

Counting Homework

Michael Padilla

June 6, 2024

Exercises for Section 4.2

- Consider lists made from the letters T, H, E, O, R, Y, with repetition allowed.
 - Length 4 lists: **$6 \times 6 \times 6 \times 6$**
 - Length 4 lists that begin with T: **$1 \times 6 \times 6 \times 6$**
 - Length 4 lists that do not begin with T: **$5 \times 6 \times 6 \times 6$**
- How many lists of length 3 can be made from the symbols A, B, C, D, E, F if..
 - repetition is allowed: **$6 \times 6 \times 6$**
 - repetition is not allowed: **$6 \times 5 \times 4$**
 - repetition is not allowed and the list must contain the letter A:
 $(A, -, -) = 1 \times 5 \times 4$
 $(-, A, -) = 5 \times 1 \times 4$
 $(-, -, A) = 5 \times 4 \times 1$
 $= 3(5 \times 4)$
 - repetition is allowed and the list must contain the letter A:
 $|U| = 6 \times 6 \times 6, |X^c| = 5 \times 5 \times 5, |X| = (6 \times 6 \times 6) - (5 \times 5 \times 5)$
- This problem involves 8-digit binary strings such as 10011011 or 00001010 (i.e., 8-digit numbers composed of 0's and 1's).
 - How many such string are there? **$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$**
 - How many such string end in 0? **$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 1$**
 - How many such string have 1's for their second and fourth digits? **$2 \times 1 \times 2 \times 1 \times 2 \times 2 \times 2 \times 2$**
 - How many such string have 1's for their second or fourth digits?
 $|A \cup B| = 2 \times 1 \times 2 \times 1 \times 2 \times 2 \times 2 \times 2$
 $|A| = 2 \times 1 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$
 $|B| = 2 \times 2 \times 2 \times 1 \times 2 \times 2 \times 2 \times 2$
 $= 2^7 + 2^7 - 2^6 = 192$
- This problem concerns 4-letter codes made from the letters A, B, C, D, ... , Z.
 - How many such codes can be made? **$26 \times 26 \times 26 \times 26$**
 - How many such codes have no two consecutive letters the same?
letter 1: any of all 26
letter 2: 26 - the first = 25
letter 3: 26 - the second = 25
letter 4: 26 - the third = 25
 $26 \times 25 \times 25 \times 25$
- A new car comes in a choice of five colors, three engine sizes and two transmissions. How many different combinations are there?
Total length is 3, first is 5 colors, second is 3 engine sizes and last is 2 transmissions.
 $5 \times 3 \times 2$
- A dice is tossed four times in a row. There are many possible outcomes. How many different outcomes are possible?
Length is 4, a dice has numbers from 1 to 6. **$6 \times 6 \times 6 \times 6$**

Exercises for Section 4.3

- Five cards are dealt off of a standard 52-card deck and lined up in a row.
 - How many such lineups are there that have at least one red card?
 $|U| = 52 \times 51 \times 50 \times 49 \times 48, |X^c| = 26 \times 25 \times 24 \times 23 \times 22$
 $(52 \times 51 \times 50 \times 49 \times 48) - (26 \times 25 \times 24 \times 23 \times 22)$
 - How many such lineups are there in which the cards are either all black or all hearts?
They are not black cards that are hearts, so we use the addition principle:
All black cards: $26 \times 25 \times 24 \times 23 \times 22$
All hearts: $13 \times 12 \times 11 \times 10 \times 9$
 $(26 \times 25 \times 24 \times 23 \times 22) + (13 \times 12 \times 11 \times 10 \times 9)$

Exercises for Section 4.4

- fff

Exercises for Section 4.5

- fff

Exercises for Section 4.7

- fff

Exercises for Section 4.8

- fff