# Math 170 Sections 7.5-7.6 Study Guide

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## 1 Section 7.5

**Problem 1)** In a certain community, 36% of families own a dog, 30% own a cat, and 22% of families that own a dog also own a cat.

(a) What is the probability that a family owns both a cat and a dog?

(b) What is the probability that a family owns a dog, given that it owns a cat?

**Problem 2)** Suppose we draw a single card at random from a standard deck of 52 playing cards. Let $A$ be the event that the card is a Diamond Card; let $B$ be the event that the card is Red; and let $C$ be the event that the card is a Jack.

(a) Are $A$ and $B$ independent? Justify your answer.

(b) Are $B$ and $C$ independent? Justify your answer.

**Problem 3)** Suppose a fair coin is tossed three times. What is the probability of tossing two Heads, given that the first toss results in Heads?

**Problem 4)** Suppose two distinguishable, fair, 6-sided dice are rolled. Let $X$ denote the result of the first die, and $Y$ denote the result of the second die.

(a) Determine $\Pr[X + Y = 8 | X = 3]$.

(b) Determine $\Pr[X + Y \text{ is odd } | X = 3]$.

## 2 Section 7.6

**Note:** We recall Bayes' Law for your convenience. Given events $A$ and $B$, we have that:

$$\Pr[B|A] = \frac{\Pr[A|B] \cdot \Pr[B]}{\Pr[A]}.$$

In particular, we may write:

$$\Pr[A] = \Pr[A|B] \cdot \Pr[B] + \Pr[A|\overline{B}]\Pr[\overline{B}].$$

**Problem 5)** You go to the doctor regarding an ingrown toenail. The doctor selects you at random to have a blood test for swine flu, which affects 1 in $10,000$ people. The test is 99% accurate; that is, the probability of a false positive is 1%. The probability of a false negative is 0%. What is the probability you have the swine flu, given that you test positive?

**Problem 6)** In society, 1% of people have liver cancer. For a test $T$, 90% of people that have cancer test positive. For people who do not have cancer, 8% of people have false positives. What is the probability that someone has cancer if they test positive?