

QUESTION Count the number of inversions in each of the following permutations:

(a) 1342

(b) 34215

(c) 635241

ANSWER An inversion in a permutation  $\sigma_1, \sigma_2, \dots, \sigma_n$  is a pair  $(\sigma_r, \sigma_s)$  with  $\sigma_r > \sigma_s$  but  $r < s$ .

The question can be solved either by counting such pairs or by drawing pictures and counting crossings.

(a) Two inversions:  $(3,2), (4,2)$ .

(b) Five inversions:  $(3,2), (3,1), (4,2), (4,1), (2,1)$ .

(c) Twelve inversions:

$(6,3), (6,5), (6,2), (6,4), (6,1), (3,2),$

$(3,1), (5,2), (5,4), (5,1), (2,1), (4,1)$ .