

STRAND: STATISTICS

Unit 4 *Sampling*

TEXT

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4 Sampling

4.1 Questionnaires and Surveys

The UK Government's census, first undertaken in 1801 and with the exception of 1941, continuing to be held every ten years, is a vast and costly exercise but is important for policy and planning purposes. The most recent UK census took place on 27th March 2011; data is available from the Office for National Statistic (ONS) at

<http://www.ons.gov.uk/ons/index.html>

There have been suggestions that a sample (that is, a subgroup of people) rather than a full census (everyone) might be a more efficient method of collecting the data.

In either case though, as for any worthwhile survey, the questions asked must be clear, unambiguous and unbiased. This is the theme of this section.



Note

When designing a questionnaire to use as part of a survey, bear in mind the following guidelines.

- The questionnaire should try to find out the information you need.
- You should know how you are going to collect your responses.
- Questions should be clear and concise with no ambiguity.
- Do not ask for information you do not need.
- Allow for all possible responses.
- Questionnaires should be fair and not biased in any way.
- The people asked to complete the questionnaire should be from a variety of backgrounds.

It should also be noted that if you need to design a questionnaire for your project work, it is strongly recommended that you first try it out with a small number of people. This is called a *pilot* survey.

Questions can be designed in two distinct ways, namely those that require a specified response to be chosen from a number of options or by giving a number, and those that allow more detailed responses. The first group are often referred to as *closed* questions; the second as *open* questions. Here are some examples.

Closed

"Did you watch the football match on TV last night?" YES / NO

"How many hours of TV did you watch last night?"

Choose from ' 0 - 1, 1 - 2, 2 - 3, 3 - 4, 4 - 5, more than 5 '

The second example of a closed question shows an example with multiple responses – by which we mean more than 2! So 'YES / NO' is not regarded as a multiple response.

There is though a problem with these responses as there is potential overlap. i.e. in which category do you place 1 hour or 2 hours, etc.? It should be made clear, i.e. 0 – 1 includes everything up to and including 1, etc.

Open

"What sort of TV programmes do you like to watch, and why?"

"Where did you go for your holiday last year?"

The second example of open questions is *good* for a *face-to-face* discussion, as it allows a wide range of answers. The questioner will then be able to react to these answers, and continue the discussion. This example is *bad* for a *questionnaire* for the same reason! Any answer is possible but the writer of the questionnaire does not have the chance to follow up answers. It could though be modified and become a closed question with multiple responses: for example,

"Please tick a box to show where you went on holiday last year."

☐ UK

☐ USA

☐ France

☐ Italy

☐ Greece

☐ Other (please say where) _____



Worked Example 1

Consider this questionnaire:

Are you concerned about the environment?

Are you concerned about the level of pollution caused by cars?

Do you think the health of young children is at risk due to exhaust fumes from cars?

Is there too much congestion in the city centre?

Is public transport under-used?

Do you think cars should be banned from the city centre?

Comment on the questions given here.



Solution

This questionnaire is very biased and has been designed to lead people towards answering 'yes' to the last question. There are no questions about the advantages of cars, the problems of using public transport or other ways of reducing pollution.



Worked Example 2

What is wrong with the following survey, used to find the favourite sports of the students in one school?

Which is your favourite sport?

Tennis

☐

Rugby

☐

Netball

☐

Basketball

☐

Swimming

☐

Snooker

☐

Other

☐



Solution

The question used in this survey does not cover all the possible responses well. Many students might have, for example, football as their favourite sport and so would tick the box marked 'Other'. This would give unhelpful results. Also, students are asked to make only one choice although they may well like more than one sport.

The following wording would produce more useful responses.

"Please tick one box in each row to show your preference."

	<i>I really enjoy this sport</i>	<i>I like this sport</i>	<i>I've no great preference</i>	<i>I dislike this sport</i>	<i>I hate this sport</i>
<i>Tennis</i>					
<i>Rugby</i>					
<i>Netball</i>					
<i>Basketball</i>					
<i>Swimming</i>					
<i>Snooker</i>					
<i>Please put any other sport that you like here</i>					



Exercises

1. Consider the following two sets of questions.

<i>Is meat a good source of protein?</i> <i>Is protein an important part of your diet?</i> <i>Do you like eating meat?</i>	<i>Is all meat obtained from dead animals?</i> <i>Do you like killing animals?</i> <i>Do you like eating meat?</i>
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- (a) Comment on the way that the last question might be answered in each case.
 - (b) Write a better set of questions to find out if people like eating meat.
2. Design a questionnaire that would encourage students at a school to say:
- (a) that school uniform is a good policy,
 - (b) that school uniform should be abandoned.
3. Wendy asks her class the following question.

