

Populations, samples and sampling frames

About 50 minutes Calculator allowed 42 marks



Hints online, answers free with an account:
mathswariz.uk/worksheets/stats-populations-samples-and-sampling-frames/

Date _____

A Do Now

The first question is what today's lesson needs. The others bring back earlier topics.

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|---|---|
| <p>A1 Needed today [2 marks]</p> <p>As part of a statistical investigation, Liam is deciding which questions to ask. Which stage of the enquiry cycle is Liam at? Name the next stage and say what happens in it.</p> | <p>A2 Last lesson [2 marks]</p> <p>Eight times, in seconds: 80.0, 100.0, 62.8, 70.0, 98.3, 95.5, 86.0, 93.2. How many of them are in the class $80 < t \leq 100$?</p> |
|---|---|

Answer

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|--|--|
| <p>A3 Maths skill [2 marks]</p> <p>$\frac{2}{3}$ of a number is 22. What is the number?</p> | <p>A4 Maths skill [2 marks]</p> <p>Write 600 g : 0.5 kg as a ratio in its simplest form.</p> |
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Answer

Answer

B Examples, then your turn

Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

A water company supplies 23 600 homes. It wants to know what its customers think of the taste of their tap water. It keeps a list of the account number of every home. Write down the population, a sampling frame and the sampling unit.

Hint The frame is the list you would pick from; the unit is one thing on it.

- B1** A sports centre wants to find out what its 1850 members think of its new opening hours. It has a database of every member's name and email address. Write down the population, a sampling frame and the sampling unit. [3 marks]

EXAMPLE 2

A factory makes fireworks in batches of 5000. It wants to check that a batch lights correctly before it is sold. Should it test a census or a sample of the batch? Give a reason.

Hint Think about what happens to a firework when it is tested.

B2 A teacher wants to know which of two trips each of the 28 pupils in her class prefers.

- (a) Give one advantage and one disadvantage of a census of the class. [2 marks]

- (b) Should she take a census or a sample? Give a reason. [2 marks]

Total for B2: 4 marks

EXAMPLE 3

A council wants the views of the adults in a town on a new car park. Its sampling frame is the list of people who bought a parking permit last year. Give two reasons why this frame is not suitable.

Hint Who is in the population but not on the list?

B3 A gym wants to know what the adults in its town think of its prices. Its sampling frame is its list of current members. Explain why the results may be biased. [2 marks]

EXAMPLE 4

A town has 3200 households. In a random sample of 40 households, 9 have a dog.

(a) Estimate the number of households in the town that have a dog.

(b) A second random sample of 160 households has 30 with a dog. Which sample gives the more reliable estimate? Give a reason for your answer.

Hint Work out the fraction of the sample with a dog, then take that fraction of 3200.

B4 A library has 6400 books. A random sample of 50 books has 7 that are damaged. A second random sample of 200 books has 22 that are damaged. Use each sample to estimate the number of damaged books in the library. Which estimate is more reliable? Give a reason. [4 marks]

EXAMPLE 5

A bus company plans to give a questionnaire to 3000 passengers. Explain what a pilot study is, and give one reason for carrying one out first.

Hint A pilot study is small and comes before the main survey.

B5 Leah will time 200 students solving a puzzle. Give two reasons why she should carry out a pilot study first. [2 marks]

c Practice

C1 A farmer has 240 sheep. She [2 marks]
wants to know their mean mass.
Give one advantage and one
disadvantage of weighing every
sheep.

C2 A factory has 2750 workers. In a [2 marks]
random sample of 80 of them, 18
work at night. Estimate how
many of the factory's workers
work at night. Give your answer
to the nearest whole number.

Answer

C3 Priya tests her questionnaire on [2 marks]
10 people in a pilot study. Six of
them ask what she means by
"regularly" in her question "Do
you visit the park regularly?".
Suggest a change she should
make before the main survey,
and give a reason.

C4 Kai asks 5 people in the town [2 marks]
centre whether they like a
new town logo. Four of them
say yes. He says, "So 80% of
the people in the town like
the new logo."

Give two reasons why Kai's
conclusion may not be reliable.

D Exam-style questions

D1 A head teacher says, "We will ask every one of our 1260 students how long they [3 marks]
spend on homework in a week, because a census always gives the best result."

Assess the head teacher's plan. You must give a conclusion.

D2 A council wants to estimate how many of the 14 500 households in a city do not own a car. It chooses a random sample of 250 households from its council tax list. In the sample, 38 households do not own a car.

(a) Write down the sampling frame. [1 mark]

Answer

(b) Estimate the number of households in the city that do not own a car. [2 marks]

Answer

(c) A councillor used a sample of 40 households and estimated 2900 households without a car. Which estimate should the council use? Give a reason for your answer. [1 mark]

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(d) The council tax list was last updated three years ago. Explain how this could affect the estimate. [1 mark]

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Total for D2: 5 marks

E Extension

No route is given. The hints are at the end of the sheet. Use one at a time.

E1 A wildlife park has 1500 visitors one weekend. Amir asks a random sample of 60 of them and 24 say they would come back. Bea asks a separate random sample of 90 and 45 say they would come back. Use both samples together to give the best estimate of how many of the 1500 visitors would come back. [3 marks]

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Do not average the two estimates: the samples are different sizes.
- Hint 2** Put the two samples together: $24 + 45$ out of $60 + 90$.
- Hint 3** $\frac{69}{150} \times 1500 = 690$.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

I can name the population, a sampling frame and the sampling unit in a question. ☐ ☐ ☐

I can decide between a census and a sample and give a reason in context. ☐ ☐ ☐

I can estimate from a sample and say which estimate is more reliable. ☐ ☐ ☐