



Statistical investigations

Year 8 About 60 minutes No calculator 45 marks

Date _____

A Do Now

Quick questions to start.

- A1** Last lesson [1 mark] The cumulative frequencies of 40 times are 6, 15, 28, 36 and 40. How many times are in the third class?
- A2** Needed today [1 mark] Work out the median of 7, 3, 9, 4 and 12.

Answer

Answer

- A3** Needed today [1 mark] Work out the mean of 12, 15, 9 and 14.
- A4** From chapter 2 [1 mark] Expand $4(3x - 2)$.

Answer

Answer

B Example, then your turn

Year 8

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

EXAMPLE 1

Maya asks, "Do people with longer legs jump further?" (i) Write a hypothesis she could test. (ii) Should she use primary or secondary data? Why?

Hint A hypothesis is a statement, not a question. It says what you think will happen.

- B1** Jack asks, "Does more sleep help students do well in a times-table test?" (i) Write a hypothesis he could test. (ii) Write down the two things he must record for each student. [2 marks]

EXAMPLE 2

The table shows the students in each year group of a school. Lucy wants a sample of 60 students, with the same proportion from each year group. How many should she choose from each year group?

Year group	Students
Year 7	180
Year 8	150
Year 9	120
Year 10	90
Year 11	60

Hint Work out what fraction of the school she will choose. Then take that fraction of each year group.

EXAMPLE 3

Hypothesis: "The warmer a table-tennis ball is, the higher it bounces." Ben drops a ball 5 times at each temperature. The table shows the bounce heights in centimetres. Work out the mean height at each temperature. Does the data support the hypothesis?

Bounce	20 °C	40 °C	60 °C
1	31	38	45
2	34	41	44
3	30	37	47
4	33	40	46
5	32	39	43

Hint Add the five heights in each column and divide by 5.

B2 A chess club has 135 junior and 225 senior members. [2 marks]

Omar wants a sample of 40 members, with the same proportion of juniors and seniors as the club. How many juniors and how many seniors should he choose?

Answer juniors seniors

B3 Hypothesis: "The more fertiliser a plant is given, the taller it grows." The table shows the heights, in centimetres, of 5 plants in each group. Work out the mean height for each group. Does the data support the hypothesis? Give a reason. [4 marks]

Plant	0 ml	5 ml	10 ml
1	12	16	18
2	15	18	17
3	11	15	16
4	14	19	19
5	13	17	15

EXAMPLE 4

Hypothesis: "Older students estimate 30 seconds better." Each student says "stop" when they think 30 s have passed. Year 7 (s): 34, 22, 40, 27, 45, 25, 38. Year 11 (s): 31, 26, 33, 29, 35, 28, 30. Compare the medians and ranges. Does the data support the hypothesis?

Hint Put each list in order. The median is the middle (4th) time.

- B4** Hypothesis: "Students react faster after practice." [3 marks]
In a ruler-drop test, a shorter distance is a faster reaction. Before (cm): 18, 24, 15, 21, 27, 12, 19. After (cm): 14, 16, 11, 17, 13, 15, 19. Work out each median. Does the data support the hypothesis? Give a reason.

c Practice

Year 8

- C1** Sam times students solving a puzzle. Most take 1 to 3 minutes. He records each time to the nearest minute. Explain why this is not good, and suggest a better accuracy. [2 marks]
- C2** Kai makes this collection sheet for times from 20 to 40 seconds. Give one problem with the classes, and say how to fix it. [2 marks]

Time (s)	Tally	Frequency
20–25		
25–30		
30–35		
35–40		

- C3** Zara's hypothesis is "Most students at my school walk to school." She asks the 30 students in her tutor group, who all live near the school. Give two reasons why her sample is not good. [2 marks]
- C4** Lily's walking times, in minutes, are 12, 14, 13, 15, 14, 52. Which average should she use? Give a reason, and work it out. [2 marks]

- D1** Leo tests the hypothesis "Girls read for longer than boys." He asks 8 girls and 5 boys how many minutes they read yesterday. Girls: 25, 40, 20, 35, 30, 15, 45, 30. Boys: 35, 40, 25, 45, 30. Leo says, "The girls read for 240 minutes in total and the boys for 175, so girls read more." [4 marks]

Show that Leo is wrong. You must show your working.

- D2** Lena wants to find out how much time students spend on homework. She writes this question with three response boxes: "How much time do you spend on homework?"
- (a) Write down two things wrong with her question or her response boxes. [2 marks]
- ☐ 0–1 hour
☐ 1–2 hours
☐ 2–3 hours
- (b) Write a better question for Lena, with response boxes. [2 marks]

Total for D2: 4 marks

- D3** Hypothesis: "Year 9 students can hold their breath for longer than Year 7 students." The table shows the times, in seconds, for 9 students from each year.

- (a) Work out the median time for each year group. [2 marks]

Answer Year 7 s Year 9 s

- (b) Work out the range for each year group. [1 mark]

Answer Year 7 s Year 9 s

Year 7 (s)	Year 9 (s)
28	36
35	44
22	31
41	52
30	40
26	29
38	47
33	38
24	42

- (c) Does the data support the hypothesis? Give a reason, and make one comparison of the spread.

[2 marks]

Total for D3: 5 marks

D4 A sports centre has 1200 members. The table shows its three groups of members. The manager wants a sample of 80 members, with the same proportion from each group.

- (a) Work out how many members from each group should be in the sample. [3 marks]

Group	Members
Adults	660
Juniors	420
Seniors	120

Answer Adults Juniors Seniors

- (b) Karim says, "I will ask the first 80 people who come in on Monday morning." [1 mark]
Give one reason why his sample may not represent all the members.

Total for D4: 4 marks

E Extension

Stretch

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

- E1** Ali drops a ball 5 times at 40°C and 5 times at 60°C. Heights are whole numbers of centimetres. One height at 60°C, x cm, was lost. The table shows the heights in centimetres. Ali says the data supports "warmer balls bounce higher" only if BOTH the mean and the median at 60°C are higher than at 40°C. Work out the smallest value of x that does this. [5 marks]

Bounce	40 °C	60 °C
1	44	40
2	47	47
3	52	53
4	45	58
5	52	x

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Find the mean and median at 40°C.
Hint 2 Mean 48, median 47. Mean: $198 + x > 240$.
Hint 3 Mean: $x \geq 43$. Median: $x > 47$. Both: $x \geq 48$.

How did it go?

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

I can write a hypothesis and plan the data. ☐ ☐ ☐

I can choose a fair, proportional sample. ☐ ☐ ☐

I can test a hypothesis with averages and range. ☐ ☐ ☐