<i>Which of these breakfast cereals do you like best?</i>		
Cornflakes ☐	Porridge ☐	Bran Flakes ☐

She then says that her class's favourite breakfast cereal is Cornflakes.

- (a) Is her conclusion valid?
 - (b) Criticise her question.
 - (c) Write a better question for her to use.
4. Design a questionnaire which you could use to find out:
- (a) if people think they have a good public transport service,
 - (b) whether the music tastes of girls and boys are different,
 - (c) whether younger people are more likely than older people to be vegetarian,
 - (d) who might win the next General Election.

Use your questionnaire to collect some data and present your results.

5. You have been asked to estimate what percentage of all cars on the road have each registration letter (M, N, etc.).
- (a) Describe how you would collect the data for a survey to answer this problem.
 - (b) Describe any problems that might arise as you collect data.

6. Akiko did a survey to find out which colours of cars are popular.
She found that red was the most popular colour. She did not find any cars that were purple or pink.
Think about a survey which **you** could do. It must not be about the colour of cars.
- (a) What is your survey about?
- (b) Write down two things which you might expect to find out.
7. In a survey of community life on a new housing estate the following question is suggested.
(A) "What do you most like about living here?"
An alternative is proposed.
(B) "Tick the box which describes why you most like living here."

Design of houses	☐
Friendliness of neighbours	☐
More open space	☐

Give one advantage of each form of question.

8. A survey is done to find out in which sports pupils take part.
The results of the survey are shown below.

	% Boys	% Girls
Athletics	37.1	33.3
Basketball	12.7	4.5
Cycling	71.7	60.5
Dancing	4.9	31.5
Football	72.0	14.5
Gymnastics	5.0	16.3
Hockey	6.5	3.5
Judo	16.0	6.7
Netball	3.3	35.0
Roller-skating	7.3	26.0
Rugby	11.8	2.5
Swimming	53.1	55.0

- (a) Which two sports are the most popular with **both** boys **and** girls?
- (b) The question asked in the survey was:

Which sports do you take part in?

You want to find out more about pupils' involvement in sport.

Write down another question that you could ask.

9. The school governors are worried about road safety outside the school gates. They think there ought to be a Pelican Crossing.
- To decide on this, they need to find out how much traffic comes along the road at different times of day and on different days of the school week.
- Design an observation sheet to gather this information.
10. Mee Ling thinks that pupils who come to school by bus are more likely to be late than those who do not travel by bus.
- In order to test whether or not this is true, she carries out a survey on 100 pupils, from years 7 and 8, for 5 consecutive Tuesdays.
- The results are shown in the following table.

METHOD OF TRAVEL	NUMBER OF STUDENT-DAYS	NUMBER OF LATES
Bus	150	40
Cycle	50	10
Car	100	22
Walk	200	25
TOTAL	500	97

- (a) Do the results show that Mee Ling is correct?
Show the working on which you base your answer.
- (b) Suggest 3 ways in which Mee Ling could have improved her survey.
- (c) A pupil is selected at random from Year 7.

Mee Ling stated:

"The table shows that the probability that this pupil walks to school on Tuesdays is $\frac{2}{5}$."

Would you describe this statement as

correct, about right, or wrong?

Choose one of the three alternatives and give reasons for your choice.

11. (a) A headline in a newspaper this year stated:

Students skip Breakfast

Our survey shows that few students are eating cereals, fruit, or bread for breakfast.

In fact they are eating nothing at all!

You are asked to conduct a survey to find out what students eat for breakfast.

Design an observation sheet to collect the data you need.

Invent the first 20 entries on your data sheet.

- (b) The newspaper made the following statement about the eating habits of teenagers.

Only one in a hundred teenagers eats fruit and vegetables each day. Over half eat no vegetables other than chips.

You are asked to find out whether this statement is true in your area.

Give three questions you could ask teenagers to see if what the article says is true in your area.

