

DISCRETE MATHS (Q 6 & 7, PAPER 2)

2004

6 (a) A committee of five is to be selected from six students and three teachers.

- (i) How many different committees of five are possible?
- (ii) How many of these possible committees have three students and two teachers?

6 (b) (i) Solve the difference equation $3u_{n+2} - 2u_{n+1} - u_n = 0$, where $n \geq 0$, given that

$$u_0 = 3 \text{ and } u_1 = 7.$$

- (ii) Evaluate $\lim_{n \rightarrow \infty} u_n$.

6 (c) Eight cards are numbered 1 to 8. The cards numbered 1 and 2 are red, the cards numbered 3 and 4 are blue, the cards numbered 5 and 6 are yellow and the cards numbered 7 and 8 are black.

Four cards are selected at random from the eight cards.

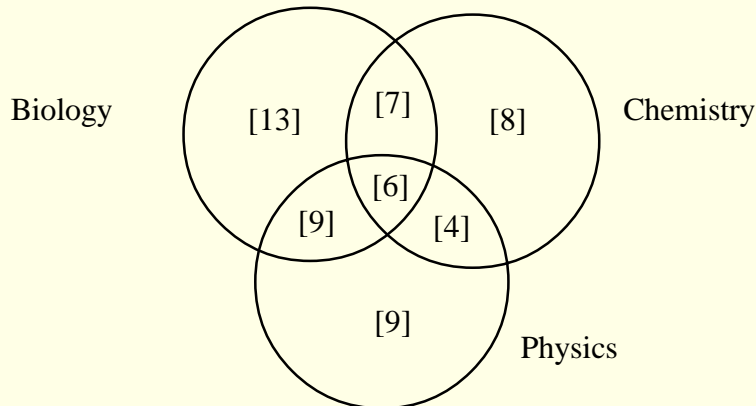
Find the probability that the four cards selected are:

- (i) all of different colours
- (ii) two odd-numbered cards and two even-numbered cards
- (iii) all of different colours, two odd-numbered and two even-numbered.

7 (a) At the Olympic Games, eight lanes are marked on the running track. Each runner is allocated to a different lane. Find the number of ways in which the runners in a heat can be allocated to these lanes when there are

- (i) eight runners in the heat
- (ii) five runners in the heat and any five lanes may be used.

7 (b) In a class of 56 students, each studies at least one of the subjects Biology, Chemistry, Physics. The Venn diagram shows the number of students studying the various combinations of subjects.



- (i) A student is picked at random from the whole class. Find the probability that the student does not study Biology.
- (ii) A student is picked at random from those who study at least two of the subjects. Find the probability that the student does not study Biology.
- (iii) Two students are picked at random from the whole class. Find the probability that they both study Physics.
- (iv) Two students are picked at random from those who study Chemistry. Find the probability that exactly one of them studies Biology.

7 (c) The mean of the real numbers p , q and r is \bar{x} and the standard deviation is σ .

- (i) Show that the mean of the four numbers of p , q , r and \bar{x} is also \bar{x} .
- (ii) The standard deviation of p , q , r and \bar{x} is k . Show that $k : \sigma = \sqrt{3} : 2$.

ANSWERS

- 6 (a) (i) 126 (ii) 60
- 6 (b) (i) $u_n = 6 - 3(-\frac{1}{3})^n$ (ii) 6
- 6 (c) (i) $\frac{8}{35}$ (ii) $\frac{18}{35}$ (iii) $\frac{3}{35}$
- 7 (a) (i) 40,320 (ii) 6,720
- 7 (b) (i) $\frac{3}{8}$ (ii) $\frac{2}{13}$ (iii) $\frac{27}{110}$ (iv) $\frac{13}{25}$