Problem 1(a)

Suppose car license plates have 3 letters followed by 3 numbers, chosen uniformly at random.

- What is the probability of getting the license plate, **ABC123**?
- (1/26)*(1/26)*(1/26)*(1/10)*(1/10)*(1/10)

Problem 1(b)

Suppose car license plates have 3 letters followed by 3 numbers, chosen uniformly at random.

- What is the probability that the first letter is **A**?
- 1/26

Problem 1(c)

Suppose car license plates have 3 letters followed by 3 numbers, chosen uniformly at random.

- What is the probability that the third letter is **A**?
- 1/26

Problem 1(d)

Suppose car license plates have 3 letters followed by 3 numbers, chosen uniformly at random.

- What is the probability that the last two digits are **35**?
- (1/10)*(1/10)

Problem 1(e)

Suppose car license plates have 3 letters followed by 3 numbers, chosen uniformly at random.

- What is the probability that the license plate does **not** start with an **A**?
- 1 – 1/26 = 25/26

Problem 1(f)

Suppose car license plates have 3 letters followed by 3 numbers, chosen uniformly at random.

- What is the probability that the license plate does **not** contain an **A**?
- (25/26)*(25/26)*(25/26)
- P(1st letter ≠ A AND 2nd letter ≠ A AND 3rd letter ≠ A)

Problem 1(g)

Suppose car license plates have 3 letters followed by 3 numbers, chosen uniformly at random.

- What is the probability that the first letter is **A** or the second letter is **A**?
- $1/26 + 1/26 - (1/26)^2$
- P(1st letter = A OR 2nd letter = A) =
  P(1st letter = A) + P(2nd letter = A)
  – P(1st letter = A AND 2nd letter = A)

Problem 1(h)

Suppose car license plates have 3 letters followed by 3 numbers, chosen uniformly at random.

- What is the probability that the license plate contains an **A**?
- $1/26 + 1/26 + 1/26 - 3*(1/26)^2 + (1/26)^3$
- P(1st = A OR 2nd = A OR 3rd = A)
  = P(1st = A) + P(2nd = A) + P(3rd= A)
  – P(1st=A AND 2nd=A) – P(1st=A AND 3rd=A)
  – P(2nd=A AND 3rd=A)
  + P(1st = A AND 2nd = A AND 3rd = A)

Problem 2(a)

Suppose car license plates have 3 letters followed by 3 numbers. The letter Z is not used and the number 0 is not used. The letter A is twice as likely as all other letters, and the number 0 is twice as likely as all other numbers.

- What is the probability of getting the license plate, **ABC123**?
- (2/26)*(1/26)*(1/26)*(2/10)*(1/10)*(1/10)

Problem 2(b)

Suppose car license plates have 3 letters followed by 3 numbers. The letter Z is not used and the number 0 is not used. The letter A is twice as likely as all other letters, and the number 1 is twice as likely as all other numbers.

- What is the probability of getting the license plate, **XYZ123**?
- 0

Problem 3(a)

A student must choose exactly two out of three electives: art, French, and mathematics. They choose art with probability 5/8, French with probability 5/8, and art and French together with probability 1/4.

- What is the probability that they choose mathematics?
- P(NOT (Art AND French)) = 1 – 1/4
- = 3/4

Problem 3(b)

A student must choose exactly two out of three electives: art, French, and mathematics. They choose art with probability 5/8, French with probability 5/8, and art and French together with probability 1/4.

- What is the probability that they choose either art or French?
- P(Art OR French)
  = P(Art) + P(French) – P(Art AND French)
  = 5/8 + 5/8 – 1/4 = 1

Problem 4

A local club plans to invest $10000 to host a baseball game. They expect to sell tickets worth $15000. But if it rains on the day of game, they won't sell any tickets and the club will lose all the money invested.

- What is the expected value of the profit if there is a 20% chance of rain?
- 5000*0.8 – 10000*0.2 = $2000

Problem 5

The probability of owning a dog is 0.44.

The probability of owning a cat is 0.29.

The probability of owning both is 0.17.

- Is owning a cat independent from owning a dog?
- No.
- 0.44*0.29 = 0.128
- P(dog AND cat) ≠ P(dog)*P(cat)