8.1 and 8.2 Worksheet

1.) A biologist is attempting to classify 52,000 species of insects by assigning a sequence of 3 letters to each species. Is it possible to classify all the insects this way? If not, what is the minimum number of letters that has to be used?

2.) Until recently, all area codes (3 digits) had a 0 or 1 as the middle digit, and the first digit cannot be 1. As the restriction on the middle digit was removed, how many additional area codes were available?

3.) How many different 7-letter words can you form by arranging the letters in the word ARRANGE?

4.) A family of 2 parents and 5 children (3 girls and 2 boys) go for a movie. The parents want to sit together, and the girls want to sit together. How many ways are there to seat them in a row of 7 seats?

5.) A jar has 6 red chips, 3 green chips, and 4 orange chips. A sample of 4 chips is chosen.

(a) How many samples are possible with all red chips?

(b) How many samples are possible with 2 green and 2 orange chips?

(c) How many samples are possible with exactly 2 red chips?

Solutions

1.) Number of distinct sequences: $\underline{26} \cdot \underline{26} \cdot \underline{26} = 17,576$

If we use a sequence of four letters, then we will have $26^4 = 456,976$ distinct sequences, which would be enough.

2.) With restriction: $\underline{9} \cdot \underline{2} \cdot \underline{10} = 180$ area codes

Without restriction: $\underline{9} \cdot \underline{10} \cdot \underline{10} = 900$ area codes

Number of new area codes $= 900 - 180 = 720$

3.) Different words $\longrightarrow$ distinguishable permutations

2 A's and 2 R's $\longrightarrow \frac{7!}{2!2!} = 1260$

4.) 4! 3! 2!

5.) (a) $C(6,4) = 15$

(b) $C(3,2) \cdot C(4,2) = 3 \cdot 6 = 18$

(c) $C(6,2) \cdot C(7,2) = 15 \cdot 21 = 315$