

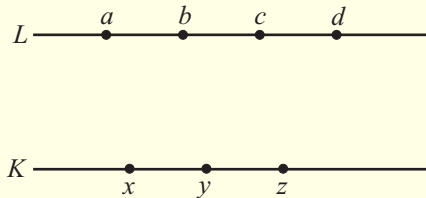
**DISCRETE MATHS (Q 6 & 7, PAPER 2)**

**2003**

- 6 (a) Eight people, including Kieran and Anne, are available to form a committee. Five people must be chosen for the committee.
- (i) In how many ways can the committee be formed if both Kieran and Anne must be chosen?
  - (ii) In how many ways can the committee be formed if neither Kieran nor Anne can be chosen?
- 6 (b) (i) Solve the difference equation  $u_{n+2} - 4u_{n+1} + 3u_n = 0$ , where  $n \geq 0$ , given that  $u_0 = -2$  and  $u_1 = 4$ .
- (ii) Verify that the solution you have obtained in (i) satisfies the difference equation.
- 6 (c) Ten discs, each marked with a different whole number from 1 to 10, are placed in a box. Three of the discs are drawn at random (without replacement) from the box.
- (i) What is the probability that the disc with the number 7 is drawn?
  - (ii) What is the probability that the three numbers on the discs drawn are odd?
  - (iii) What is the probability that the product of the three numbers on the discs drawn is even?
  - (iv) What is the probability that the smallest number on the discs drawn is 4?

- 7 (a) Five cars enter a car park. There are exactly five vacant spaces in the car park.
- In how many different ways can the five cars park in the vacant spaces?
  - Two of the cars leave the car park without parking. In how many different ways can the remaining three cars park in the five vacant spaces?

7 (b)



$L$  and  $K$  are distinct parallel lines.

$a$ ,  $b$ ,  $c$  and  $d$  are points on  $L$  such that  $|ab| = |bc| = |cd| = 1$  cm.

$x$ ,  $y$  and  $z$  are points on  $K$  such that  $|xy| = |yz| = 1$  cm.

- How many different triangles can be constructed using three of the named points as vertices?
  - How many different quadrilaterals can be constructed using four of the named points as vertices?
  - How many different parallelograms can be constructed using four of the named points as vertices?
  - If one quadrilateral is constructed at random, what is the probability that it is *not* a parallelogram?
- 7 (c) The mean of the real numbers  $a$  and  $b$  is  $\bar{x}$ . The standard deviation is  $\sigma$ .
- Express  $\sigma$  in terms of  $a$ ,  $b$  and  $\bar{x}$ .
  - Hence, express  $\sigma$  in terms of  $a$  and  $b$  only.
  - Show that  $\bar{x}^2 - \sigma^2 = ab$ .

**ANSWERS**

6 (a) (i) 20                      (ii) 6

6 (b) (i)  $u_n = 3(3)^n - 5$

6 (c) (i)  $\frac{3}{10}$                       (ii)  $\frac{1}{12}$                       (iii)  $\frac{11}{12}$                       (iv)  $\frac{1}{8}$

7 (a) (i) 120                      (ii) 60

7 (b) (i) 30                      (ii) 18                      (iii) 8                      (iv)  $\frac{5}{9}$

7 (c) (i)  $\sigma = \sqrt{\frac{(a - \bar{x})^2 + (b - \bar{x})^2}{2}}$                       (ii)  $\sigma = \frac{a - b}{2}$