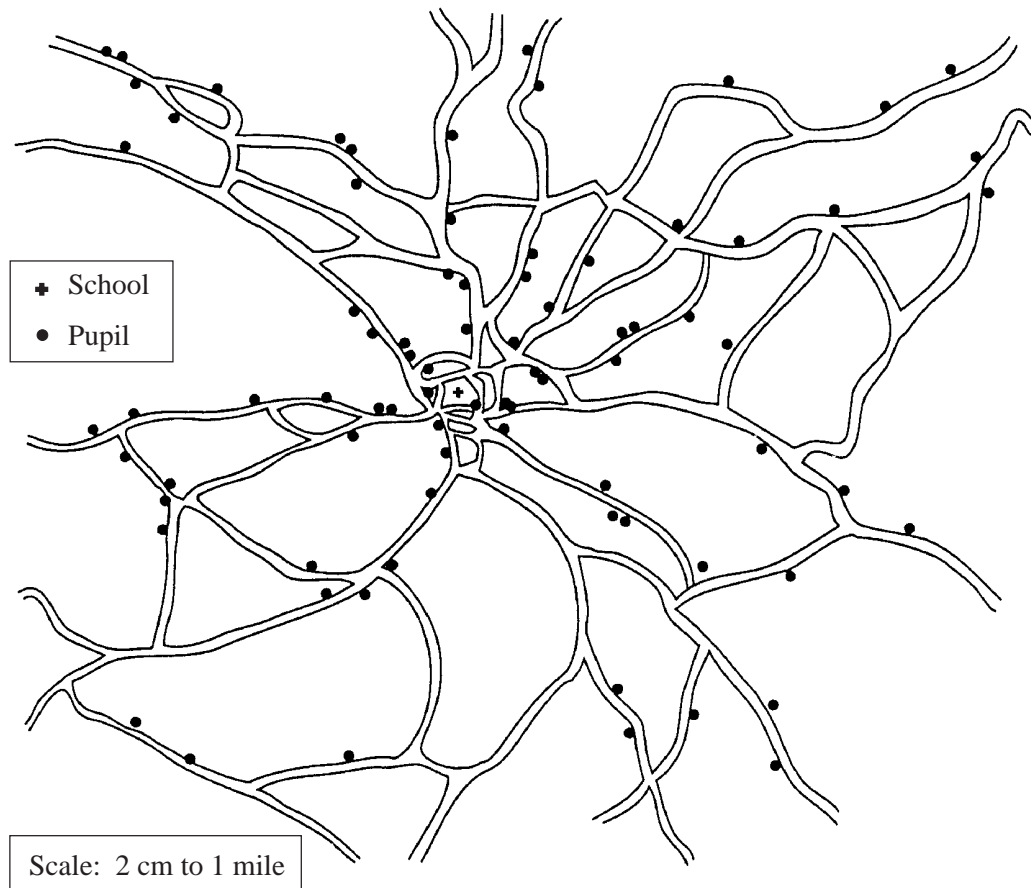
Answer the previous questions for this day's visits.

ACTIVITY 8.2

Estimation of Mean Distances

A small primary school needs to develop a new policy for funding contributions to pupils' travel costs to school. At the moment, only pupils who live more than 3 miles from the school 'as the crow flies' are given free transport, funded by the local council.

To estimate the mean distances travelled by all the pupils, the Head Teacher has pinpointed on a map the home of each of the pupils. This is shown below.



1. By first drawing concentric circles of radius 2 cm, 4 cm and 6 cm, with the school as centre, use the data from the map to complete a copy of the table opposite.

2. Estimate the average distance from school of all pupils, except those who live more than 3 miles away.

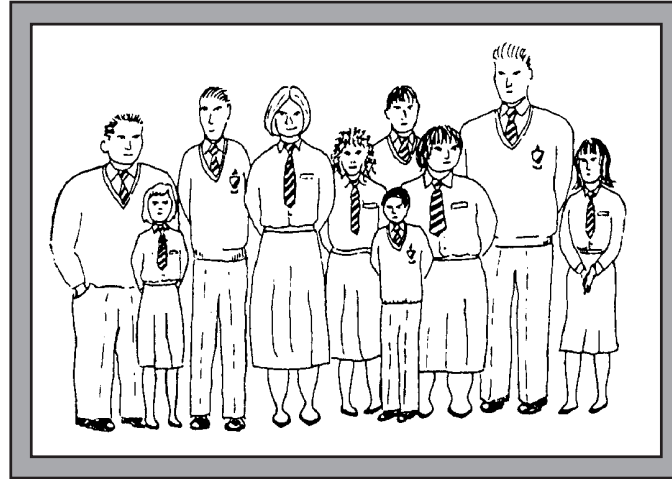
3. Estimate the weekly cost of a transport subsidy which pays:

- *nothing* to pupils who live less than 1 mile from school;
- at the rate of £2 *per mile per week* to pupils who live between 1 mile and 3 miles from the school.

| <i>Distance from School</i> | <i>No. of Pupils</i> |
|-----------------------------|----------------------|
| Less than 1 mile | |
| Between 1 and 2 miles | |
| Between 2 and 3 miles | |
| More than 3 miles | |

ACTIVITY 8.3

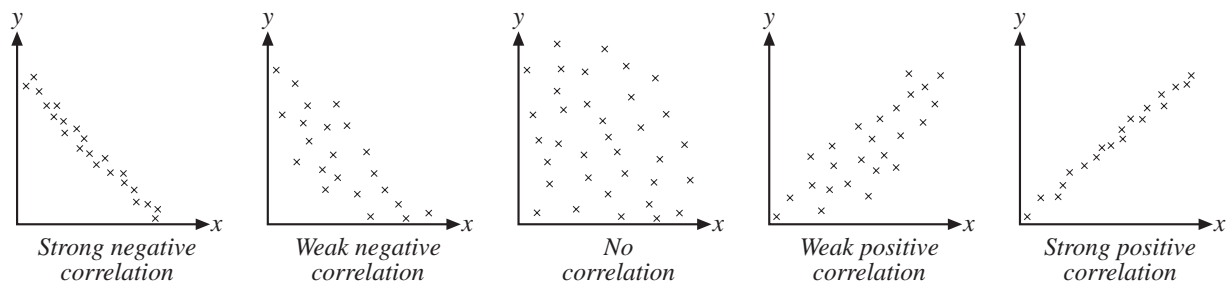
Correlation



The bodies of most people are in proportion. If you are particularly tall, then you will probably also have long arms and legs and large hands, etc. The purpose of this activity is to attempt to see how clear-cut these relationships are.

We say that two variables have *positive correlation* if they increase in proportion.

Different types of correlation are sketched below in scatter diagrams.



1. For your class members, or a group of 20 to 30 people, find out their
 - (i) height
 - (ii) feet size
 - (iii) arm length
 - (iv) hand size
 - (v) waist size
 - (v) circumference of head.

2. (a) Taking the y variable as height and x as one of the other variables, draw scatter diagrams for each x variable.
 - (b) Determine the type of correlation in each case.

ACTIVITY 8.4

Football Results

The table below gives the complete set of football Premier League results for Saturday/Sunday 9/10 December 2000.

| <i>Home Team</i> | <i>Goals Scored</i> | <i>Away Team</i> | <i>Goals Scored</i> |
|------------------|---------------------|-------------------|---------------------|
| Arsenal | 5 | Newcastle | 0 |
| Bradford City | 3 | Tottenham | 3 |
| Charlton | 3 | Manchester United | 3 |
| Chelsea | 4 | Derby | 1 |
| Coventry | 1 | Leicester | 0 |
| Liverpool | 0 | Ipswich | 1 |
| Manchester City | 5 | Everton | 0 |
| Southampton | 1 | Leeds | 0 |
| Sunderland | 1 | Middlesbrough | 0 |
| West ham | 1 | Aston Villa | 1 |

Plot the number of goals scored by each team on a scatter diagram, using

x -axis – home team score
 y -axis – away team score

- Describe the type of correlation produced by this scatter plot.
- Repeat the exercise with a more recent set of results.

Does this show the same type of correlation?

For the next problem you will need a summary of the football results for a complete year (see a football annual or the internet address <http://www.soccernet.com>).

- (a) For last year's Premiership League champions, construct a scatter plot, using, for each of their matches,

x – winning team's score
 y – opponent's score

What type of correlation is observed?

- (b) What type of correlation would you expect to find if you were to undertake the same exercise with the club at the bottom of the league?
Check your predictions by constructing the scatter plot.

Extension

Draw scatter plots for the first 10 clubs in the league table for the year, against factors such as

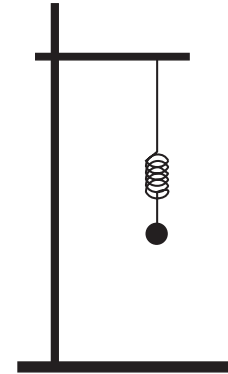
- transfer money spent on the team,
- number of foreign players on the team,
- length of service of current manager, etc.

For each scatter plot, predict the type of correlation and then check your prediction.

ACTIVITY 8.5

Stretching Springs

You will need a *spring*, a *stand* and a *selection of masses*.



1. Complete a table like the one below:

| <i>Mass (grams)</i> | <i>Length of Spring (cm)</i> |
|---------------------|------------------------------|
| | |
| | |
| | |
| | |

2. Plot the data on a scatter diagram, using at least 10 points.
3. Draw a line of best fit.
4. Determine the equation of the line of best fit.

Extension

Use your equation to predict the length of the spring for other masses. Test your predictions by actually using the spring to find the values observed.