12. A bus company attempted to estimate the number of people who travel on local buses in a certain town. They telephoned 100 people in the town one evening and asked 'Have you travelled by bus in the last week?'

Nineteen people said 'Yes'. The bus company concluded that 19% of the town's population travel on local buses.

Give 3 criticisms of this method of estimation.

4.2 Sampling

In 1975 the Government wanted census information before the 1981 full census, so a ten per cent census was carried out using 1 in 10 of the population. This is known as a *survey* or *sample*. Data are obtained by asking people to fill in forms which are then given to collectors trained to sort out any queries.

When deciding how to carry out a data collection there are several decisions to be made:

- (a) What size of sample can you reasonably expect to take, given limited time, money and resources?
- (b) How are items to be used in the sample to be chosen to avoid introducing bias?
- (c) How are the data to be collected to avoid bias?

The answer to question (a) clearly depends on the individual circumstances. It should be obvious, however, that the larger the sample the more sensitive the result.

In questions (b) and (c) the key element is to eliminate possible bias. For example, if you are a political pollster wanting to know the state of the parties, then a sample taken only in an affluent, expensive out-of-town suburb will be biased just as a sample taken in a run-down inner city area will be. So the sample must not be biased – but the same also applies to the questions. Questions such as

"Should we increase spending on education?"

are biased as they do not represent the complete picture. If we spend more on education, this means that we must spend less on something else. A less biased question would be,

"Should we spend more on education and less on other services?"

Here, we will be looking for sampling methods that lead to a *representative sample*, by which we mean that the sample has similar properties to the total *population*. As we said before, here we use the word 'population' not just for human or animal populations but to represent the complete group under study, e.g. all schools in the UK, all cars in England, etc.

The main methods used for sampling in practice are described below. First, we create a list of all members of the population; this is called the **sampling frame**.

- (a) **Random** – to be truly random each individual must have an equal chance of being chosen. This method is often used for selecting people from Electoral Registers. If the researcher is calling at people's houses the system must be rigidly adhered to (i.e. call back if people are out). It does not necessarily ensure a representative sample.
- (b) **Systematic** – taking items at regular intervals, e.g. every 4th tree when sampling in a forest. Although this does not necessarily ensure a representative sample it should be better than random sampling. Again the system must be rigidly adhered to. This method is often used when sampling goods on a production line.
- (c) **Stratified** – this is used to ensure that the sample is representative and that it has the same proportions as the population. To do this you first need to divide the whole of the population into appropriate categories and then, inside each category, choose a random sample of appropriate size. This can be difficult in practice. What is commonly used in street surveys is a *quota* sampling method where interviewers are simply asked to interview a certain proportion of each category, e.g. age groups, and these can be chosen at random.
- (d) **Cluster** – here, because of the large size of a population, particular regions are drawn at random, and then an appropriate number of individuals are drawn at random from each chosen region.

In the following example you will see how these methods are used in practice.



Worked Example 1

There are 12 teachers in a small school. A sample of size 4 is to be selected from this population.

- (a) Create a systematic sample for the population.
- (b) Create a random sample for the population.



Solution

- (a) As there are 12 teachers, a systematic sample could be made by selecting every third teacher from the list. This would create a sample containing:

Mrs Green, Mr Vinner, Mr Hampson and Mr Grainger.

8	0	0	2	8	6	0	3
2	3	9	0	1	8	5	6
8	4	3	4	7	3	5	1
3	1	9	8	7	3	7	5
2	8	7	3	3	2	8	3
5	2	7	0	5	3	2	3
4	7	1	4	6	9	6	8
1	5	4	5	0	5	1	8
5	9	7	9	8	0	5	1
7	5	1	1	0	1	1	0

- (b) The list of random numbers shown here has been generated using a spreadsheet. The numbers have been arranged to give two digit numbers. Numbers greater than 12 are not needed in this case so these numbers can be deleted.

1. Mrs Skirton
2. Mrs Pearson
3. Mrs Green
4. Mrs Crocker
5. Mrs Barnes
6. Mr Vinner
7. Mr Krishnan
8. Mr Gadd
9. Mr Hampson
10. Mr Thompson
11. Mr Mobey
12. Mr Grainger

Beginning in the top left-hand corner and working down the columns gives the result shown opposite.

