



H25-test Recognising Misleading Graphs (Higher): Test Pack

EDEXCEL 1ST0 · Calculator allowed · about 25 minutes

Total Marks

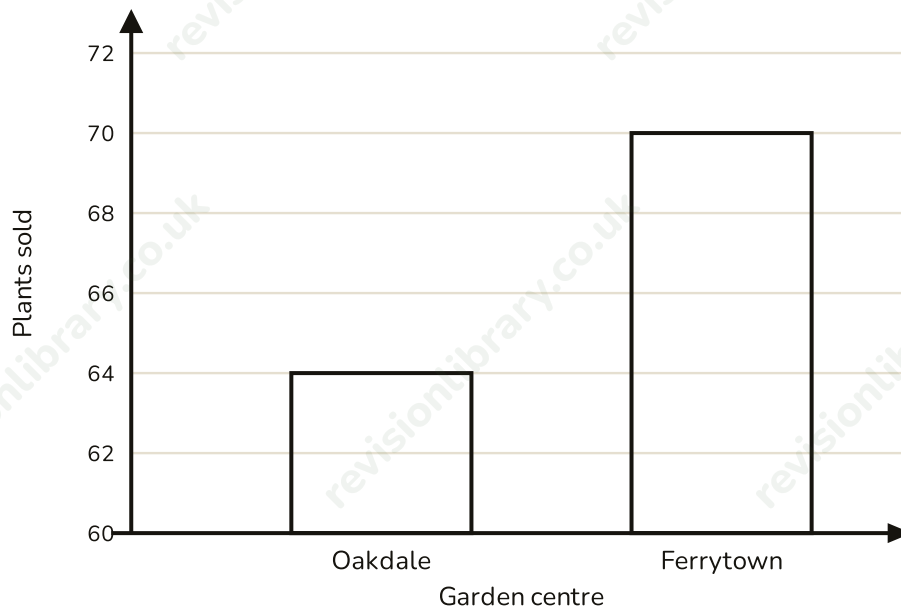
Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** For each statement about misleading graphs and charts, write down whether it is True or False.
- (i) A pictogram gives a fair impression of the data only if every symbol represents the same fixed amount, with any partial symbol drawn strictly in proportion. (1)
- _____
- (ii) A pie chart drawn with a 3D tilt effect always represents exactly the same information as the equivalent flat (2D) pie chart, just in a different style. (1)
- _____
- (iii) In a histogram with unequal class widths, plotting frequency (instead of frequency density) on the vertical axis will always give a fair impression of how concentrated the data is in each class. (1)
- _____
- (iv) Two line graphs plotted from identical data can look very different if one graph stretches its vertical axis and the other does not, even though none of the underlying figures have changed. (1)
- _____

(Total for Question 1 is 4 marks)

- 2 Two garden centres, Oakdale and Ferrytown, recorded their weekend plant sales (number of plants sold). Oakdale sold 64 plants and Ferrytown sold 70 plants. The bar chart shows this data, with the vertical axis starting at 60.



- (a) Write down the number of plants sold at Oakdale and at Ferrytown. (1)
- (b) Explain why this bar chart could give a misleading impression of the difference in sales between the two garden centres. (2)
- (c) Suggest one specific change the garden centres could make to redraw this chart fairly, and explain what effect this change would have on how the bars compare. (2)

(Total for Question 2 is 5 marks)

- 3** A charity draws a poster to show how much money it raised in two years, using coin pictures. In Year 1 it raised £2,000, shown by a coin of radius 1 cm. In Year 2 it raised £6,000 (three times as much), shown by a coin of radius 3 cm (three times the radius).



- (a) Using $\pi = 3.14$, work out the area of the Year 1 coin (radius 1 cm). (2)
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- (b) Using $\pi = 3.14$, work out the area of the Year 2 coin (radius 3 cm). (2)
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- (c) Compare the ratio of the two coins' areas to the ratio of the two amounts raised, and explain why scaling the radius like this could mislead a reader. (2)
- (d) Suggest a fairer way the charity could redraw the pictogram so that the visual impression matches the data, and explain why your method is fairer. (2)

(Total for Question 3 is 8 marks)

4 Priya is investigating whether adverts for phone data plans use misleading bar charts to make their own network look the best value.

