

Scatter Diagrams Mark Scheme

Q1.

Question number	Answer	Additional guidance	Mark
(a)	B1 24		(1)
(b)	B1 19.5 (allow answers in the range 19.4-19.6)		(1)
(c)	B1 Line drawn between (170, 19)/(170, 20) and (270, 24)/(270, 25)		(1)
(d)	B1 Positive B1 Strong B1 As the total number of hours of sunshine increases, the mean maximum temperature increases.	A response that covers all 3 aspects can score 3 marks	(3)
(e)(i)	B1ft 21.5 - 22.5	B1 for answer in range 21.5 - 22.5 or follow through value read off their line of best fit with positive gradient. B1 for understanding that the estimate is made within the range of given x - values	(2)
(e)(ii)	B1 e.g. 'The result has been interpolated'		

Q2.

Question number	Answer	Additional guidance	Mark
	<p>B1B1B1B1B1 for five correct things identified</p> <ul style="list-style-type: none"> • Both cars decrease in price as their mileage increases • Model A reduces in price by 13.5p per mile • Model B reduces in price by 10.5p per mile • Model A reduces in price more per mile than model B / model A's mileage affects the price more than model B's. • Model B has a greater (initial) price • A correct comparison of the price of model A and model B for a specific mileage 	<p>e.g. at 2000 miles Model A would be expected to cost £13,230 and Model B would be expected to cost £20,290</p> <p>Note: 'for model A the price decreases as the mileage increases at a faster rate than it does for model B' can score B1B1 for the first and fourth bullet point in one statement.</p>	(5)

Q3.

Question	Answer	Additional guidance	Mark
(a)	B1 e.g. Students who score highly in GCSE Mathematics also score highly in A-level Mathematics	B1 for a suitable hypothesis regarding relative performance in the two exams	(1)
(b)	B1 GCSE is sat first It is plotted on the x -axis	B1 for an acceptable reason. Allow equivalent wording. Condone 'horizontal' axis.	(1)
(c)	B2 ft The scatter graph shows <u>positive correlation</u> ... which supports the hypothesis	B2 for a correct conclusion for their hypothesis (ft) and mention of positive correlation. (Otherwise B1 for identifying positive correlation)	(2)
(d)	B1 straight line with correct gradient B1 straight line through (578, 78)	1 st B1 accept $0.6 < \text{gradient} < 0.8$ (not inclusive) If line does not extend at least from $x = 540$ to $x = 600$ then score max B1B0	(2)
(e)	B1 ft e.g. for every extra mark at GCSE an extra 0.7 is scored for A-level	B1 ft for correct equivalent interpretation. Allow ft from their line. (e.g. 7 extra A-level marks for every extra 10 GCSE marks)	(1)
(f)	B1 (Will not be reliable because) 540 is outside the range of data / it is extrapolation	B1 for assessing the appropriateness of the method	(1)

Q4.

Question	Answer	Additional guidance	Mark
(a)	B1 eg Data is bivariate/paired OR so she can see if there is correlation (between her variables)	B1 for justifying appropriateness of a scatter diagram	(1)
(b)	B2 Line of best fit drawn through (25.2, 72), Otherwise B1 For plotting (25.2, 72) OR a sensible line of best fit which does not go through double mean point	B2 for an appropriate line which recognises that it should be drawn through the double mean point. B1 only for a partially correct answer	(2)
(c)	B1 Correct comment related to the graph (points 1 to 4) B1 Correct comment related to sample (points 5 to 8) B1 B1 B1 for any three further correct comments, eg 1. Points are close to a line (so strong correlation) OR some points not close to a line (so correlation not strong) 2. Line has positive gradient / points increasing left to right (so positive correlation) 3. Life expectancy is higher when age of mother is higher 4. Life expectancy increases by just over 2 years (eg 2.3) as age of mother increases by 1 year 5. Small sample of data / only valid for these 12 countries 6. Sample is not random / may not be representative 7. Source given is likely to be reliable OR secondary data may not be reliable	To gain all 5 marks at least one correct comment must be made interpreting the graph (equivalent to points 1 to 4) AND assessing the validity of conclusions based on the sample (equivalent to points 5 to 8) Accept equivalent comments for each example (1 to 11) 1. Assessing <i>strength</i> of correlation 2. Justifies <i>positive</i> correlation 3. <i>Interpreting</i> positive correlation 4. Interpreting gradient (accept 1sf from their line) 5. Assessing validity based on small sample 6. Recognising the sample may not be valid as not random 7. Considering the reliability of the source	(5)
	8. Data may be out of date 9. Statement A is (OR is not) appropriate* 10. Statement B is not appropriate * 11. Correlation does not imply causation	8. Recognising that secondary data may not be up to date 9. Assessing the appropriateness of statement A (* dependent upon a correct supporting reason) 10. Concluding that statement B is not valid (* dependent upon a correct supporting reason) 11. Recognising that causation is not implied by correlation Ignore excess comments if not contradictory	

Q5.