The teachers selected are:

No. 2	Mrs Pearson
No.11	Mr Mobey
No. 5	Mrs Barnes
No. 1	Mrs Skirton

Select Teacher no. 2

8	0	0	2	8	6	0	3
2	3	9	0	1	8	5	6
8	4	3	4	7	3	5	1
3	1	9	8	7	3	7	5
2	8	7	3	3	2	8	3
5	2	7	0	5	3	2	3
4	7	1	4	6	9	6	8
1	5	4	5	0	5	1	8
5	9	7	9	8	0	5	1
7	5	1	1	0	1	1	0

Select Teacher no. 5

Select Teacher no. 11 Select Teacher no. 1

Worked Example 2

A headteacher wishes to select a stratified sample of 50 pupils from Years 10, 11, 12 and 13. The table shows how many students are in each year.

Year	Number of pupils
10	320
11	300
12	180
13	150

Solution

First find the total number of pupils in the population.

$$\begin{aligned}\text{Total} &= 320 + 300 + 180 + 150 \\ &= 950\end{aligned}$$

The fraction of the population in Year 10 is $\frac{320}{950}$.

So the number of pupils selected from Year 10 is given by:

$$\frac{320}{950} \times 50 = 16.84, \text{ so select 17 pupils.}$$

The number of pupils selected from Year 11 is given by:

$$\frac{300}{950} \times 50 = 15.79, \text{ so select 16 pupils.}$$

The number of pupils selected from Year 12 is given by:

$$\frac{180}{950} \times 50 = 9.47, \text{ so select 9 pupils.}$$

The number of pupils selected from Year 13 is given by:

$$\frac{150}{950} \times 50 = 7.89, \text{ so select 8 pupils.}$$

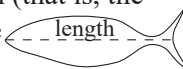
Note

Note that, having designed a questionnaire and selected a sampling method, the issue of how to obtain the data is an important one. Although not covered here, it should be noted that data collection might be through

- personal interviews (at home, work or in the street)
- telephone enquiry (used by many opinion pollsters)
- postal or email enquiry (cheap but potentially biased sample, e.g. open to misuse)
- electronic method (used to obtain data, for example, TV viewing of selected viewers)

