

### 016 Solution

Let  $a_1 < a_2 < \cdots < a_r$  be a choice of  $r$  numbers, no two consecutive, out of  $\{1, 2, \cdots, n\}$ . Then  $a_1, a_2 - 1, a_3 - 2, \cdots, a_r - r + 1$  is a choice of  $r$  distinct numbers out of  $\{1, 2, \cdots, n - r + 1\}$ .

Conversely, if  $b_1 < b_2 < \cdots < b_r$  is a choice of  $r$  distinct numbers out of  $\{1, 2, \cdots, n - r + 1\}$ . Then  $b_1, b_2 + 1, b_3 + 2, \cdots, b_r + r - 1$  is a choice of  $r$  numbers, no two consecutive, out of  $\{1, 2, \cdots, n\}$ .

It follows from this 1-1 correspondence that there are  $\binom{n-r+1}{r}$  ways to choose  $a_1 < a_2 < \cdots < a_r$ , no two consecutive, out of  $\{1, 2, \cdots, n\}$ .

Similarly, there are  $\binom{n-r-1}{r-2}$  ways to choose  $1 = a_1 < a_2 < \cdots < a_r = n$ , no two consecutive, out of  $\{1, 2, \cdots, n\}$ .

Therefore, there are

$$\binom{n-r+1}{r} - \binom{n-r-1}{r-2} = \frac{n}{n-r} \binom{n-r}{r}$$

ways.