DISCRETE MATHS (Q 6 & 7, PAPER 2)

2005

6 (a) How many three-digit numbers can be formed from the digits 1, 2, 3, 4, 5, if

    (i) the three digits are all different

    (ii) the three digits are all the same?

6 (b) (i)   Solve the difference equation $u_{n+2} - 4u_{n+1} - 8u_n = 0,$ where $n \geq 0,$ given that $u_0 = 0$ and $u_1 = 2.$

    (ii)   Verify that your solution gives the correct value for u_2.

6 (c) Nine cards are numbered from 1 to 9. Three cards are drawn at random from the nine cards.

    (i)   Find the probability that the card numbered 8 is not drawn.

    (ii) Find the probability that all three cards drawn have odd numbers.

    (iii) Find the probability that the sum of the numbers on the cards drawn is greater than the sum of the numbers on the cards not drawn.

7 (a) (i) How many different groups of four can be selected from five boys and six girls?

(ii) How many of these groups consist of two boys and two girls?

7 (b) There are sixteen discs in a board-game: five blue, three green, six red and two yellow. Four discs are chosen at random. What is the probability that

(i) the four discs are blue

(ii) the four discs are the same colour

(iii) all four discs are different in colour

(iv) two of the discs are blue and two are not blue?

7 (c) On 1st September 2003 the mean age of the first-year students in a school is 12·4 years and the standard deviation is 0·6 years. One year later all of these students have moved into second year and no other students have joined them.

(i) State the mean and the standard deviation of the ages of these students on 1st September 2004. Give a reason for each answer.

A new group of first-year students begins on 1st September 2004. This group has a similar age distribution and is of a similar size to the first-year group of September 2003.

(ii) State the mean age of the combined group of the first-year and second-year students on 1st September 2004.

(iii) State whether the standard deviation of the ages of this combined group is less than, equal to, or greater than 0·6 years. Give a reason for your answer.

ANSWERS

6 (a) (i) 60   (ii) 5

6 (b) (i) $u_n = \frac{\sqrt{3}}{6}(2 + 2\sqrt{3})^n - \frac{\sqrt{3}}{6}(2 - 2\sqrt{3})^n$ (ii) $u_2 = 8$

6 (c) (i) $\frac{2}{3}$ (ii) $\frac{5}{42}$ (iii) $\frac{1}{42}$

7 (a) (i) 330   (ii) 150

7 (b) (i) $\frac{1}{364}$ (ii) $\frac{1}{91}$ (iii) $\frac{9}{91}$ (iv) $\frac{55}{182}$

7 (c) (i) 13·4 years, 0·6 years   (ii) 12·9 years   (iii) Greater