

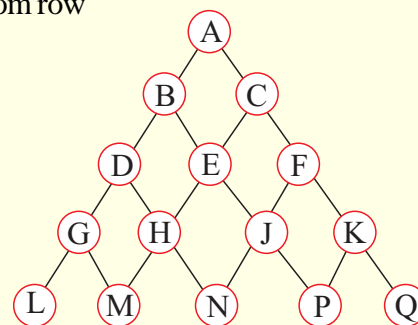
**DISCRETE MATHS (Q 6 & 7, PAPER 2)**

**2011**

6. (a) Two adults and four children stand in a row for a photograph. How many different arrangements are possible if the four children are between the two adults?
- (b) (i) Solve the difference equation  $u_{n+2} - 6u_{n+1} + 8u_n = 0$ , where  $n \geq 0$ , given that  $u_0 = 0$  and  $u_1 = 4$ .
- (ii) For what value of  $n$  is  $u_n = 30(2^n)$ ?
- (c) Five cards are drawn together at random from a standard pack of 52 playing cards. Find, in decimal form, correct to two significant figures, the probability that:
- (i) all five cards are diamonds
  - (ii) all five cards are of the same suit
  - (iii) the five cards are the ace, two, three, four and five of diamonds
  - (iv) the five cards include the four aces.

7. (a) A team of four is selected from a group of seven girls and five boys.
- (i) How many different selections are possible?
  - (ii) How many of these selections include at least one girl?

- (b) A marble falls down from A and must follow one of the paths indicated on the diagram. All paths from A to the bottom row are equally likely to be followed.



- (i) One of the paths from A to H is A-B-D-H. List the other two possible paths from A to H.
  - (ii) Find the probability that the marble passes through H or J.
  - (iii) Find the probability that the marble lands at N.
  - (iv) Two marbles fall from A, one after the other, without affecting each other. Find the probability that they both land at P.
- (c) The real numbers  $a, b$  and  $c$  have mean  $\mu$  and standard deviation  $\sigma$ .
- (i) Show that the mean of the numbers  $\frac{a-\mu}{\sigma}$ ,  $\frac{b-\mu}{\sigma}$  and  $\frac{c-\mu}{\sigma}$  is 0.
  - (ii) Find, with justification, the standard deviation of the numbers  $\frac{a-\mu}{\sigma}$ ,  $\frac{b-\mu}{\sigma}$  and

$$\frac{c-\mu}{\sigma}.$$

**ANSWERS**

6 (a) 48

(b)(i)  $u_n = 2(4)^n - 2(2)^n$  (ii)  $n = 4$

(c) (i) 0.00050 (ii) 0.002 (iii) 0.00000038

(iv) 0.000018

7 (a) (i) 495 (ii) 490

(b)(i) A-B-E-H, A-C-E-H (ii)  $\frac{3}{4}$  (iii)  $\frac{3}{8}$  (iv)  $\frac{1}{16}$

(c) (ii) 1