TRINITY COLLEGE

MATHEMATICS APPLICATIONS YEAR 12
Test 1 2016
Bivariate Data

STUDENT'S NAME SOLUTIONS

DATE: Friday 26th February **TIME**: 50 minutes **MARKS**: 46

INSTRUCTIONS:

Standard Items: Pens, pencils, drawing templates, eraser
Special Items: Three approved calculators, 1 A4 page of notes

Questions or parts of questions worth more than 2 marks require working to be shown to receive full marks.

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1. (3 marks)

The coefficient of determination between the variables x and y is 0.85 and the line of regression of y on x is $y = -0.46x + 5.3$.

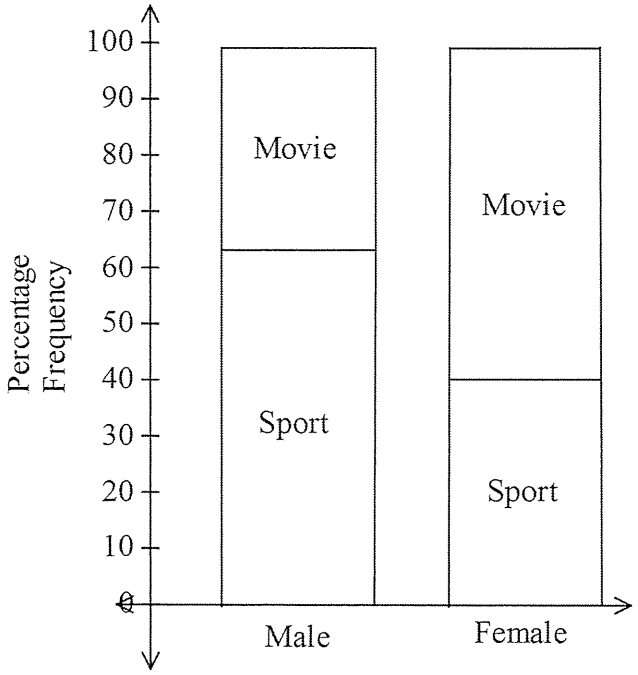
Which of the following statements must be true?

A: The correlation coefficient between x and y is 0.92.
B: The response variable is y and the explanatory variable is x.
C: The regression line passes through 85% of the points
D: The correlation coefficient between x and y is $-(0.85^2)$
E: 85% of the variation in y can be explained by the variation in x.
F: As x decreases y increases.
G: 85% of the variation in x can be explained by the variation in y.

2. (5 marks)

A survey was conducted on the relationship between gender and TV show preference (movies or sport)

The results are shown below in the segmented column graph.



(a) For this survey, determine

(i) The explanatory variable [1]

GENDER

(ii) The response variable [1]

TV SHOW

(b) For this survey, is there any association between the two variables? Explain your answer. [3]

YES

MALES PREFER SPORT

FEMALES PREFER MOVIES

3. (12 marks)

A survey was conducted to determine whether being in a specific year group will be associated with students having a part time job.

The information collected is shown in the table below.

	Part time job	No job
Year 10	28	45
Year 11	31	35
Year 12	42	39

(a) State the explanatory variable and the response variable. [2]

