SCORE A+

Data & Measurement

With Classified answer book

8

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2- Sampling and Bias

1. **Is this Biased?**

a. People riding the bus were asked how many cars they own. Yes or No

b. Every other person that walks into Walmart is asked how old their mom is. Yes or No

c. You survey your 7 teachers to see what color their shoes are. Yes or No

d. People walking out of the AT&T store were asked if they use a cell phone. Yes or No

e. You survey all the 5th graders to see the average age of all the students in Odessa. Yes or No

2. A large corporation wants to find out which benefits plan its employees would prefer. Which procedure would be most likely to obtain a statistically unbiased sample?

a. survey a random sample of employees from a list of all employees
b. invite all employees to indicate their choices by e-mail
c. place suggestion boxes at random locations in the company's plant and offices
d. assemble a group with one member from each department and record the preferences of these employees

3. Which question is unbiased?

a. Does the school board have the right to enforce a dress code?
b. Do you think the mayor is doing a good job in spite of his questionable character?
c. Do you prefer daytime or evening television programming?
d. Do you think the government should be allowed to cut down trees willy-nilly to build a new highway?

4. Which question is biased?

a. Do you prefer daytime or evening television programing?
b. Should there be a school dress code?
c. Do you prefer news or mindless sitcoms?
d. Do you think a new highway should be built?

5. When a research company polls residents about their voting intentions, new Canadians are under-represented. This is an example of

a. sampling bias
b. response bias
c. non-response bias
d. measurement bias

6. A radio station asks its listeners to call in to answer a survey question on spending by politicians. This is an example of

a. sampling bias
b. response bias
c. non-response bias
d. measurement bias

7. In an experiment, the heights of participants was measured by two different laboratory assistants. This may lead to

a.sampling bias
b.response bias
c.non-response bias
d.measurement bias

3-Data Collection & Sampling

1 You are going to investigate how long learners in your school spend playing computer games.

- **a** Age is one factor that could affect this.
  Write two other factors.
- **b** Write three questions you could ask.
- **c** Write two predictions you could test.
- **d** Describe two different ways to take a sample.

2 You are going to investigate the number of passengers in cars on a busy road.

- **a** What factors can affect the number of passengers?
- **b** Write three questions you could ask about the number of passengers.
- **c** Write two predictions you could test.
- **d** Describe some different ways of choosing a sample of cars to test your predictions.

3 You are going to investigate the speed with which people can write either on paper or using a keyboard.

- **a** Write some questions you could ask about writing or typing speed.
- **b** Write some predictions you could test.
- **c** Describe some different ways of choosing a sample to test your predictions.
- **d** Which sample method from part **c** is best?
  Give a reason for your answer.
- **e** Carry out a small trial of your investigation.
  Can you think of ways to improve the investigation?

4 At a concert, 56% of people in the audience are female and 44% are male.

You want a representative sample of 60 people.
How many people in your sample should be

a female b male.

5 You want a representative group of five learners from a

You ask the teacher to choose five class learners.

a Why could this sample be biased?

b Describe two better ways to choose a sample.

6 A radio programme asks listeners to phone in and give their opinions of an insurance company. 72% of the people who phone have negative opinions of the company.

a Why could this be a biased sample?

b Describe a better way to get a sample of opinions.

7 Here are three ways of testing the prediction that people in a town are in favour of building a new shopping centre.
Give an advantage and a disadvantage of each method.

a Using social media

b Sending letters to people

c Asking people in the street

8 This table shows the ages of people who live in a village.

Age	Under 18	18 to 55	Over 55
Number of people	73	327	128

You want a representative sample of 50 people.

How many people from each age group should be in the sample?

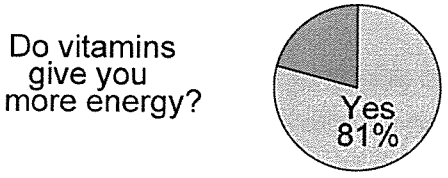
9 Look at this advert.

> 81% of adults found that vitamin pills gave them more energy.
> *Based on a sample of 48 adults taking vitamins every morning for a month.*

a Does the advert prove that taking vitamins gives an adult more energy?

b Write three questions you could ask to check whether this result is reliable.

The results could be illustrated in a pie chart as shown.



c What important information is missing from the diagram?

10 Here are three different questions in a survey.

1 Do you eat five fruit or vegetable portions a day?

2 Do you eat too much meat?

3 Do you agree that people are overweight because they are greedy and eat too much?

a Explain why each question could give biased results.

b Describe a better way of writing each question.

11 In a large group of teachers, 40% are men and 60% are women.
You have collected data from 28 men.
How many women do you need to collect data from to make it a representative sample?

12 An investigation is carried out to test the prediction that people in a town are in favour of building a new library

A survey is carried out on people using a supermarket between 09:00 and 12:00 one Wednesday and Thursday.

a Explain why this will give a biased sample.

b Suggest a way to improve the investigation.

13 A company employs 187 men and 362 women.

You want to choose a representative sample of 40 men and women.

a How many men and women should you choose?

b List three other factors to consider when choosing a representative sample.

14 You are investigating the ability of people of your age to estimate masses of everydayobjects such as books, plates or bags of rice. Here are two hypotheses:

- Girls can estimate more accurately than boys.
- Estimates of light objects will be more accurate than estimates of heavy objects.

