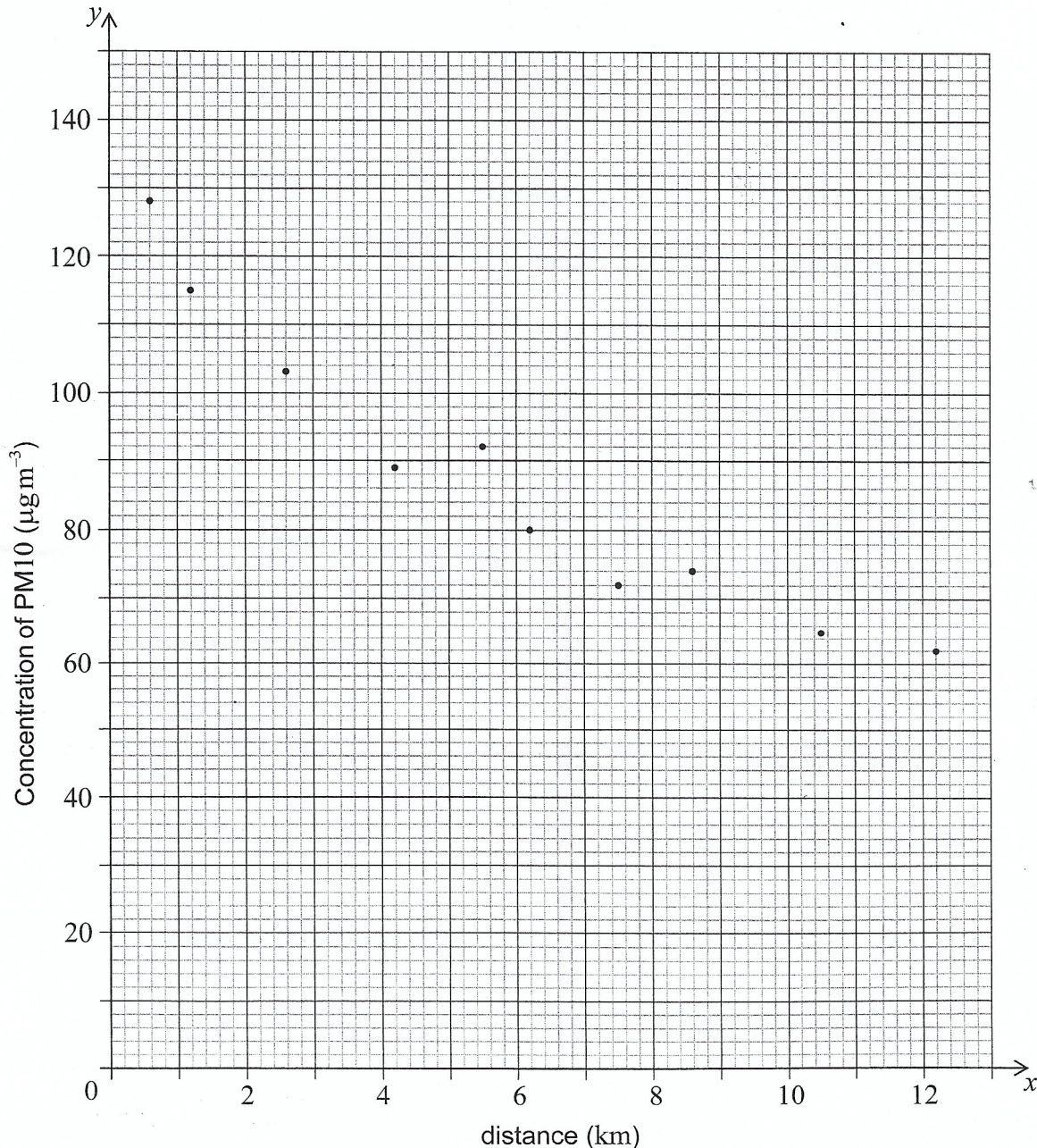


Answer **all** questions in the answer booklet provided. Please start each question on a new page. You are advised to show all working, where possible. Where an answer is incorrect, some marks may be given for a correct method, provided this is shown by written working. Solutions found from a graphic display calculator should be supported by suitable working, for example, if graphs are used to find a solution, you should sketch these as part of your answer.

1. [Maximum mark: 12]

For an ecological study, Ernesto measured the average concentration (y) of the fine dust, PM10, in the air at different distances (x) from a power plant. His data are represented on the following scatter diagram. The concentration of PM10 is measured in micrograms per cubic metre and the distance is measured in kilometres.



(This question continues on the following page)

(Question 1 continued)

His data are also listed in the following table.

Distance (x)	0.6	1.2	2.6	a	5.5	6.2	7.5	8.6	10.5	12.2
Concentration of PM10 (y)	128	115	103	89	92	80	72	b	65	62

- (a) Use the scatter diagram to find the value of a and of b in the table. [2]
- (b) Calculate
- \bar{x} , the mean distance from the power plant;
 - \bar{y} , the mean concentration of PM10;
 - r , the Pearson's product-moment correlation coefficient. [4]
- (c) Write down the equation of the regression line y on x . [2]

Ernesto's school is located 14 km from the power plant. He uses the equation of the regression line to estimate the concentration of PM10 in the air at his school.

- (d) (i) Calculate the value of Ernesto's estimate.
- (ii) State whether Ernesto's estimate is reliable. Justify your answer. [4]

ra

Answer **all** questions in the answer booklet provided. Please start each question on a new page. You are advised to show all working, where possible. Where an answer is incorrect, some marks may be given for a correct method, provided this is shown by written working. Solutions found from a graphic display calculator should be supported by suitable working, for example, if graphs are used to find a solution, you should sketch these as part of your answer.