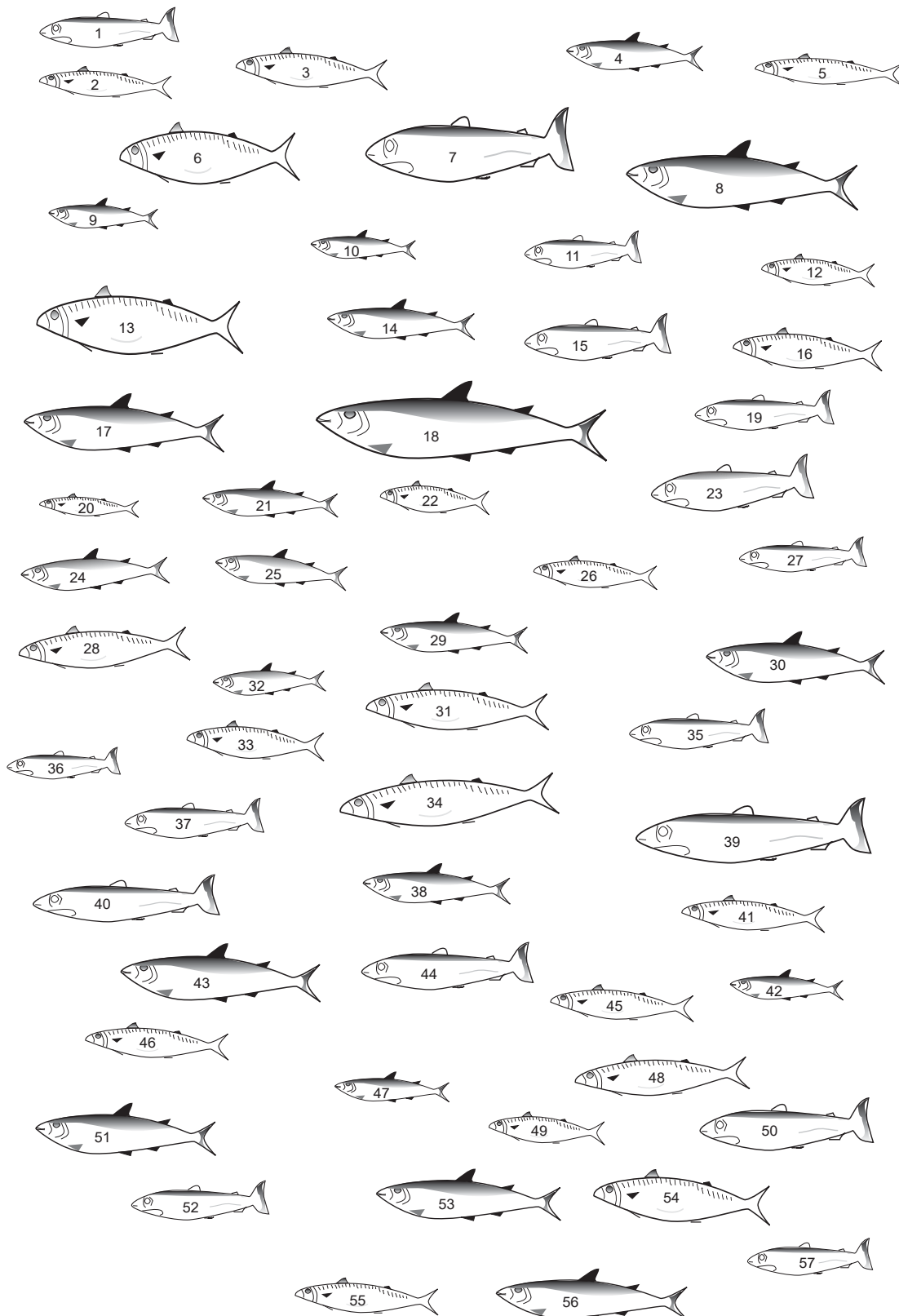


Worked Example 3

The diagram below shows 57 small fish. To estimate the average fish length (that is, the length in mm from the tip of its 'nose' to the middle of its tail, as shown here ) take random samples of size

- (a) 5 (b) 10.

Which will give you the more accurate estimate?





Solution

Here there are no obvious different categories so we will take a random sample. There is a table of random numbers on page 15.

Starting arbitrarily on row 16, combining two digits together gives numbers from 00 to 99. We use only numbers in the range 01 to 57 (and ignore any repeats), so that each fish has an equal chance of being picked.

8 4	1 3	8 4	9 1	5 4	1 1	9 9	8 2	2 8	4 7	5 4	4 3	3 4	3 4	4 0	9 0	0 8
84	13	84	91	54	11	99	82	84	75		43	34	34	9	8	
↓			↓		↓						↓	↓	↓	↓	↓	
13			54		11						43	34	(repeat so do not use)	9	8	

Thus our sample of size 5 consists of the

{13th, 54th, 11th, 43rd, 34th} fish.

The lengths of these fish are measured, to the nearest mm, as

2.6, 2.7, 1.8, 3.0, 3.2

giving an *estimate* of

$$\frac{(2.6 + 2.7 + 1.8 + 3.0 + 3.2)}{5} = 2.66 \text{ mm}$$

for the average length of all 57 fish.

For a sample of size 10, we continue in the same way with the random number table, choosing as our sample, the

{13th, 54th, 11th, 43rd, 34th, 9th, 8th, 20th, 32nd, 23rd} fish

and these have an average length of

$$\frac{(3.1 + 2.6 + 1.8 + 3.0 + 3.3 + 1.7 + 3.5 + 1.5 + 1.7 + 2.5)}{10} = 2.47 \text{ mm}$$

We would expect this second estimate of 2.47 mm to be more accurate than the first one since it is obtained from a larger sample size.



Worked Example 4

Irving is a community worker and is asked to assess the views of the community in which he works on the introduction of a neighbourhood watch scheme. The community has three different types of housing consisting of a new building development of 270 privately owned homes, a large housing association estate of 450 houses and 180 flats for the elderly.

Explain how Irving could obtain a *stratified* random sample of size 100.



Solution

There are three categories of housing in the community.

Private	270
Housing Assn.	450
Flats	180
Total	900

Since Irving requires a sample of size 100 there will be one sample member for every 9 in the population.

