1. (a) 9 × 9 × 8 since the first digit must not be zero, the second anything except the first, and the third anything but the first two.

(b) With O for odd and E for even, the four possible patterns and the number of 3-digit numbers having each pattern are

\[ EEO : 4 \times 4 \times 5 \quad EOO : 4 \times 5 \times 4 \quad OEO : 5 \times 5 \times 4 \quad OOO : 5 \times 4 \times 3. \]

The answer is the sum of these. By the way, this is 40 × 8, somewhat less than half of (a), which is 81 × 8.

2. Use the formula on page 65 or, if you don’t remember it, draw the relevant portion of the decision tree.

(a) \( \text{RANK}(7, 3, 1) = \binom{6}{3} + \binom{2}{2} + \binom{0}{1} = 21. \)

(b) We use the greedy algorithm method to compute \( \text{UNRANK}(17) \).

- Since \( \binom{6}{3} = 20 \) and \( \binom{3}{3} = 10 \), \( f(1) = 6 \) and we have 17 − 10 = 7 left to go.
- Since \( \binom{5}{2} = 10 \) and \( \binom{3}{2} = 6 \), \( f(2) = 5 \) and we have 7 − 6 = 1 left to go.
- Since \( \binom{1}{1} = 1 \), \( f(3) = 2 \).

Thus the function is 6,5,2 in one-line form.

5. Either

(0) \( n \) does not appear AND the remaining \( n - 1 \) elements form a \( k \)-list, giving the term \( 1 \times L(n - 1, k) \), OR

(1) \( n \) appears in one of the \( k \) positions AND the remaining \( n - 1 \) elements form a \( (k - 1) \)-list in the remaining \( k - 1 \) positions, giving \( k \times L(n - 1, k - 1) \), OR

(2) \( n \) appears in two of the \( k \) positions AND the remaining \( n - 1 \) elements form a \( (k - 2) \)-list in the remaining \( k - 1 \) positions, giving \( \binom{k}{2} \times L(n - 1, k - 2) \).

In other words, \( a = 1, b = k \) and \( c = \binom{k}{2} \).