

DISCRETE MATHS (Q 6 & 7, PAPER 2)

2008

- 6 (a) In a certain subject, the examination consists of a project, a practical test, and a written paper. The overall result is the weighted mean of the percentages achieved in these three components, using the weights 2, 3 and 5, respectively. Michael scores 65% in the project and 80% in the practical. What percentage mark must he get in the written paper in order to get an overall result of 70%?
- (b) Solve the difference equation $u_{n+2} - 4u_{n+1} + u_n = 0$, where $n \geq 0$, given that $u_0 = 1$ and $u_1 = 2$.
- (c) A bag contains discs of three different colours. There are 5 red discs, 1 white disc and x black discs. Three discs are picked together at random.
- (i) Write down an expression in x for the probability that the three discs are all different in colour.
- (ii) If the probability that the three discs are all different in colour is equal to the probability that they are all black, find x .

- 7 (a) Katie must choose five subjects from nine available subjects.
The nine subjects include French and German.
- (i) How many different combinations of five subjects are possible?
 - (ii) How many different combinations are possible if Katie wishes to study German but not French?
- (b) Four cards are drawn together from a pack of 52 playing cards.
Find the probability that
- (i) the four cards drawn are the four aces
 - (ii) two of the cards are clubs and the other two are diamonds
 - (iii) there are three clubs and two aces among the four cards.
- (c) The arithmetic mean of the three numbers x_1, x_2, x_3 is \bar{x} .
Let $d_1 = x_1 - \bar{x}$, $d_2 = x_2 - \bar{x}$ and $d_3 = x_3 - \bar{x}$.
- (i) Show that $\sum_{r=1}^3 d_r = 0$.
 - (ii) The standard deviation of the three numbers x_1, x_2, x_3 is σ .
Given any real number b , let $k^2 = \sum_{r=1}^3 \frac{(d_r - b)^2}{3}$.
Show that $\sigma^2 = k^2 - b^2$.

ANSWERS

6 (a) 66%

(b) $u_n = \frac{1}{2}(2 + \sqrt{3})^n + \frac{1}{2}(2 - \sqrt{3})^n$

(c) (i) $\frac{30x}{(x+6)(x+5)(x+4)}$ (ii) $x = 7$

7 (a) (i) 126 (ii) 35

(b) (i) $\frac{1}{270,725}$ (ii) $\frac{468}{20,825}$ (iii) $\frac{198}{270,725}$