MTH4108 Probability I

End-term Test

4:00pm, Monday 14 December 2009

Duration: 40 minutes

Answer All Questions. Each question carries 25 marks.

Calculators are NOT permitted in this examination.

Write your answers on the question paper. If you need more space then use the blank pages at the end of the booklet and be sure to number your answers clearly.
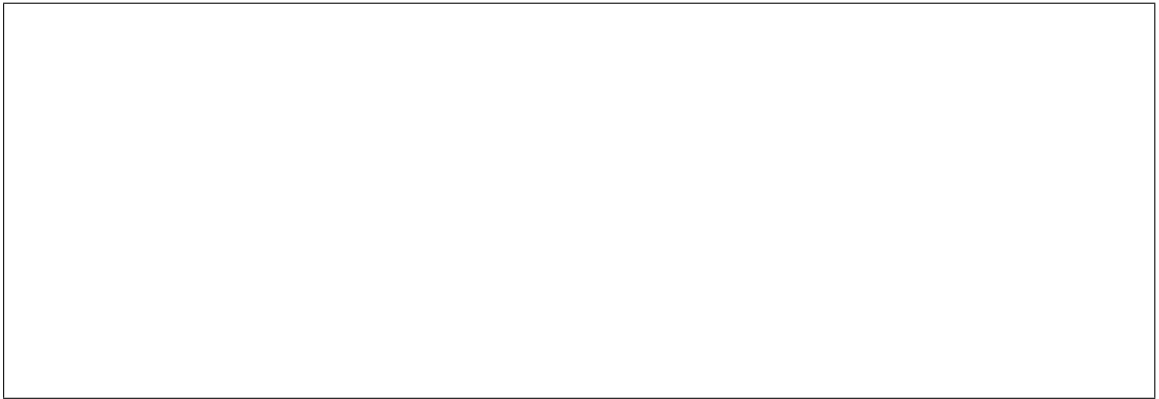
NAME:

STUDENT NUMBER:

EXERCISE CLASS GROUP:

1.

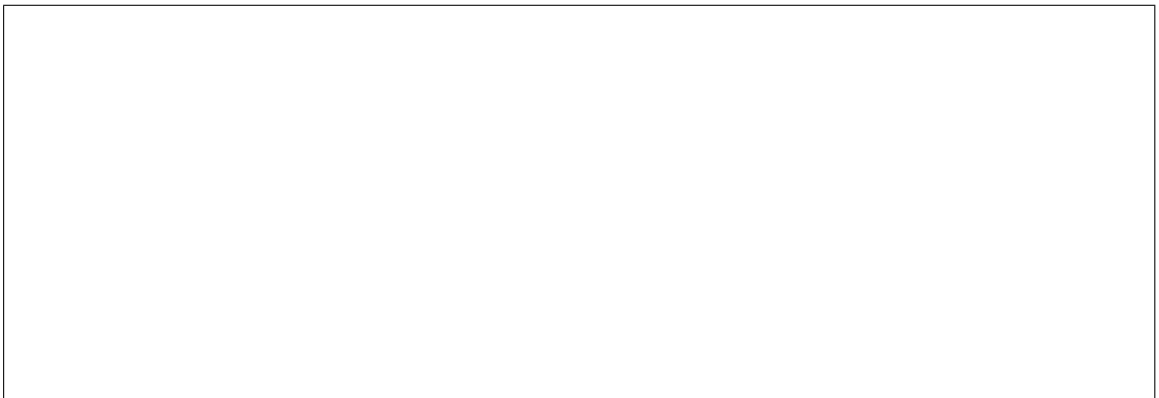   i) State the Theorem of Total Probability (you are not required to prove it).

    ii) A football team has probability 1/3 of winning its next game, probability 1/6 of drawing, and probability 1/2 of loosing. The probability that the manager is sacked after the game is 1/10 if it is won, 1/2 if it is drawn, and 9/10 if it is lost. What is the probability that the manager is sacked after the game?

2. I throw a fair coin twice. Let X be the random variable defined by putting $X = 0$ if both throws are heads, $X = 1$ if both throws are tails, and $X = 2$ if one throw is a head and the other throw is a tail.
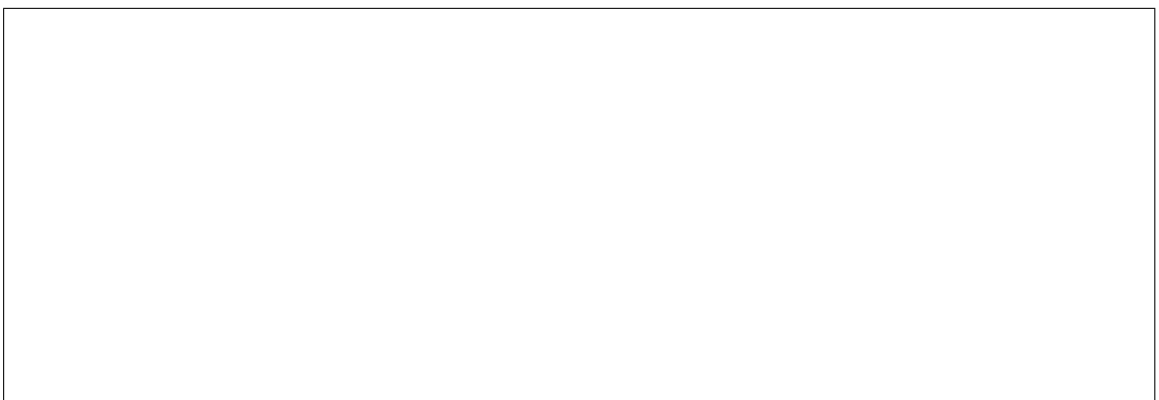
i) Determine the probability mass function of X.

ii) What is the expected value of X?

iii) What is the variance of X?

3. Suppose that X is a Binomial$(3, 1/3)$ random variable.

  i) Give an example of a 'real life' situation in which X would occur.

  ii) Determine the probability mass function of X.

  iii) Determine the cumulative distribution function of X.

4. A continuous random variable X has cumulative distribution function:

$$F_X(x) = \begin{cases} 0 & \text{if } x \leq 0 \\ x^3 & \text{if } 0 < x \leq 1 \\ 1 & \text{if } x > 1 \end{cases}$$

i) Find the probability density function of X.

ii) Calculate the expectation of X.

iii) Calculate the variance of X.

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