

Exercise walk-through

6.1.99

Independent transfer: Foundation then Higher

AQA · GCSE · Mathematics

29. Choosing displays, pie charts and time series · Foundation

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Of 40 students, 10 walk, 15 take the bus and 15 cycle. Pie angles are $90^\circ, 135^\circ, 135^\circ$, summing to 360° . With one pictogram symbol representing five students, the groups use 2,3,3 symbols. If one symbol instead means four students, ten walkers need 2.5 symbols. A daily attendance time series 32,35,33,36,34 can be joined in weekday order; the largest count is 36 and its range is 4. A frequency table for number of siblings 0,1,2,3 uses those numbers as positions on a vertical line chart, rather than treating widths as probabilities.

35. Frequency summaries and grouped estimates · Foundation

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Values 1,2,3 with frequencies 2,5,3 give total 10 and weighted sum $2+10+9=21$, so mean is 2.1. The fifth and sixth observations are both 2, giving median 2 and mode 2. For continuous classes $0 \leq x < 10, 10 \leq x < 20, 20 \leq x < 30$ with frequencies 2,5,3, midpoints 5,15,25 give estimated sum $10+75+75=160$ and estimated mean 16. The modal class is $10 \leq x < 20$. The range of individual observations cannot be recovered exactly from these intervals. For values 2,4,4,6,24, mean is 8 and median 4; the unusually large value raises the mean.

55. Quartiles, box plots and distribution comparisons · Higher

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Group A has summary 2,5,8,11,18 and group B has 1,6,8,10,20. Both medians are 8. A has $IQR=6$ and $range=16$; B has $IQR=4$ and $range=19$. B's middle half is more consistent although its full range is larger. Under a stated $1.5 \times IQR$ outlier rule, A's fences are $5-9=-4$ and $11+9=20$; a new value 23 lies above the upper fence. This rule is a specified convention, not a compulsory rule for every box plot. When using cumulative frequency, read Q1 at $N/4$ and Q3 at $3N/4$, then subtract; small reading errors affect the estimated IQR.

Exercise 2.1

2.1 Foundation: A sample contains ten values with mean 6 and fifteen values with mean 10. Find the combined mean. A voluntary online survey suggests 70% of respondents cycle; explain why a much larger voluntary response need not establish that 70% of the whole school cycles.

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2.1 The totals are 60 and 150, so combined mean is $\bar{x} = (10 \cdot 6 + 15 \cdot 10)/(10 + 15) = 210/25 = 8.4$. Weight each group mean by its size. A voluntary survey can overrepresent people interested in cycling and miss nonrespondents. More responses reduce some random variation but do not automatically remove selection bias. State the target population and how students could be selected before generalising.

Exercise 3.1

3.1 Higher: Grouped continuous data have classes $0 \leq t < 10$, $10 \leq t < 30$, $30 \leq t < 35$, with frequencies 8,12,10. Give histogram heights, cumulative frequencies and an estimated mean. Explain why the estimates cannot recover every original observation.

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3.1 Higher: Grouped continuous data have classes $0 \leq t < 10$, $10 \leq t < 30$, $30 \leq t < 35$, with frequencies 8,12,10. Give histogram heights, cumulative frequencies and an estimated mean. Explain why the estimates cannot recover every original observation.

3.1 Class widths are 10,20,5. Frequency density is frequency divided by width, giving 0.8,0.6,2; bar areas return 8,12,10. Cumulative frequencies at upper class boundaries 10,30,35 are 8,20,30, starting from (0,0). Midpoints 5,20,32.5 give estimated total $8(5) + 12(20) + 10(32.5) = 605$, hence estimated mean $605/30 = 121/6$, about 20.17. Within-class positions are unknown; the midpoint model estimates their total. Height alone is not frequency when widths differ, and a cumulative curve depends on an interpolation assumption between boundaries.

Local guidance: select and explain the relationship; calculate every requested result; check units, scope, conditions and completeness. These are authored classroom criteria.