

DISCRETE MATHS (Q 6 & 7, PAPER 2)

1996

- 6 (a) In how many ways can a group of five be selected from ten people?  
How many groups can be selected if two particular people from the ten cannot be in the same group?

- (b) There are seven white and four black beads in a bag. A bead is picked at random and not replaced. A second bead is then picked.  
(i) Find the probability that both beads are the same colour.

The two beads are returned to the bag and three red beads are added. Three beads are then picked at random without replacement. Find the probability that  
(ii) all three beads are different in colour

(iii) at least two beads of the same colour are picked.

- (c) Show that

$$u_n = \frac{1}{3} \{ (1 + \sqrt{3})^n - (1 - \sqrt{3})^n \}$$

is the solution of the difference equation

$$u_{n+2} - 2u_{n+1} - 2u_n = 0, \quad n \geq 0$$

$$\text{when } u_0 = 0 \text{ and } u_1 = \frac{2\sqrt{3}}{3}.$$

Verify this solution.

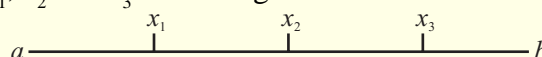
- 7 (a) Four numbers have a mean  $p$ .  
Five numbers have a mean  $x$ .  
These nine numbers have a mean  $q$ .  
Express  $x$  in terms of  $p$  and  $q$ .

- (b) Two dice  $A$  and  $B$  are cast. What is the probability of getting  
(i) a total of two or a total of six?

(ii) a total greater than nine or a total which is prime?

(iii) a total which is three times as great as other possible totals?

- (c) Real numbers  $x_1, x_2$  and  $x_3$  are each greater than  $a$  and less than  $b$  as shown on the number line.



Prove that

(i)  $a < \bar{x} < b$  where  $\bar{x}$  is the mean of  $x_1, x_2$  and  $x_3$ .

(ii)  $\sigma \leq b - a$  where  $\sigma$  is the standard deviation of  $x_1, x_2$  and  $x_3$ .

**ANSWERS**

6 (a) 252, 196

(b) (i)  $\frac{27}{55}$       (ii)  $\frac{3}{13}$       (iii)  $\frac{10}{13}$

7 (a)  $x = \frac{9q - 4p}{5}$

(b) (i)  $\frac{1}{6}$       (ii)  $\frac{19}{36}$       (iii)  $\frac{5}{18}$