4.1 Correlation and Causation (Foundation): 1-hour Pack

Total Marks

EDEXCEL 1ST0 · Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A study finds that the product moment correlation coefficient between the number of lifeguards on a beach and the number of people swimming is r = -0.85.

(a) Describe the correlation. Use these descriptions: strong is |r| of 0.7 or more, moderate is from 0.4 up to 0.7, weak is below 0.4.

(b) A student says that a change in the number of lifeguards on a beach causes a change in the number of people swimming. Comment on this claim.

(Total for Question 1 is 4 marks)

2 The data below could be plotted on a scatter graph. A kiosk records hours of sunshine (x) and ice creams sold (y).

x	3	4	6	9	10	12	19
y	61	62	76	87	91	99	126

A line of best fit is drawn so that it passes through the points (4, 62) and (12, 99).

(a) Work out the gradient of the line.

(b) Find the equation of the line in the form y = mx + c.

(Total for Question 2 is 4 marks)

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3 A study finds that the product moment correlation coefficient between the number of hours of TV watched and a person's weight is r = -0.92.

(a) Describe the correlation. Use these descriptions: strong is |r| of 0.7 or more, moderate is from 0.4 up to 0.7, weak is below 0.4.

(b) A student says that a change in the number of hours of TV watched causes a change in a person's weight. Comment on this claim.

(Total for Question 3 is 4 marks)

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4 The data below could be plotted on a scatter graph. A taxi firm records distance travelled in kilometres (x) and the fare in pounds (y).

x	2	8	9	12	13	17	18	20
y	60	66	65	74	69	75	78	82

A line of best fit is drawn so that it passes through the points (8, 66) and (18, 78).

(a) Work out the gradient of the line.

(b) Find the equation of the line in the form y = mx + c.

(c) Use your equation to estimate y when x = 10.

(d) State whether your estimate in (c) is interpolation or extrapolation, and whether it is likely to be reliable.

(Total for Question 4 is 7 marks)

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5 A study finds that the product moment correlation coefficient between the number of books in a home and a pupil's exam result is r = -0.58.

(a) Describe the correlation. Use these descriptions: strong is |r| of 0.7 or more, moderate is from 0.4 up to 0.7, weak is below 0.4.

(b) A student says that a change in the number of books in a home causes a change in a pupil's exam result. Comment on this claim.

(Total for Question 5 is 4 marks)

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6 The data below could be plotted on a scatter graph. A dealer records the age in years of a car (x) and its value in hundreds of pounds (y).

x	5	7	11	12	14	15	16	19
y	91	87	81	78	82	73	75	69

A line of best fit is drawn so that it passes through the points (7, 87) and (16, 75).

(a) Work out the gradient of the line.

(b) Find the equation of the line in the form y = mx + c.

(c) Use your equation to estimate y when x = 10.

(d) State whether your estimate in (c) is interpolation or extrapolation, and whether it is likely to be reliable.

(Total for Question 6 is 7 marks)

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7 A study finds that the product moment correlation coefficient between the sales of sun cream and the sales of sunglasses is r = -0.85.

(a) Describe the correlation. Use these descriptions: strong is |r| of 0.7 or more, moderate is from 0.4 up to 0.7, weak is below 0.4.

(b) A student says that a change in the sales of sun cream causes a change in the sales of sunglasses. Comment on this claim.

(Total for Question 7 is 4 marks)

8 A study finds that the product moment correlation coefficient between the price of a house and the number of bedrooms is r = 0.25.

(a) Describe the correlation. Use these descriptions: strong is |r| of 0.7 or more, moderate is from 0.4 up to 0.7, weak is below 0.4.

(b) A student says that a change in the price of a house causes a change in the number of bedrooms. Comment on this claim.

(Total for Question 8 is 4 marks)

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9 The data below could be plotted on a scatter graph. A kiosk records hours of sunshine (x) and ice creams sold (y).

x	3	4	7	8	10	15	16
y	35	38	55	51	56	75	81

A line of best fit is drawn so that it passes through the points (4, 38) and (15, 75).

(a) Work out the gradient of the line.

(b) Find the equation of the line in the form $y = mx + c$.

(Total for Question 9 is 4 marks)

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10 A study finds that the product moment correlation coefficient between the number of hours of TV watched and a person's weight is $r = -0.58$.

(a) Describe the correlation. Use these descriptions: strong is $|r|$ of 0.7 or more, moderate is from 0.4 up to 0.7, weak is below 0.4.

(b) A student says that a change in the number of hours of TV watched causes a change in a person's weight. Comment on this claim.

