MATHS FIELD GUIDE · GRADE 8

Displays must match the type of data

OPENING PROBLEM

How many observations are at least 10 and below 30?

Class	0–10	10–20	20–30
Frequency	4	7	3

02 Read a distribution through its scale
03 Rules and worked cases
04 Compare two sets of scores
05 Read centre and spread separately
06 Check your reasoning

ILLUSTRATED PROBLEM SHEET

Read a distribution through its scale

A display can preserve a total while hiding exact values or changing the visual impression.

1

Class	0–10	10–20	20–30
Frequency	4	7	3

How many observations are at least 10 and below 30?

Seven plus three gives ten. Use the stated interval endpoints.

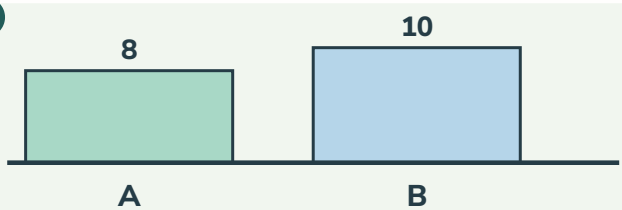
2

Class	0–10	10–30
Frequency	4	8
Freq/width	0.4	0.4

How can unequal-width histogram bars have equal height?

Frequency density is frequency divided by width. The wider bar has twice the area and twice the frequency.

3



These bars share a zero baseline. How large is the ratio B:A?

10/8 = 1.25. Starting an axis at 7 instead could exaggerate the apparent difference.

4

Group	Under 10	Total
A	6	10
B	10	25

Which group has the larger proportion under ten?

A has 60%; B has 40%. Compare shares when sample sizes differ.

Same class width
heights can directly show frequencies.

Different class widths
histogram areas represent frequencies.

CHAPTER PROBLEM

Which interval contains a journey lasting exactly ten minutes? Why?

$10 \le t < 20$. The first interval excludes its upper boundary, so the journey is counted exactly once.

MATHS REFERENCE · GRADE 8

Displays must match the type of data

A distribution describes how values are spread across a dataset. Numerical data may be discrete counts or continuous measurements.

A histogram groups numerical observations into intervals. A bar chart usually compares separate categories.

Four cases to recognise

Situation	What to do and why
A: 4,5,6 and B: 0,5,10	Both means are five. Ranges two and ten distinguish the spreads.
Add ten to every score	The entire distribution shifts ten. Each distance from its mean stays fixed.
Double each measurement	Every distance between observations doubles. Range and mean absolute deviation double.
A single high outlier is recorded	Compare mean and median. The mean uses its full size; the median depends on position.

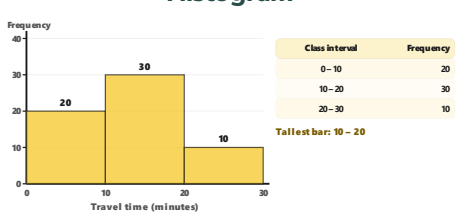
Read the model

Build the idea

Group journey times into $0 \le t < 10$, $10 \le t < 20$ and $20 \le t < 30$ minutes. Each interval has width ten.

Draw adjoining bars on a numerical time axis. Here the widths are equal, so the heights show how many observations lie in each interval.

Histogram



Bars touch because classes are continuous

Why it works

Each journey belongs to exactly one interval. Using a less-than upper boundary prevents counting a ten-minute journey twice.

The choice of grouping can change the visible pattern. Always inspect labels, widths and scales before drawing conclusions.

discrete data Values arising as distinct counts.
continuous data Measurements on a continuum.
frequency How many observations belong to a value or interval.

Group	Count	Mean
A	4	80
B	16	60

What is the combined mean?

(320 + 960)/20 = 64. The larger group pulls the mean towards 60.

WORKED INVESTIGATION

Compare two sets of scores

Group A scores 4, 5, 5, 5, 6. Group B scores 1, 3, 5, 7, 9. Compare their centres and their spread before describing the groups.

Look at this part	What it tells you
A and B	mean 5
A and B	median 5
Ranges	A 2, B 8

Work it through

The absolute distances from five total two in A and twelve in B. Dividing by five gives mean absolute deviations 0.4 and 2.4.

Catch the mistake

Equal means do not imply similar consistency. A dot plot would cluster A tightly and spread B across the scale.

Compare the cases

Follow an example

Suppose the three intervals contain 20, 30 and 10 journeys. Draw bar heights 20, 30 and 10. The middle interval has the most observations.

The total is 60 journeys. The display shows grouped frequencies, not the exact time of every individual journey.

What changes? What stays true?

A grouped display loses individual detail, so some summaries can only be estimated from it.

Centre and spread must be considered together. Two distributions can have similar centres but different tails, clusters or variability.

Change one condition

Adding five to every score shifts each centre up by five. Distances between scores stay unchanged, so each range stays fixed.

Value	2	5	8
Count	1	2	1

Find the mean without writing the full list.

Weighted total 2 + 10 + 8 = 20. Four observations give mean 5.

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

A survey records each pupil's favourite sport. Choose a display and explain why it fits.

A bar chart compares the frequencies of the sport categories. Use separate bars and label the frequency scale.

QUESTION BANK · FOLD OR COVER THE RIGHT COLUMN

Check your reasoning

Try the problem	Solution and reasoning
01 Can a grouped histogram tell whether the largest observation is exactly 29?	No. The final interval bounds it but does not reveal the exact maximum.
02 Three scores average six. Two scores are four and nine. Find the third.	The total must be eighteen. Subtract thirteen to get five.
03 Replace the 9 in B with 19. Which changes more, its mean or its median?	The total rises by ten across five scores, so the mean rises by two to seven. The median stays five.
04 Sets A and B share a median of 7. Can their ranges differ? Give an example.	Yes: 6,7,8 has range two and 0,7,14 has range fourteen.
05 Find the mean absolute deviation of 2, 4, 6.	Mean four. Distances 2,0,2 total four. Divide by three for 4/3.



Bars show percent cycling. A has 20 pupils and B has 30. Which has more cyclists?

A has 12 cyclists and B has 15. A higher percentage need not mean a higher count.

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