MATHS FIELD GUIDE · GRADE 6

Statistical questions involve variation

OPENING PROBLEM

What is the mean?

Scores	2	4	9
Total	15		

02 Read centre and spread separately
03 Rules and worked cases
04 Inspect the five lap times
05 Read totals, gaps and scale
06 Check your reasoning

ILLUSTRATED PROBLEM SHEET

Read centre and spread separately

The mean balances all values. The median uses position in sorted order.

1

Scores	2	4	9
Total	15		

What is the mean?

Redistribute fifteen points equally across three scores. Each gets five.

2

2 4 9

Which score is the median?

Four is in the middle of the ordered list. It differs from the mean of five.

3

1 3 3 9

Which score is most frequent?

Three occurs twice. It is also the median. The range is 9 – 1 = 8.

4

List	Low	High
A	4	6
B	1	9

The two-value lists both average five. Do they spread equally?

No. The ranges are two and eight.

Add 2 to every observation
mean rises by 2.

Add 2 to every observation
range is unchanged.

CHAPTER PROBLEM

Do two groups with the same mean necessarily have similar individual values?

No. The mean records a centre; spread and the full distribution may differ.

MATHS REFERENCE · GRADE 6

Statistical questions involve variation

A statistical question expects variation in its answers and uses data to investigate that variation. “How long do pupils take to travel?” has many possible observations.

A dataset has a distribution: its pattern of values, including centre, spread, clusters and unusual observations.

Four cases to recognise

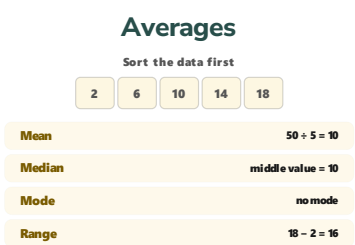
Situation	What to do and why
3, 4, 4, 5, 9	Mean five, median four, mode four, range six.
Replace 9 by 19	Mean increases by two. The middle value stays four.
Add 3 to every observation	Mean and median rise by three. Range stays six because both extremes moved equally.
Two datasets both average five	One could be 5,5,5 and the other 1,5,9. Their spreads differ.

Read the model

Build the idea

Collect travel times using the same unit and a clear question. Order them or group them into suitable intervals.

A display should retain useful information about the distribution. A mean supplies one centre value; it does not show the full pattern.



Mean, median, mode, range

Why it works

Variation is information, rather than a nuisance to be erased. Two groups with equal means can differ substantially in consistency.

A sample describes observed members of a population. How the sample was chosen affects how confidently its findings can be extended.

distribution The pattern of a dataset.
population The full group of interest.
sample The observed part of that group.
variation Differences among observations.

Heads	Tosses	Share
3	4	3/4
5	10	1/2

Which trial set landed closer to half heads?

The second. The first did not disprove a fair-coin model.

WORKED INVESTIGATION

Inspect the five lap times

Five lap times are 50, 52, 52, 54 and 62 seconds. Order the times before identifying the middle and spread.

Look at this part	What it tells you
Mean	270 ÷ 5 = 54 s
Median	52 s
Range	62 − 50 = 12 s

Work it through

A recording error changes 62 to 82. The mean rises by 20/5 = 4 seconds and the range rises by 20. The middle value stays 52.

Catch the mistake

The mean can differ from the most frequent time. Here 52 occurs twice, while the mean uses all five measurements.

Compare the cases

Follow an example

Compare travel times 8, 9, 10, 11, 12 with 2, 6, 10, 14, 18. Both means are 10.

Their ranges are 4 and 16. The second group has much wider variation even though the centres match.

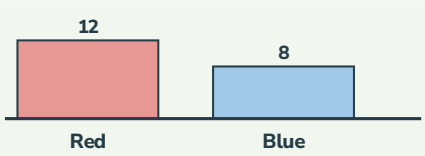
What changes? What stays true?

A sample of friends may not represent the whole school. A convenient sample can omit important groups.

A surprising value deserves investigation. It may be real, or it may be a recording error. Do not remove it simply because it is inconvenient.

Change one condition

If the purpose is to describe a usual lap despite one very slow lap, explain why the median resists that extreme time.



Estimate the chance of red from these twenty draws.

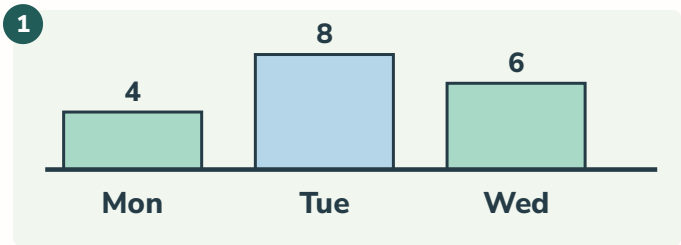
12/20 = 3/5. Record whether each counter was replaced before comparing trials.

ILLUSTRATED PROBLEM SHEET

Read totals, gaps and scale

Check the key and the starting point before comparing heights.

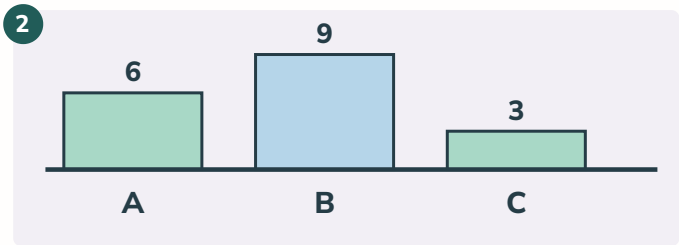
1



How many records altogether?

4 + 8 + 6 = 18. The tallest bar alone cannot give the total.

2



How many more in B than in C?

Nine minus three gives six. B also has three times C.

3

Key	Symbols	Votes
2 votes	4	8
4 votes	2	8

Which drawing represents more votes?

They represent the same eight. The number of symbols depends on the key.

4

Group	Total	Yes
A	10	6
B	20	8

Which group has more yes votes? Which has the greater share?

B has more yes votes. A has the greater share: 6/10 exceeds 8/20.

Totals 12 and 18
difference 6.

Totals 12 and 18
ratio 2:3.

CHAPTER PROBLEM

Compare “How tall is this door?” with “How tall is each Grade 6 learner in this school?” Which is statistical, and why? Name its population.

The learner-height question is statistical because heights vary across learners. Its population is all Grade 6 learners in this school. The single-door question asks for one height, not variation across that population.

QUESTION BANK · FOLD OR COVER THE RIGHT COLUMN

Check your reasoning

Try the problem	Solution and reasoning
01 Three scores average six. Two scores are four and nine. Find the third.	The total must be eighteen. Subtract thirteen to get five.
02 A chart counts books read in one week. Can it tell which book was most popular?	Only if it also records book titles. Counts per pupil alone cannot answer that question.
03 For each Grade 6 learner, record height in centimetres and favourite colour. Which variable is numerical and which is categorical?	Height is numerical data measured in centimetres. Favourite colour is categorical data: the answers name categories rather than measured amounts.
04 Add a sixth lap of 54 seconds to the original data. What happens to the mean and median?	The mean stays 54 because the new lap equals the old mean. The middle pair is 52 and 54, so the median becomes 53 seconds.
05 Five numbers average 6. Four are 3, 5, 7 and 9. What is missing?	Total 30 minus known 24 leaves six.
06 A list contains 2,2,2,9,10. Which centre describes the most common value?	The mode is two. The mean is five and is less representative of the repeated value.

Set	Hits	Tries
A	3	5
B	9	15

Combine the evidence.

Twelve hits in twenty tries gives 3/5. Pool counts before dividing.

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