Discrete Maths (Q 6 & 7, Paper 2)

1999

6 (a) In how many ways can a group of five people be selected from four women and four men?
In how many of these groups are there exactly three women?

(b) Solve the difference equation
$u_{n+2} - 2u_{n+1} - 6u_n = 0$, where $n \geq 0$,
given that $u_0 = 0$ and $u_1 = 14$.

(c) In a class of 24 students, there are 14 boys and 10 girls.
In a particular week (Monday to Sunday inclusive), three students celebrate their birthdays. Assume that the birthdays are equally likely to fall on any day of the week and that the birthdays are independent of each other.
What is the probability that these three students

(i) are three boys or three girls

(ii) have birthdays falling on different days of the week or on the same day of the week other than Monday?

7 (a) Six discs of equal size are stacked one on top of the other. There are two identical red discs and one each of blue, yellow, green and white.

In how many different ways can the six discs be stacked so that the two red discs are either at the top or at the bottom?

(b) Two balls are at the same time taken at random from a box containing three black, three red and three yellow balls.
Find the probability that
(i) both balls are yellow
(ii) neither of the two balls is yellow
(iii) at least one of the two balls is yellow.

(c) The numbers a, $3a$, b, $2b$ have mean $2b$ and standard deviation σ.
(i) Express b in terms of a.
(ii) Express σ in terms of a.
(iii) Find the range of values of a for which $\sigma^2 < 18 \cdot 5$.

ANSWERS

6 (a) 56, 24

6 (b) $u_n = \sqrt{7}(1+\sqrt{7})^n - \sqrt{7}(1-\sqrt{7})^n$

6 (c) (i) $\frac{11}{46}$ (ii) $\frac{216}{343}$

7 (a) 96

7 (b) (i) $\frac{1}{12}$ (ii) $\frac{5}{12}$ (iii) $\frac{7}{12}$

7 (c) (i) $\frac{4}{5}a$ (ii) $\frac{\sqrt{74}}{10}a$ (iii) $-5 < a < 5$