Question number	Answer	Additional guidance	Mark
(a)	B1 31	Condone 3100	(1)
(b)	B1 straight line drawn between (30, 5)/(30, 10) and (100, 25)/(100, 30) inclusive		(1)
(c)	B1 positive B1 strong B1 as the weight (in tons) increases the maximum number of passengers increases oe	Accept as the maximum number of passengers increases the weight (in tons) increases Do not accept e.g. a big ship will hold more people as this is referring to a single vessel only.	(3)
(d)	B2 not appropriate AND this would be extrapolation / point is outside the range of the data / trend may not continue OR if B2 not scored... B1 not appropriate AND an attempt at a reason OR B1 for reference to extrapolation / point being outside the range of the data/trend may not continue without a comment on appropriateness	B2 for assessing the appropriateness of the use of the line of best fit to estimate the maximum number of passengers OR B1 for an attempt at assessing the appropriateness of the use of the line of best fit to estimate the maximum number of passengers	(2)

Q6.

Question number	Answer	Additional guidance	Mark
(a)	B1 Graph supports the hypothesis + reason B1 Scatter shows negative correlation	B1 for conclusion supported by sensible reason B1 for statistical reasoning using words in bold	(2)
(b)	M1 e.g. $83.5 - 0.7 \times 4 = 80.7$ or $83.5 - 0.7 \times 8 = 77.9$ or sensible straight line with correct gradient A1 correct straight line within tolerance	M1 for one pair of coordinates correctly identified, or for a sensible attempt at straight line with correct gradient. A1 Their line should extend horizontally at least from 4.2 to 7 and (if extended) be vertically within one square of 80.7 at $x = 4$ and one square of 77.9 at $x = 8$	(2)
(c)	B1 79.6 from graph	B1 for answer between 79.5 and 79.7 (may use equation OR vertical line drawn from $x = 5.6$)	(1)
(d)	B1 e.g. change in life expectancy as unemployment increases. B1 0.7 years fall in life expectancy (per 1% increase in unemployment)	B1 for recognising in context that gradient indicates a rate. Accept equivalent wording. No figures needed for 1 st B1 B1 for interpreting in context the <u>value</u> . Mark may be gained for correct equivalent figures used within their comment. (e.g. 1.4% more unemployment results in 1 year reduction in life expectancy)	(2)
(e)	B1 B1 for any two comments from <ul style="list-style-type: none"> • Involves extrapolation / 8% is outside of range • It is a for a different region so may be affected by other factors • Correlation does not look very strong 	Accept equivalent statistical reasoning. B1 for each correct point but allow each bullet point once only.	(2)

Q7.

Question	Scheme	Marks
(a)	The variable being measured or studied.	B1
(b)(i)	Point plotted at (1.4, 21.5)	B1 (1)
(b)(ii)	Line of best fit passing through (1.4, 21.5) in tolerance	B1 (2)
(c)(i)	$\Delta y/\Delta x = 3.8$ (100kCal/hour)	M1A1ft
(c)(ii)	(380) kCal burned for every additional hour of exercise	B1 (3)
[6]		
Notes		
(a)	Allow the variable you can't control / dependent variable	
(b)(i)	$\frac{1}{2}$ square tolerance	
(b)(ii)	Should extend from between (0.5, 17), (0.5, 19.5) and (2, 22.5), (2, 25) and pass through (or within tolerance of) (1.4, 21.5) or their mean point	
(c)(i)	M1 for attempt at $\Delta y/\Delta x$ from their line of best fit drawn with figures seen (may be on graph) A1 for an answer in the range 2.1–5.4 <u>or</u> 210 – 540 <u>or</u> ft from their line of best fit with positive gradient	
(c)(ii)	Correct contextualised interpretation of the gradient which must include rate, kCal/calories and hours/time	