6.7 Scatter Graphs and Correlation: Test Pack

Calculators not allowed · about 55 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Plot the following points on graph paper: (1, 2), (3, 4), (5, 6).

(a) Plot the point (1, 2). **(1)**

(b) Plot the point (3, 4). **(1)**

(c) Plot the point (5, 6). **(1)**

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2 A scatter graph is drawn from these points: (2, 19), (5, 28), (7, 50), (8, 36), (10, 43), (13, 51), (18, 67). The line of best fit for the other points is $y = 3x + 13$.
One point is an outlier. Write down the coordinates of the outlier.

(2)

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3 A line of best fit drawn through data approximately passes through (1, 4) and (5, 16). Use these points to write an equation for the line in the form $y = mx + c$ and then estimate y at $x = 3$.

(2)

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4 Stretch: A line of best fit drawn through a scatter is y = 4x - 6. A point at x = 2 has y = 3. Calculate how far vertically this point is from the line (distance between actual y and line y), and say whether the point lies above or below the line.

(3)

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5 Stretch: A researcher plots number of weekly practice hours (x) against penalty success rate (%) (y) and finds a strong positive correlation. She fits the line y = 6x + 20. Using this line, estimate how many hours of practice are needed to reach a predicted success rate of 80%. Show your working.

(3)

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6 A scatter graph is drawn from these points: (5, 28), (6, 31), (8, 38), (11, 46), (13, 52), (14, 42), (16, 63). The line of best fit for the other points is y = 3x + 14.
One point is an outlier. Write down the coordinates of the outlier.

(2)

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7 A line of best fit for temperature (x) and ice creams sold (y) has equation y = 4x + 26. Write down what the gradient 4 means in this context.

(2)

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8 Here are five pairs of data showing hours of revision and exam score: (0, 45), (1, 50), (2, 55), (3, 60), (4, 65). Describe the correlation and say if it is strong, moderate or weak.

(2)

9 A line of best fit for hours of revision (x) and test mark (y) has equation $y = 6x + 27$. Use the line to estimate y when $x = 16$.

(2)

10 The scatter graph plots shoe size (x) and reading score (y) for 9 cases. The points are: (1, 5), (3, 17), (9, 34), (11, 39), (13, 46), (14, 44), (15, 46), (16, 57), (18, 62).
Describe the correlation shown by the points.

(2)

11 For each set of points, state whether the correlation is positive, negative or no correlation.

(a) Points: (1, 1), (2, 2), (3, 3) **(1)**

(b) Points: (1, 5), (2, 3), (3, 1) **(1)**

(c) Points: (1, 3), (2, 2), (3, 3) **(1)**

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12 A scatter graph is drawn from these points: (4, 28), (5, 34), (9, 50), (11, 44), (15, 74), (16, 77), (18, 84). The line of best fit for the other points is $y = 4x + 13$.
One point is an outlier. Write down the coordinates of the outlier.

(2)

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13 A small company recorded advertising spend (x, in hundreds of pounds) and number of new customers (y): (1, 4), (2, 6), (3, 20), (4, 11). Which point is the best candidate for an outlier? Explain briefly.

(2)

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14 A scatter graph is drawn from these points: (4, 11), (5, 14), (10, 24), (13, 29), (17, 39), (18, 23), (19, 41). The line of best fit for the other points is $y = 2x + 4$.
One point is an outlier. Write down the coordinates of the outlier.

(2)

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15 The scatter graph for hours of revision (x) and test mark (y) uses data with x values from 4 to 22. The line of best fit is $y = 3x + 10$. Katie uses the line to predict y when $x = 32$. Is this prediction likely to be reliable? Give a reason.

(2)

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16 A line of best fit for data is $y = 3x + 2$. Estimate y when $x = 4$.

(2)

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17 A scatter graph is drawn from these points: (2, 22), (6, 39), (10, 53), (14, 88), (16, 77), (18, 87), (19, 91). The line of best fit for the other points is $y = 4x + 14$.
One point is an outlier. Write down the coordinates of the outlier.

(2)

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18 Explain what the gradient of a line of best fit tells you in the context of a scatter graph where x is time spent practising and y is number of free throws scored.

