Discrete Maths (Q 6 & 7, Paper 2)

2007

6 (a) Six people, including Mary and John, sit in a row.
(i) How many different arrangements of the six people are possible.

(ii) In how many of these arrangements are Mary and John next to each other?

(b) α and β are the roots of the quadratic equation $px^2 + qx + r = 0$.

$u_n = l\alpha^n + m\beta^n$, for all $n \in \mathbf{N}$.

Show that $pu_{n+2} + qu_{n+1} + ru_n = 0$, for all $n \in \mathbf{N}$.

(c) w white discs and r red discs are placed in a box. Two of the discs are drawn at random from the box. The probability that both discs are red is p.
(i) Find p in terms of w and r.

(ii) When $w = 1$, find the value of r for which $p = \frac{1}{2}$.

(iii) There are other values of w and r that also give $p = \frac{1}{2}$.
The next smallest such value is even.
By investigating the even numbers in turn, find this value of w and the corresponding value of r.

7 (a) How many different selections of four letters can be made from the letters of the word FLORIDA?

(ii) How many of these selections contain at least one vowel?

(b) Two dice are thrown.
(i) What is the probability of getting two identical numbers or a total of five?

(ii) What is the probability that the product of the two numbers thrown is at least twice their sum?

(c) (i) Find, in terms of a and d, the mean of the first seven terms of an arithmetic sequence with first term a and common difference d.

(ii) Show that the standard deviation of these seven numbers is $2d$.

ANSWERS

6 (a) (i) 720 (ii) 240

(c) (i) $\frac{r}{(r+w)} \times \frac{(r-1)}{(r+w-1)}$ (ii) $r = 3$ (iii) $w = 6$, $r = 15$

7 (a) (i) 35 (ii) 34

(b) (i) $\frac{5}{18}$ (ii) $\frac{11}{36}$

(c) (i) $a + 3d$