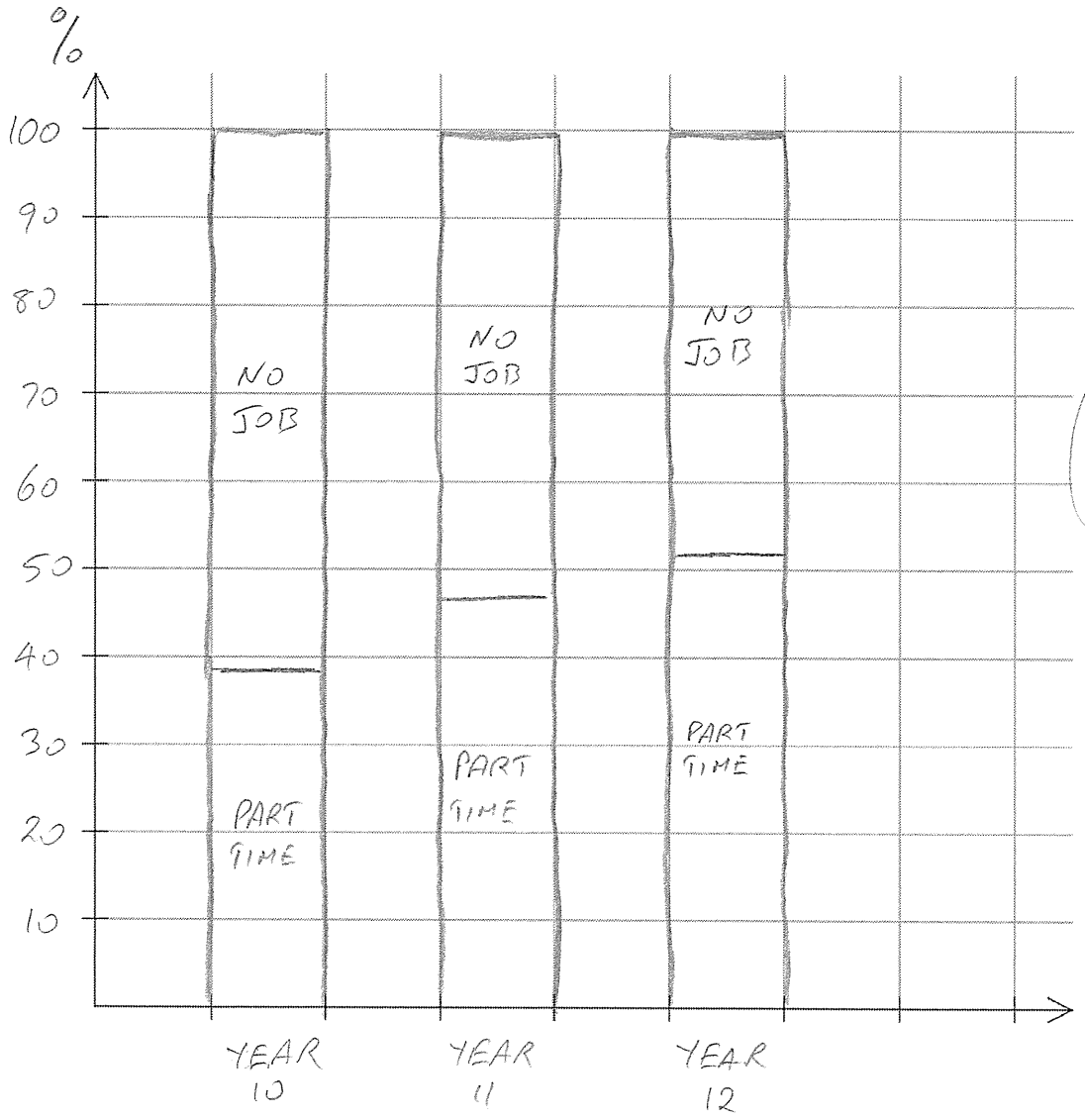
EXPLANATORY YEAR GROUP

RESPONSE PART TIME JOB

(b) Convert the two-way table above into a column or row percentage table appropriate to the explanatory/response variables. [3]

	Part time	No job	
Year 10	38%	62%	100%
Year 11	47%	53%	100%
Year 12	52%	48%	100%

(c) Construct a segmented column graph from the data in (b). [4]



(d) For this survey, is there any association between the two variables? Explain your answer. [3]

YES

THE OLDER STUDENTS HAVE MORE PART TIME JOBS

THE OLDER STUDENTS HAVE LESS OF NO JOBS

4. (17 marks)

The statistics below show the age of a company's employees and the number of absent work days in the last year.

Age (a)	22	46	38	27	51	28	36	50	34	44
Absent days (d)	10	3	6	9	4	8	37	3	7	2

(a) Identify the outlier and remove it from any further calculations [1]

(36, 37)

(b) Determine

(i) The correlation coefficient between age and days absent [1]

$r = -0.94$

(ii) The equation of the line of regression of d on a [1]

$\hat{d} = -0.256a + 15.43$

(c) Describe the value of the correlation coefficient [2]

STRONG
NEGATIVE

(d) (i) As age increases, in general, what happens to the number of days absent? [1]

DECREASE

(iii) What precise mathematical evidence confirms your answer to (d) (i)? [1]

REGRESSION LINE GRADIENT NEGATIVE

OR r NEGATIVE

(e) Determine the coefficient of determination and explain what information this reveals. [2]

$r^2 = 0.88$

88% OF VARIATION IN d EXPLAINED BY VARIATION IN a.