(2)

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19 A teacher draws a rough line of best fit through points and uses it to estimate. The line passes through (0, 10) and (5, 25). Calculate the gradient of this line and explain what it means for the data.

(2)

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20 The scatter graph plots age of a car in years (x) and its value in hundreds of pounds (y) for 7 cases. The points are: (1, 63), (4, 54), (5, 52), (6, 52), (9, 43), (10, 36), (16, 25). Describe the correlation shown by the points.

(2)

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Mark scheme · 6.7 Scatter Graphs and Correlation: Test Pack

Question 1

(a) point plotted at x=1, y=2 (cao) **B1**

(a) Answer: **(1, 2)**

(b) point plotted at x=3, y=4 (cao) **B1**

(b) Answer: **(3, 4)**

(c) point plotted at x=5, y=6 (cao) **B1**

(c) Answer: **(5, 6)**

Question 2

compares the points with the line of best fit **M1**

(7, 50) cao **A1**

Answer: **(7, 50)**

Question 3

calculate gradient m = (16-4)/(5-1) = 12/4 = 3 **M1**

y = 3x + 1 and estimate y(3) = 10 cao **A1**

Answer: **y = 3x + 1; estimate at x=3 is 10**

Question 4

substitute x = 2 to find line y = 4(2) - 6 = 2 **M1**

calculate vertical distance = |3 - 2| = 1 **M1**

state point is 1 above the line (actual y greater than line y) cao **A1**

Answer: **1 above the line**

Question 5

set up equation 6x + 20 = 80 or equivalent **M1**

solve 6x = 60 to get x = 10 (method shown) **M1**

conclude 10 hours (cao) **A1**

Answer: **10 hours**

Question 6

compares the points with the line of best fit **M1**

(14, 42) cao **A1**

Answer: **(14, 42)**

Question 7

refers to the change in y for each 1 unit increase in x **M1**

y increases by 4 for each extra unit of x **A1**

Answer: **ice creams sold increases by 4 for each extra unit of temperature**

Question 8

identify positive correlation (scores increase as hours increase) or equivalent **M1**

describe as strong (points lie close to a straight increasing trend) cao **A1**

Answer: **Positive correlation, strong**

Question 9

substitutes x = 16 **M1**

123 cao **A1**

Answer: **123**

Question 10

describes the trend (as x increases, y ...) in words or the type of correlation **M1**

positive correlation cao **A1**

Answer: **positive correlation**

Question 11

(a) positive correlation cao **B1**

(a) Answer: **Positive correlation**

(b) negative correlation cao **B1**

(b) Answer: **Negative correlation**

(c) no correlation or very weak correlation cao **B1**

(c) Answer: **No correlation**

Question 12

compares the points with the line of best fit **M1**

(11, 44) cao **A1**

Answer: **(11, 44)**

Question 13

identify (3, 20) as the point that does not follow the trend of the other three points **M1**

brief explanation: it is far above the trend shown by the other points (about 9 customers would be expected at x = 3) cao **A1**

Answer: **(3, 20) is the outlier; it is much higher than the trend suggested by the other points (about 9 would be expected at x = 3)**

Question 14

compares the points with the line of best fit **M1**

(18, 23) cao **A1**

Answer: **(18, 23)**

Question 15

notes that 32 is outside the range of the data **M1**

No, because it is extrapolation **A1**

Answer: **No, it is outside the range of the data (extrapolation)**

Question 16

substitute x = 4 into expression y = 3x + 2 or equivalent **M1**

y = 14 cao **A1**

Answer: **14**

Question 17

compares the points with the line of best fit **M1**

(14, 88) cao **A1**

Answer: **(14, 88)**

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Question 18

mention relationship between change in y and change in x (rise over run) or rate of change	**M1**
contextual statement: how many extra free throws are scored per unit of practice time (cao)	**A1**

Answer: **Gradient = increase in free throws per unit of practice time; it tells how many more free throws are expected for each extra unit of practice**

Question 19

calculate gradient = (25-10)/(5-0) = 3	**M1**
interpretation: y increases by 3 for each increase of 1 in x, cao	**A1**

Answer: **Gradient = 3; it means y increases by 3 for each 1 increase in x**

Question 20

describes the trend (as x increases, y ...) in words or the type of correlation	**M1**
negative correlation cao	**A1**

Answer: **negative correlation**

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