

UNIVERSITY OF BOLTON

**SCHOOL OF THE BUILT ENVIRONMENT &
ENGINEERING**

BSc(HONS) IN ARCHITECTURAL TECHNOLOGY

**BSc(HONS) IN BUILDING SURVEYING AND
PROPERTY MANAGEMENT**

BSc(HONS) IN CONSTRUCTION MANAGEMENT

**BSc(HONS) IN QUANTITY SURVEYING AND
COMMERCIAL MANAGEMENT**

SEMESTER ONE EXAMINATION 2008/2009

MATHEMATICS & STATISTICS

MODULE NO: BLT1011

Date: Thursday 22 January 2009

Time: 10.00 am -12.00 noon

INSTRUCTIONS TO CANDIDATES:

There are **FOUR** questions.

Answer **THREE** questions only.

All questions carry equal marks,
30 marks for each question.

Marks for parts of questions are shown
in brackets.

All working must be shown. Solutions
obtained by programming an electronic
calculator are not acceptable.

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1. (a) Transpose the following formulae to make the indicated variable the subject.

(i) $a = \frac{wl^2}{\pi d^2}$ (2 marks)

(ii) $x = \frac{3c + 5k}{4k - 2b}$ (3 marks)

- (b) Solve the simultaneous equations

$$\begin{aligned} \frac{3}{x} + \frac{6}{y} &= 4 \\ \frac{9}{x} - \frac{12}{y} &= -3 \end{aligned} \quad (5 \text{ marks})$$

- (c) Two of the monthly wage costs for casual employees at a construction site are given below. Use this information to calculate the individual monthly wage paid by the firm to bricklayers and joiners.

Five bricklayers and four joiners £29,600

Two bricklayers and five joiners £20,000 (5 marks)

- (d) Solve the following Quadratic Equations

i) $\frac{x+2}{x} = \frac{x-3}{5}$ (5 marks)

ii) $x^4 - 5x^2 + 6 = 0$ (5 marks)

- (e) To make it secure, a rectangular construction site with an area of 800 m^2 is to be fenced. If 120 metres of fencing is required, calculate the dimensions of the site.

(5 marks)

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2. (a) From point A , the angle of elevation to the top of a suspension bridge tower is 30° .

From point B , on the same level as A , but 100 metres further away from the tower, the angle of elevation is 20° . Calculate the height of the top of the tower above the level of AB .

(6 marks)

- (b) A building plot has the dimensions and shape shown below. Calculate:-

- (i) The area

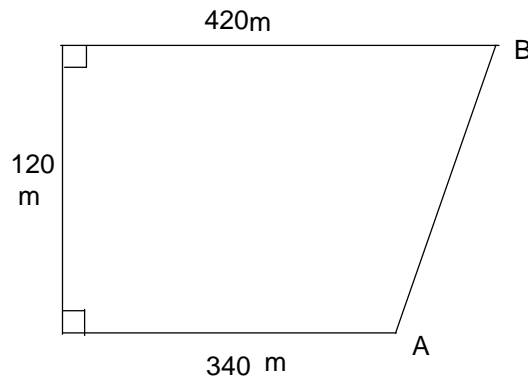
(2 marks)

- (ii) The distance AB

(2 marks)

- (iii) Angle B .

(2 marks)



- (c) A closed container used to store diesel fuel on a construction site, is in the form of an horizontal cylinder, of diameter 2 metres, with the addition of two hemispherical ends, the overall length is 4 metres. Neglecting the thickness of the container, calculate the capacity of the container in both cubic metres and litres.

(8 marks)

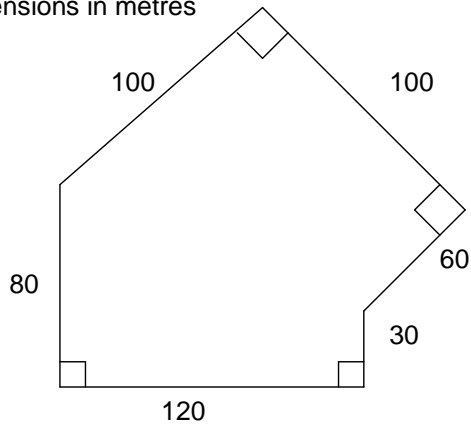
Question 2 continued over the page...

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Question 2 continued

- (d) A proposed development site has the dimensions shown below. The Developer proposes to build 60 houses with an average plot size of 220 square metres. Calculate the percentage of the site which would then be available for access roads, open spaces etc.

(10 marks)

All dimensions in metres



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3. (a) To assess its future policy on property development in a particular area, a company surveys the number of houses sold per week over the previous 52 weeks with the following results.

No. of houses sold per week	0	1	2	3	4	5	6	7	8	9	10
No of weeks this No. sold	2	1	3	6	12	8	6	5	3	4	2

For these results :-

- i) Draw a bar-chart (5 marks)
 - ii) Explain why a histogram would be inappropriate (2 marks)
 - iii) Calculate the Mode, the Median and the Mean (5 marks)
 - iv) Calculate the Standard Deviation (5 marks)
 - v) The number of weeks when more than 4 houses were sold. (1 mark)
- (b) Two types of 15mm copper pipe fittings are delivered to a construction site. One type already contains sufficient solder to effect a joint, the other requiring the addition of solder, the two types being known as 'solder ring' and 'plain' respectively. The delivery consists of 1000 solder ring and 600 plain fittings which have unfortunately been mixed together. Calculate the probability that a fitting selected at random will be :-
- (i) Solder ring (2 marks)
 - (ii) Plain (2 marks)
- If two fittings are selected at random, calculate the probability that they will be
- (iii) both plain (4 marks)
 - (iv) one of each (4 marks)

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4. The following table shows the age and annual maintenance costs of the 10 vehicles owned by a construction company.

Age of Vehicle. x years	3	5	4	8	6	3	4	6	8	5
Annual Maintenance cost. £ y	150	370	150	220	185	100	120	190	210	160

- i) Draw a 'Scatter Diagram'. (6 marks)
- ii) Calculate the equation of the 'least squares' regression line. (12 marks)
- iii) plot this line on the scatter diagram. (3 marks)
- iv) Use this line to estimate the expected maintenance costs of a 7 year old vehicle. (2 marks)
- v) Calculate the Correlation Coefficient (7 marks)

END OF QUESTIONS

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Formula Sheet

$$\text{If } ax^2 + bx + c = 0, \text{ then } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\sin = \frac{\text{opposite}}{\text{hypoteneuse}}; \quad \cos = \frac{\text{adjacent}}{\text{hypoteneuse}}; \quad \tan = \frac{\text{opposite}}{\text{adjacent}}$$

$$\text{Volume of a Cylinder} = \pi r^2 h; \quad \text{Volume of a Sphere} = \frac{4}{3} \pi r^3$$

$$\text{Mean} = \frac{\sum fx}{\sum f}; \quad \text{S.D.} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$$

If the regression line has the equation $y = mx + c$, and n is the number of pairs of results, then: –

$$m = \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - \left(\sum x\right)^2}; \quad \text{and } c = \frac{\sum y \sum x^2 - \sum x \sum xy}{n \sum x^2 - \left(\sum x\right)^2}$$

$$\text{The Correlation Coefficient, } r = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sqrt{\left(\sum x^2 - \frac{\left(\sum x\right)^2}{n}\right) \left(\sum y^2 - \frac{\left(\sum y\right)^2}{n}\right)}}$$

END OF PAPER