1. [Maximum mark: 14]

The following table shows the average body weight, x , and the average weight of the brain, y , of seven species of mammal. Both measured in kilograms (kg).

Species	Average body weight, x (kg)	Average weight of the brain, y (kg)
Cat	3	0.026
Cow	465	0.423
Donkey	187	0.419
Giraffe	529	0.680
Goat	28	0.115
Jaguar	100	0.157
Sheep	56	0.175

(a) Find the range of the average body weights for these seven species of mammal. [2]

(b) For the data from these seven species

(i) calculate r , the Pearson's product-moment correlation coefficient;

(ii) describe the correlation between the average body weight and the average weight of the brain. [4]

(c) Write down the equation of the regression line y on x , in the form $y = mx + c$. [2]

The average body weight of grey wolves is 36 kg.

(d) Use your regression line to estimate the average weight of the brain of grey wolves. [2]

In fact, the average weight of the brain of grey wolves is 0.120 kg.

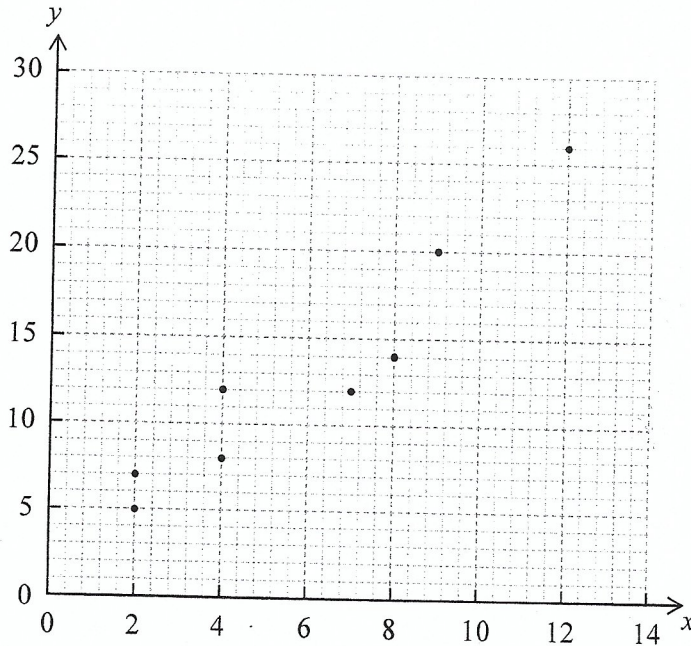
(e) Find the percentage error in your estimate in part (d). [2]

The average body weight of mice is 0.023 kg.

(f) State whether it is valid to use the regression line to estimate the average weight of the brain of mice. Give a reason for your answer. [2]

4. Consider the following set of data which is plotted on the scatter diagram below.

x	2	4	7	12	4	8	9	2
y	5	8	12	26	12	14	20	7



- (a) Write down the coordinates of the mean point (\bar{x}, \bar{y}) . [2 marks]
- (b) Write down the value of r , the Pearson's product-moment correlation coefficient for this set of data. [2 marks]
- (c) Draw the regression line for y on x on the set of axes above. [2 marks]

Working:

Answers:

(a)

(b)

r4

4. Identical mosquito traps are placed at different distances from a lake. On one day the number of mosquitoes caught in 10 of the traps is recorded.

Distance, m (x)	8	15	22	30	34	45	50	60	74	82
Number of mosquitoes (y)	78	75	72	67	66	59	59	53	48	43

It is believed the number of mosquitoes caught varies linearly with the distance, in metres, of the trap from the lake.

- (a) Find
- (i) Pearson's product-moment correlation coefficient, r ;
 - (ii) the equation of the regression line y on x . [4]
- (b) Use the equation of the regression line y on x to estimate the number of mosquitoes caught in a trap that is 28 m from the lake. [2]

Working:

Answers:

- (a) (i)
- (ii)
- (b)

15

Please start each question on a new page. You are advised to show all working, where possible. Where an answer is incorrect, some marks may be given for a correct method, provided this is shown by written working. Solutions found from a graphic display calculator should be supported by suitable working, for example, if graphs are used to find a solution, you should sketch these as part of your answer.

1. [Maximum mark: 17]

As part of his IB Biology field work, Barry was asked to measure the circumference of trees, in centimetres, that were growing at different distances, in metres, from a river bank. His results are summarized in the following table.

Distance, x (metres)	5	12	17	21	24	30	34	44	47
Circumference, y (centimetres)	82	76	70	68	67	60	62	50	50

- (a) State whether *distance from the river bank* is a continuous or discrete variable. [1]
- (b) **On graph paper**, draw a scatter diagram to show Barry's results. Use a scale of 1 cm to represent 5 m on the x -axis and 1 cm to represent 10 cm on the y -axis. [4]
- (c) Write down
 - (i) the mean distance, \bar{x} , of the trees from the river bank;
 - (ii) the mean circumference, \bar{y} , of the trees. [2]
- (d) Plot and label the point $M(\bar{x}, \bar{y})$ on your graph. [2]
- (e) Write down
 - (i) the Pearson's product-moment correlation coefficient, r , for Barry's results;
 - (ii) the equation of the regression line y on x , for Barry's results. [4]
- (f) Draw the regression line y on x on your graph. [2]
- (g) Use the equation of the regression line y on x to estimate the circumference of a tree that is 40 m from the river bank. [2]