(a) Plan: Suggest one thing Priya should decide before she starts collecting her sample of adverts, and give a reason for your suggestion. **(2)**

(b) Collect: Priya records, for each of her 15 sampled adverts, whether the bar chart's vertical axis starts at zero. Her results: Yes - 6 adverts, No - 9 adverts. Write down the fraction of adverts in her sample where the axis did not start at zero, in its simplest form. **(1)**

.....
(c) Process: Work out this fraction as a percentage. **(2)**

.....
(d) Interpret: Priya concludes 'Most phone data plan adverts are misleading, because their bar chart's vertical axis doesn't start at zero.' Comment on whether her sample is likely to be reliable evidence for this general conclusion. **(3)**

(Total for Question 4 is 8 marks)

Mark scheme · H25-test Recognising Misleading Graphs (Higher): Test Pack

Question 1

- (i) **B1** True cao
- **(i) Answer: True**
- (ii) **B1** False cao
- **(ii) Answer: False**
- (iii) **B1** False cao
- **(iii) Answer: False**
- (iv) **B1** True cao
- **(iv) Answer: True**

Question 2

- (a) **B1** Oakdale = 64 and Ferrytown = 70, both cao
- **(a) Answer: Oakdale = 64, Ferrytown = 70**
- (b) **B1** identifies that the vertical axis starts at 60, not 0 (a truncated/non-zero axis)
- (b) **B1** explains this makes the real difference of 6 plants look much bigger than it really is, since the Ferrytown bar is drawn far taller even though it is only a small amount more
- **(b) Answer: The vertical axis starts at 60 instead of 0, so the small true difference of 6 plants (64 compared with 70) is stretched to fill most of the chart, making Ferrytown's sales look far higher than Oakdale's.**
- (c) **B1** suggests starting the vertical axis at 0 (instead of 60)
- (c) **B1** explains that on a 0 to 72 scale the two bars would then be almost the same height (64 out of 72, and 70 out of 72), giving a fair impression that matches the true difference of about 9%, instead of looking two and a half times as big
- **(c) Answer: Redraw the chart with the vertical axis starting at 0. On a 0 to 72 scale, Oakdale's bar would reach 64/72 of the height and Ferrytown's would reach 70/72, so the bars would look almost the same height, fairly reflecting the true 6-plant (about 9%) difference.**

Question 3

- (a) **M1** 3.14×1^2 , oe
- (a) **A1** 3.14 cm^2 cao
- **(a) Answer: 3.14 cm^2**
- (b) **M1** 3.14×3^2 , oe
- (b) **A1** 28.26 cm^2 cao
- **(b) Answer: 28.26 cm^2**
- (c) **B1** correctly finds the area ratio $28.26 : 3.14 = 9 : 1$, compared with the money ratio of $6000 : 2000 = 3 : 1$
- (c) **B1** explains the Year 2 coin looks nine times as big as the Year 1 coin, even though only three times as much money was raised, exaggerating how much more successful Year 2 was
- **(c) Answer: The area ratio is $28.26 : 3.14 = 9 : 1$, but the true amount-raised ratio is only $3 : 1$; tripling the radius makes the picture look nine times bigger, so the poster exaggerates how much Year 2's fundraising improved on Year 1's.**
- (d) **B1** valid method, e.g. keep every coin the same fixed size and draw three identical coins for Year 2 for every one coin used for Year 1, or scale the AREA of a single coin directly in proportion to the amount raised (so the area ratio is exactly $3 : 1$) rather than scaling the radius
- (d) **B1** explains why the suggested method is fairer, e.g. repeating identical, equally-sized coins means the number of coins (not their size) shows the multiple, so the visual impression matches the data exactly
- **(d) Answer: Keep the coin the same fixed size throughout, and show Year 2 with three identical coins for every one coin used for Year 1; since every coin is now the same size, the number of coins shown is directly proportional to the amount raised, giving a fair visual impression.**

Question 4

- (a) **B1** valid decision suggested, e.g. which networks or sources to include, how many adverts to sample, or what counts as a 'bar chart' for this investigation
- (a) **B1** valid reason linked to getting a fair, representative sample or a workable, consistent definition
- (a) **Answer: e.g. Priya should decide in advance exactly how many adverts and from how many different networks she will look at, so that her sample is a consistent size and is not chosen to fit whatever result she expects to find.**
- (b) **B1** 3/5 cao
- (b) **Answer: 3/5**
- (c) **M1** $9/15 \times 100$, oe
- (c) **A1** 60% cao
- (c) **Answer: 60%**
- (d) **B1** identifies a possible limitation of the sample, e.g. it may only cover a small number of networks, a short time period, or adverts from a single source, so it may not be representative of all data plan adverts
- (d) **B1** suggests a valid improvement, e.g. a bigger and more varied sample (more networks, more adverts, over a longer time period) would give more reliable evidence
- (d) **B1** explains that 60% is a statistic about Priya's sample only, and does not automatically prove a fact about every phone data plan advert that exists
- (d) **Answer: A sample of only 15 adverts, possibly from a small number of networks or a short time window, may not represent all phone data plan advertising; a bigger, more varied sample (more networks, more adverts, over a longer period) would give more reliable evidence. Even a correctly worked out 60% is a fact about Priya's own sample, not automatic proof about every advert that has ever been produced.**