This gives the representative numbers as shown on the right:

	<i>No.</i>	<i>No. ÷ 9</i>
<i>Private</i>	270	30
<i>Housing Assn.</i>	450	50
<i>Flats</i>	180	20
Total	900	100

Inside each category, they need to be chosen at random by numbering, for example, the private houses 001 to 270, and using the first 30 numbers in this range from a table of random digits, taken three at a time.



Worked Example 5

A survey is carried out to investigate the quality of new houses.

All the people in the country who have recently bought a new house are to be surveyed.

- Give one reason why a pilot survey might be carried out first.
- Give one reason why the survey should be carried out by post.
- Give one possible disadvantage of a postal survey.



Solution

- To see if there are any difficulties with any of the questions in the survey.
- It is far cheaper than sending people to each new house in the country.
- Not everyone will respond to a postal survey so the survey might not be truly representative.



Exercises

- A factory contains 24 identical machines which are labelled:

A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X

- Create a systematic sample containing:

- 8 machines,
- 6 machines,
- 4 machines.

- Use the random numbers in the table to create random samples containing:

- 5 machines,
- 10 machines.

- Describe another way that a random sample could be made.

6	8	0	6	4	2	3	8	0	6	1	5
5	0	9	6	2	4	2	1	8	2	5	3
5	5	4	0	3	2	4	6	7	4	7	6
0	6	5	7	3	5	4	8	2	0	9	2
2	8	7	4	4	4	7	3	4	4	2	5
6	5	0	8	5	6	6	8	4	5	7	4
6	3	7	7	8	7	5	8	0	0	0	9
1	3	2	6	7	6	7	6	8	1	6	0
8	0	5	1	8	9	5	9	3	8	1	0
2	7	2	2	8	7	5	5	8	0	5	2

2. The table shows the number of students in each year group of a school.

How many students should be selected from each year group to create a stratified sample of 80 students?

<i>Year</i>	<i>Number of students</i>
7	150
8	148
9	162
10	154
11	152
12	80
13	62

3. A company wants to form a stratified sample to discuss issues with the staff.

- (a) How many of each type of employee should be included in a sample of size 20?

	<i>Number employed</i>
Managers	8
Supervisors	20
Administrators	12
Manual Staff	140
Delivery Staff	30

- (b) If a stratified sample contains 8 manual staff, what would be the size of the complete sample?

4. In order to form a sample a number of pupils are selected from a number of different teaching groups. The size of the samples and the teaching groups are given in the table below.

<i>Group</i>	<i>Number in Group</i>	<i>Number in Sample</i>
A	36	9
B	32	8
C	24	5
D	18	4

- (a) Is this a stratified sample?
 (b) How should it be changed to give a stratified sample?

5. For an experiment in Biology a square metre of ground has been divided into 100 squares as shown.

You are required to create a sample of 10 squares.

- (a) Describe two ways of creating a systematic sample, giving the results from each method.
 (b) Use the following list of random numbers to create a random sample.

	A	B	C	D	E	F	G	H	I	J
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

11	57	42	70	41	12	88	51
32	38	14	65	49	46	18	62
48	20	47	44	56	65	46	36
42	59	61	41	78	42	72	11
50	42	58	78	71	78	12	37
66	08	21	84	94	61	31	30
14	64	51	05	53	93	45	86
93	49	05	27	54	18	64	57
87	61	55	67	23	26	70	75
03	87	19	48	10	69	35	61
42	52	83	74	35	09	13	36
51	43	76	62	91	39	89	75

Create a second random sample, by starting in a different place in the list of random numbers.

How many squares do the two samples have in common?

6. What problems might be encountered if samples are formed in the following ways?
 - (a) Selecting people at random from a telephone directory.
 - (b) Selecting every third person entering a shopping arcade.
 - (c) Selecting people at random at a football match.
 - (d) Selecting people leaving a golf course in red cars.
7. Describe a survey, in which each of the samples in question 6 could be a good sample to base the survey on.
8. Describe how you might select a sample if you were asked to conduct a survey to find out if:
 - (a) the parents of primary school children were happy with their schools,
 - (b) users of mobile phones were happy with the service provided,
 - (c) the local bowling green was properly maintained,
 - (d) the local public transport services are adequate.
9. (a) In a school there are 420 pupils in the lower school, 310 pupils in the middle school, and 130 pupils in the upper school.
 - (i) How many pupils from each part of the school should be included in a stratified random sample of size 100?
 - (ii) Explain why a stratified random sample should be taken rather than a simple random sample.
- (b) These 100 pupils were asked to keep a record of the number of hours of television that they watched in one week.