(Total for Question 10 is 4 marks)

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11 A study finds that the product moment correlation coefficient between the sales of sun cream and the sales of sunglasses is r = 0.25.

(a) Describe the correlation. Use these descriptions: strong is |r| of 0.7 or more, moderate is from 0.4 up to 0.7, weak is below 0.4.

(b) A student says that a change in the sales of sun cream causes a change in the sales of sunglasses. Comment on this claim.

(Total for Question 11 is 4 marks)

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12 The data below could be plotted on a scatter graph. A kiosk records hours of sunshine (x) and ice creams sold (y).

x	3	8	12	13	14	18	20
y	49	67	80	81	83	98	103

A line of best fit is drawn so that it passes through the points (8, 67) and (18, 98).

(a) Work out the gradient of the line.

(b) Find the equation of the line in the form y = mx + c.

(c) Use your equation to estimate y when x = 4.

(d) State whether your estimate in (c) is interpolation or extrapolation, and whether it is likely to be reliable.

(Total for Question 12 is 7 marks)

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Mark scheme · 4.1 Correlation and Causation (Foundation): 1-hour Pack

Question 1

negative	B1
strong	B1
correlation does not prove causation	B1
a third factor, such as the number of visitors, may affect both	B1

Answer: (a) strong negative correlation; (b) correlation does not imply causation; a third factor such as the number of visitors may be the cause

Question 2

change in y divided by change in x	M1
gradient 4.625 cao	A1
substitutes a point into y = mx + c	M1
y = 4.625x + 43.5 cao	A1

Answer: (a) 4.625; (b) y = 4.625x + 43.5

Question 3

negative	B1
strong	B1
correlation does not prove causation	B1
a third factor, such as overall lifestyle, may affect both	B1

Answer: (a) strong negative correlation; (b) correlation does not imply causation; a third factor such as overall lifestyle may be the cause

Question 4

change in y divided by change in x	M1
1.2 cao	A1
substitutes a point to find c	M1
y = 1.2x + 56.4 cao	A1
substitutes x = 10	M1
68.4 cao	A1
interpolation and more reliable as within the data range	B1

Answer: (a) 1.2; (b) y = 1.2x + 56.4; (c) 68.4; (d) interpolation

Question 5

negative	B1
moderate	B1
correlation does not prove causation	B1
a third factor, such as family circumstances, may affect both	B1

Answer: (a) moderate negative correlation; (b) correlation does not imply causation; a third factor such as family circumstances may be the cause

Question 6

change in y divided by change in x	M1
-1.3333333333 cao	A1
substitutes a point to find c	M1
y = -1.3333333333x + 96.3333333333 cao	A1
substitutes x = 10	M1
83 cao	A1
interpolation and more reliable as within the data range	B1

Answer: (a) -1.3333333333; (b) y = -1.3333333333x + 96.3333333333; (c) 83; (d) interpolation

Question 7

negative	B1
strong	B1
correlation does not prove causation	B1
a third factor, such as sunny weather, may affect both	B1

Answer: (a) strong negative correlation; (b) correlation does not imply causation; a third factor such as sunny weather may be the cause

Question 8

positive	B1
weak	B1
correlation does not prove causation	B1
a third factor, such as the size of the house, may affect both	B1

Answer: (a) weak positive correlation; (b) correlation does not imply causation; a third factor such as the size of the house may be the cause

Question 9

change in y divided by change in x	M1
gradient 3.3636363636 cao	A1
substitutes a point into y = mx + c	M1
y = 3.3636363636x + 24.5454545455 cao	A1

Answer: (a) 3.3636363636; (b) y = 3.3636363636x + 24.5454545455

Question 10

negative	B1
moderate	B1
correlation does not prove causation	B1
a third factor, such as overall lifestyle, may affect both	B1

Answer: (a) moderate negative correlation; (b) correlation does not imply causation; a third factor such as overall lifestyle may be the cause

Question 11

positive	B1
weak	B1
correlation does not prove causation	B1
a third factor, such as sunny weather, may affect both	B1

Answer: (a) weak positive correlation; (b) correlation does not imply causation; a third factor such as sunny weather may be the cause

Question 12

change in y divided by change in x	M1
3.1 cao	A1
substitutes a point to find c	M1
y = 3.1x + 42.2 cao	A1
substitutes x = 4	M1
54.6 cao	A1
interpolation and more reliable as within the data range	B1

Answer: (a) 3.1; (b) y = 3.1x + 42.2; (c) 54.6; (d) interpolation

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