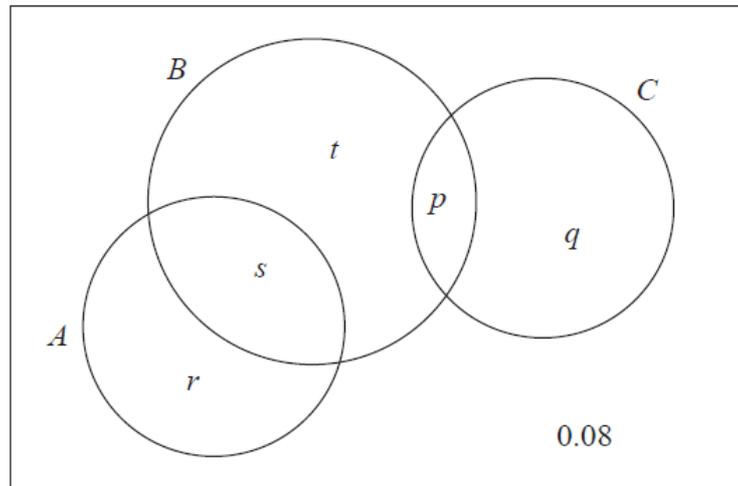# Statistics 13 – Bivariate Data

Please **complete** this homework by _____. Start it early. If you can't do a question you will then have time to ask your teacher for help or go to a drop in session.

Section 1 – Review of previous topics. Please _complete_ all questions.

Q1. The Venn diagram shows three events A, B and C, where p, q, r, s and t are probabilities.

$P(A) = 0.5$, $P(B) = 0.6$ and $P(C) = 0.25$ and the events B and C are independent.

(a) Find the value of p and the value of q.

(b) Find the value of r.

(c) Hence write down the value of s and the value of t.

(d) State, giving a reason, whether or not the events A and B are independent.

Q2.
If X~Bin(10,0.6), use the Binomial function on your calculator to find:
(a)   P(X=6)
(b)   P(X ≤ 2)
(c)   P(1 < X ≤ 3)

Q1.

A biologist is comparing the intervals (m seconds) between the mating calls of a certain species of tree frog and the surrounding temperature (t ºC). The following results were obtained.

t °C	8	13	14	15	15	20	25	30
m secs	6.5	4.5	6	5	4	3	2	1

(a) Draw a scatter graph of this information

(2)

(b) The equation of the regression line of m on t is $m = 8.47 - 0.256t$. Add this to your scatter graph

(2)

(c) Use the equation of the regression line to calculate an estimate for the time interval between mating calls when the surrounding temperature is 10 ºC.

(1)

(d) Comment on the reliability of this estimate, giving a reason for your answer.

(1)

Q2.

The age, t years, and weight, w grams, of each of 10 coins were recorded and the equation of the regression line was found to be $w = 11.6 - 0.0263t$

(a) State, with a reason, which variable is the explanatory variable.

(2)

(b) Using this model, estimate
  (i) the weight of a coin which is 5 years old,
  (ii) the effect of an increase of 4 years in age on the weight of a coin.

(2)

Q3.

A scientist is researching whether or not birds of prey exposed to pollutants lay eggs with thinner shells. He collects a random sample of egg shells from each of 6 different nests and tests for pollutant level, p, and measures the thinning of the shell, t. The results are shown in the table below.

p	3	8	30	25	15	12
t	1	3	9	10	5	6

(a) Draw a scatter diagram to represent these data.

(2)

(b) Explain why a linear regression model may be appropriate to describe the relationship between p and t.

(1)

(c) The equation of the regression line of t on p is found to be $t = 0.741 + 0.318p$, draw the regression line on your scatter diagram.

(2)

The scientist reviews similar studies and finds that pollutant levels above 16 are likely to result in the death of a chick soon after hatching.

(d) Using the equation for the regression line to calculate an estimate for the minimum thinning of the shell that is likely to result in the death of a chick.

(2)

Q4.

The table shows the daily maximum mean windspeed, w (kn) and the daily Maximum gust, g (kn) in Camborne for the first 15 days in July 1987, from the large data set.

w	6	13	12	6	15	17	10	12	6	3	3	4	7	5	8
g	16	29	25	14	38	40	21	24	16	10	n/a	11	15	17	20

(a) Draw a scatter graph for this data (omitting the (3, n/a) value).

(2)

(b) Describe the correlation between w and g.

(1)

(c) Comment on whether there is likely to be a causal relationship between daily mean wind speed and maximum gust.

(1)

(d) The equation of the regression line for g on w is given by $g = 2.85 + 2.07w$. Draw this regression line onto your scatter graph.

(2)

(e) For one day w = 3 and there is no corresponding value for maximum gust. Use the equation of the regression line to find g.

(1)

(e) Why is not suitable to use the regression line to find the maximum expected gust for a daily mean windspeed of 25kn?

(1)

Total 25