The results are summarised below.

<i>No. of hours watched</i>	0–	5–	10–	20–	30–	40–	60–	80-100
<i>No. of viewers</i>	7	3	15	35	22	10	6	2

Draw a histogram to illustrate these data.

Table of Random Numbers

93319	51747	56137	84026	09938	33225	09260	99111	95811	65380
66963	84712	47728	09302	97054	18325	39521	09998	13502	03175
32402	79709	90355	63399	65756	88808	03729	68890	53723	54769
54957	86171	49491	66036	18419	76886	79804	58345	95727	43667
08145	65172	33770	22459	81756	34626	12437	77989	93784	63509
68822	62237	97229	84879	85615	27975	08792	06415	97140	18104
12863	24668	57894	41004	71069	88470	10189	64518	96966	05133
61482	50377	82349	42127	20668	79952	63515	31342	86673	73307
27435	16613	17128	95452	16456	07938	38823	56349	61056	39089
90894	90120	81304	97886	30899	90879	76106	42547	61752	83702
91542	63732	52826	13498	15318	32814	17932	81000	36354	62391
61541	21834	16647	45699	68935	19547	29529	16353	73731	23654
00721	61877	13197	61565	90793	22343	47901	27820	29716	64722
58234	83176	07400	93972	12910	26171	62233	48527	22017	86412
90901	96697	93813	92525	38424	83822	12367	92113	58091	73871
84138	49154	11998	28475	43343	40908	74679	82072	32902	33021
99982	38394	12149	92320	45068	56675	15303	61472	20199	77634
55118	33697	88713	83980	35348	99632	79747	67890	66721	52867
44596	57212	94875	90894	75242	16150	80707	84160	49579	45894
69441	12716	60696	90838	22693	56043	56973	12863	04986	30644
65987	65511	94550	58344	41328	95482	31816	96121	95629	61646
30442	37490	00651	19619	69512	56027	49675	69408	54436	11548
31841	63651	72390	47059	10040	55521	86911	23854	51584	41387
25590	26741	75800	15745	69549	91253	80164	11724	45069	04435
94224	21091	04534	84401	76736	29703	52139	31717	28279	93696
52985	99052	71324	15364	26327	39095	26028	29939	23509	13451
73517	02148	31714	13119	15732	45512	68301	89041	38890	81037
22887	10718	31454	52309	06514	42507	75468	48605	06298	18200
76438	04101	75458	55270	99354	51854	74394	43987	63733	27449
14482	91534	34322	58089	96509	13719	73664	68489	82340	88210
35831	77045	25029	98535	03402	70868	04587	48599	47285	46148
87857	90657	80145	26419	21262	28733	28579	43054	61071	91889
29247	64438	86175	87703	83446	67031	54625	99997	35700	91742
47772	29667	93738	68677	99266	49739	67150	90133	30988	31886
95635	92152	39697	58015	36592	55997	19531	65129	89328	61894
50339	66056	60354	65281	29894	37775	34516	11016	69852	54617
67913	58978	35732	47891	64046	04856	97359	73264	19503	37402
80090	57366	79265	48560	14360	87736	91582	27931	38780	05247
13249	74207	05827	30621	83365	47467	32843	91140	18080	40854
76852	80223	46216	65444	64815	81402	50385	77524	73167	43195
16731	07241	55052	54549	92503	74292	68834	89765	41287	36098
98006	83605	33978	33014	52325	17769	53144	13260	34459	85508
56587	43498	48494	71779	58770	27636	32147	99218	01012	26591
83471	72666	64849	24946	63288	51123	85098	50281	64871	47266
52502	18474	08744	40914	79954	28137	63705	89423	49704	90259
03846	57786	80554	51830	19528	19318	70590	50811	50034	99810
40864	30009	89931	33920	20729	04074	14893	06818	83086	36458
37140	43492	22727	88547	56098	32953	53634	91516	82806	39158
35137	83718	60390	45365	31548	65730	64725	96106	70568	79585
26709	48705	88170	52680	26408	18142	71563	73812	87382	45203