(f) Determine the centroid. [1]

(37.8, 5.8)

(g) Predict the number of absent work days for an employee who was 57 years old. [1]

$0.86 \approx 1$ DAY

(h) Comment on the prediction in (g) [2]

UNRELIABLE

EXTRAPOLATION

(i) What change would be expected in the number of absent work days for an employee over 8 years. Justify your answer. [2]

$8x - 0.256$

$\approx$ 2 DAYS LESS ABSENT

(j) The boss of this company was heard to say that the number of absent work days was directly attributable to the age of the worker. Comment on this statement. [2]

NOT APPROPRIATE

CAUSE NOT ESTABLISHED

5. (9 marks)

The table below shows pairs of readings of M and t obtained from an experiment.

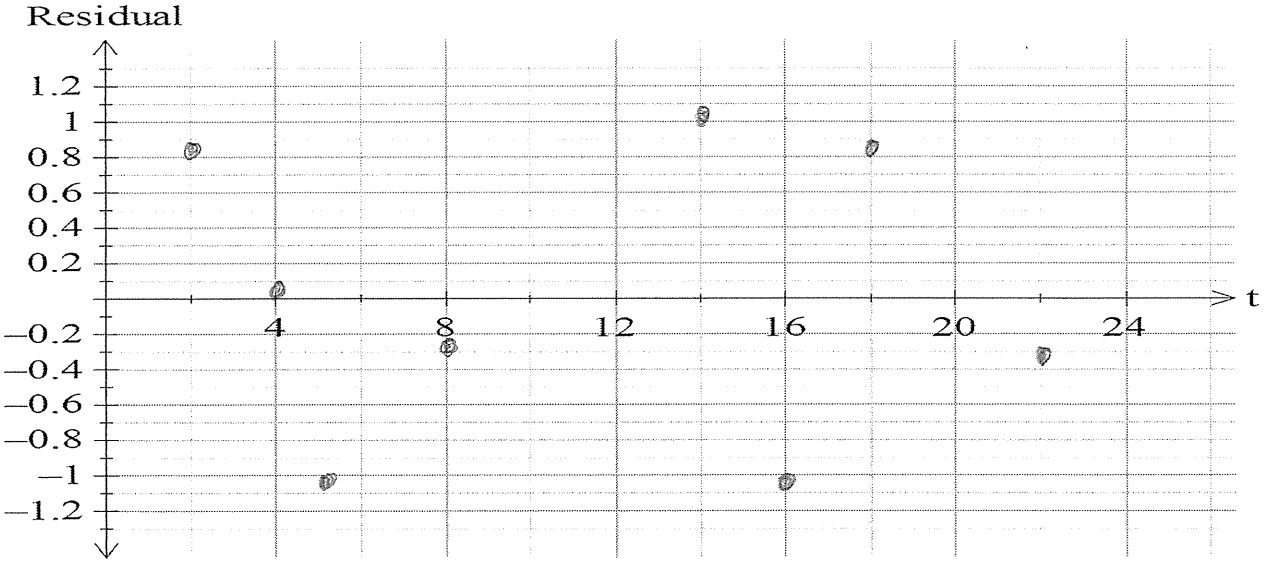
t	2	4	5	8	14	16	18	22
M	4.3	5.5	5.4	9.2	16.5	16.4	20.3	23.1
Residual	0.81	0.02	-1.08	-0.27	1.05	-1.05	0.86	-0.34

(a) Determine the least squares regression line of M on t. [2]

$\hat{M} = 0.997t + 1.491$

(b) Complete the row of residuals in the table. [2]

(c) On the axes below, draw the graph of the residuals for M [3]



(d) Comment on the appropriateness of a linear relationship between M and t. [2]

LINEAR RELATIONSHIP APPROPRIATE

NO PATTERN IN RESIDUALS