Describe:

a data you need to collect to test these hypotheses

_____

_____

b why the data is appropriate

_____

_____

c how you will collect the data.

_____

_____

15 You want to collect the heights of a sample of people. Here are three ways to collect For the each data.
method explain why the results could be
biased.

a ~~Ask people to tell you their height.~~

b Ask people to stand against a wall with a measuring tape on it.

c Make your own estimate by looking at each person.

16 You are investigating the readability of articles in online newspapers. Here are two ways to do this investigation:

1 Count the number of letters in each word in an article.

2 Measure the length of time it takes to read the article. For **each** method:

a Is the method an appropriate way to investigate readability? Give a reason for your answer.

Method 1

Method 2

b Could the results you get using **each** method be biased? Give a reason for your answer.

Method 1

Method 2

17 You are going to do a survey of a sample of customers in a supermarket.
You want to investigate:

- the time a customer is in the supermarket
- the amount of money the customer spends.

a Write down two hypotheses you could investigate.

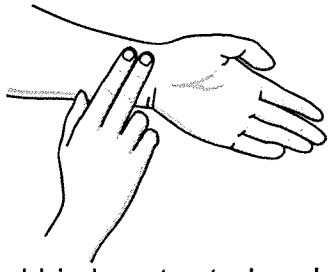
b Describe three ways of trying to eliminate bias in your results.
Give a reason for each way.

18 You want to collect feedback from people who have stayed in a hotel.
You send the people an email asking them to complete a short questionnaire online.
Give two possible sources of bias.

19 **(a)** Yuri wants to investigate how exercise changes his heart rate.

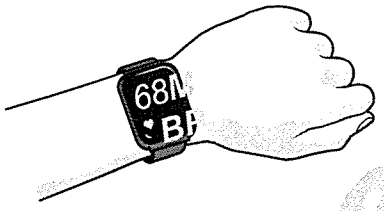
He considers two methods for measuring his heart rate.

Method A



Find his heart rate by placing two fingers on his wrist and counting the beats.

Method B



Find his heart rate using a digital heart rate monitor.

Yuri decides to use method A.

Give one reason why this may **not** be the better method.

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(b) Yuri also wants to compare his results with those for other people his age.

He decides to repeat his experiment on 40 members of a gym.

Explain why his sampling method may **not** give him reliable data about the heart rates of other people his age.

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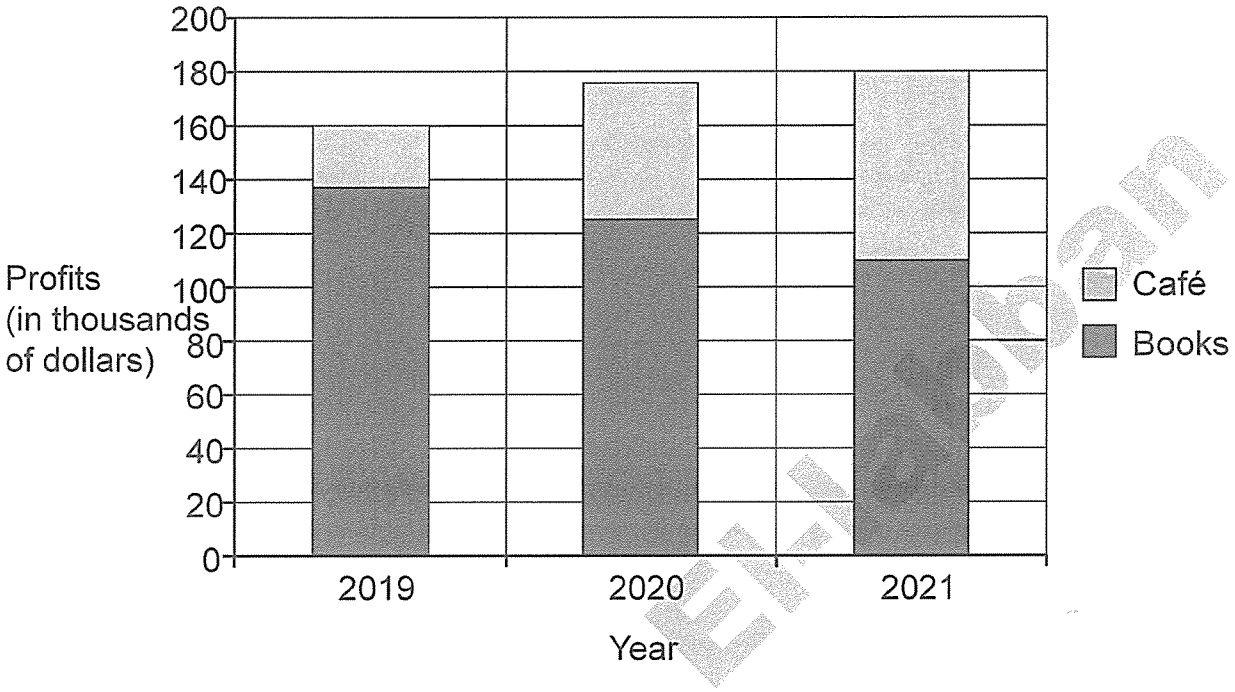
20 Samira owns a bookshop.

She makes money from the café in the shop as well as from selling books.
The bar chart shows Samira's profits between 2019 and 2021



Samira says, 'My total profits have increased between 2019 and 2021'

Write down one other comment to describe how her profits have changed between 2019 and 2021

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