



EST.MM

HIBERNIA COLLEGE DUBLIN

Computing



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Tutorial: Maths for Computing



2001

Question 11

- (a) The code to open a combination lock is an ordered sequence of four digits chosen from the set $\{1, 2, 3, 4, 5, 6\}$. How many different codes are possible
- (i) if repetition is allowed?
 - (ii) if repetition is not allowed?

[2]



2004

Question 8 An ordered sequence of four digits is formed by choosing digits without repetition from the set $\{1, 2, 3, 4, 5, 6, 7\}$.

(a) Determine:

- (i) the total number of such sequences;
- (ii) the number of sequences which begin with an odd number;
- (iii) the number of sequences which end with an odd number;

**2003**

Question 9 A pin number is formed by choosing an ordered sequence of 4 digits from the set $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$ where repetitions are not allowed but numbers beginning with 0 are.

- (a) How many different numbers can be formed? [1]
- (b) How many numbers will be (i) odd (ii) greater than or equal to 8000 (iii) odd and greater than or equal to 8000? [4]



2001

- (b) Twelve balls numbered $1, 2, 3, \dots, 12$, are placed in a container and three balls are drawn at random without replacement. How many different selections of three balls are possible, if the order of selection is not important? [2]
- (c) In the experiment described in part (b), let A be the event that the number on each ball drawn is at most 5. Let B be the event that the number on each ball drawn is odd. Calculate the probability of each of the events A , B and $A \cap B$. [6]



2001

**2002**

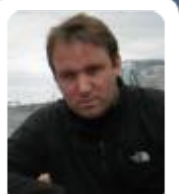
Question 10 A deck of cards has 52 playing cards. The deck has 4 suits (Spades, Hearts, Diamonds and Clubs), with 13 different cards in each suit. We can represent each card by its suit and number (from 1 to 13).

In an experiment two cards are chosen at random and removed from the deck of cards. Let A be the event that both cards are Spades, and let B be the event that one card is an Ace (with number 1) and the other card is a picture card (with number 11, 12 or 13).

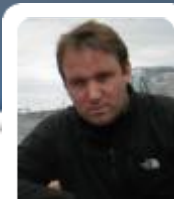


2002

- (a) Describe a sample space to model the out comes of this experiment, giving the total number of possibilities. You may assume that the order in which the cards are choosen is not important. [4]
- (b) Calculate the probabilities of A , B , $A \cap B$ and $A \cup B$. [4]
- (c) Are A and B independent events? Justify your answer. [2]



2002



2003



2003

(c) If A is the event that the number is odd and B is the event that the number is greater than or equal to 8000 calculate the following probabilities:

(i) $P(A)$

(ii) $P(B)$

(iii) $P(A \cap B)$.

[3]



2003

- (d) Draw a Venn diagram to show the relationship between the sets A and B above.
- (i) Shade the region containing the numbers which are even and ≥ 8000 .
 - (ii) Put the number 7052 in the correct region on your diagram. [2]



2004

- (iv) the number of sequences which begin and end with an odd number;
- (v) the number of sequences which begin with an odd number or end with an odd number or both;
- (vi) the number of sequences which begin with an odd number or end with an odd number but not both. [6]



2004

- (b) By finding the number of such sequences or otherwise find the probability that the sequence:
- (i) ends with an even number;
 - (ii) begins and ends with an even number. [4]



2004



2005

Question 8 A college teaches courses in mathematics, computing and statistics. Students choose a range of courses from these three subject areas. Currently 600 students are enrolled of whom 300 study mathematics courses, 120 study statistics and 380 study computing courses. 40 students study courses from all three subject areas. 200 mathematics students study computing as well. 60 computing students also study statistics and 70 statistics students also study mathematics.



2005

- (a) Let the subject areas be represented by the letters M for mathematics, C for computing and S for statistics. Draw a labelled Venn diagram showing the areas M , C , and S in such a way as to represent the students studying at the college. On your diagram show the number of students studying in each region of the Venn diagram. [3]
- (i) How many students study none of these courses at all?
- (ii) How many students study mathematics but not computing or statistics?



2005

- (iii) How many students study courses from precisely two of these subject areas? [3]
- (b) What is the probability that a student at this college will study precisely
 - (i) one course?
 - (ii) two courses?
 - (iii) three courses? [3]
- (c) What is the probability that a student from the college who is studying mathematics is also studying computing? [1]



2005



2006

Question 7 A 4 letter code is made from the letters $\{a,b,c,d,e\}$, where repetitions are allowed and the order of the letters in the code is significant - for example “a,a,e,c” is a different code to “a,c,e,a”.

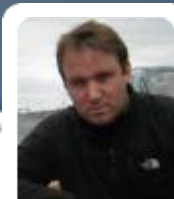
Let \mathcal{U} be the set of all such codes.

Let \mathcal{V} be the set of all such codes beginning with a vowel.

Let \mathcal{P} be the set of all such codes which are palindromic.

(A palindromic code is a string of letters which read the same backwards as forwards, for example “a,e,c,e,a” is a 5 letter palindromic code.)

(a) How many elements are there in the sets \mathcal{U} , \mathcal{V} and \mathcal{P} ? [3]



2006



2006

- (b) Draw a Venn diagram to show the relationship between the sets \mathcal{U} , \mathcal{V} and \mathcal{P} .
Show the relevant number of elements in each region of your diagram. [4]
- (c) What is the probability that a code chosen in this way:
- (i) begins with a vowel;
 - (ii) is palindromic;
 - (iii) both begins with a vowel and is palindromic? [3]



2007

Question 8 Given S is the set of all 5 digit binary strings, E is the set of a 5 digit binary strings beginning with a 1 and F is the set of all 5 digit binary strings ending with two zeroes.

- (a) Find the cardinality of S , E and F . [3]
- (b) Draw a Venn diagram to show the relationship between the sets S , E and F .
Show the relevant number of elements in each region of your diagram. [3]

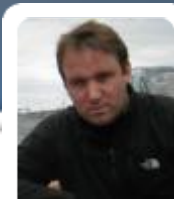


2007

(c) What is the probability that a 5 digit binary string chosen at random :

- (i) begins with a 1;
- (ii) ends with two zeroes;
- (iii) both begins with a 1 and ends with two zeroes;
- (iv) either begins with a 1 or ends with two zeroes or both? [3]

(d) Say whether or not E and F are independent events, justifying your answer. [1]



2007