7.4 Quick Notes

Conditional Probability

1) If E and F are events, and p(F)≠ 0, then "the probability of E, given F" is given by the following;

$$P(E \mid F) = \frac{P(E \cap F)}{P(F)}$$ (by doing some algebra we also get $P(E \cap F) = P(F)P(E \mid F)$)

Ex. Select a card from an ordinary deck. Let A be the event that card is a King, B=event that card is red, C= event that card is a "face" . Compute probabilities: P(A|B), P(A|C), P(B|C)

Ex) There are 5 red, 2 blue, and 1 white ball in an urn. If we randomly pull 2 balls out (without replacement), then find the probability that: a) they are both red b) they are both white c) neither is red

d) exactly one is blue e) they are the same color f) they are different colors

Ex) Box of marbles

	Red	White	Blue
Small	11	14	10
Large	3	5	7

(Assume random selection of a marble when applicable)

a) find the prob that a marble is red.

b) find the probability that a marble is small and white.

c) find the prob that a marble is small or white.

d) find the prob that a blue marble is small.

e) find the prob that a small marble is blue.

f) find the prob that a marble is large, given that it isn't red.

Ex) Of 30 vehicles on Honest Bob's lot, 12 were trucks, 23 had automatic transmissions, and 9 were trucks and had automatic transmissions. If a vehicle was randomly selected,find the probability that:

a) it was neither a truck nor an automatic.

b) it was a truck and an automatic.

c) given that a truck was selected, it was an automatic

d) given that an automatic car was selected, it was not a truck.

7.5

A and B are **<u>independent events</u>** if and only if $P(A \cap B) = P(A)P(B)$

Ex) Assume that A and B are independent events, P(A) = .42, and P(B) = .67. Find the following;

a) $P(A \cap B)$ b) $P(A \cup B)$ c) $P(A \mid B)$ d) $P(\overline{A} \mid B)$ e) $P(A \mid \overline{B})$ f) $P(\overline{A} \mid \overline{B})$ g) $P(B \mid A)$

h) $P(B \mid \overline{A})$ i) $P(\overline{B} \mid A)$ j) $P(\overline{B} \mid \overline{A})$

Ex) From the table above, are "being a large marble" and "being a red marble" independent events?

Ex. From the card problem, are events A and B or A and C independent?

Ex. A marksman hits a target with probability 0.7. Assuming independence of successive firing, find probability of:

a) 2 misses followed by 3 hits

b) 2 misses and one hit in any order

Ex. Test has 10 multiple choice questions. Probability of a correct answer on each is 0.25. Assuming independence of answers on all questions, what is the probability that a student will answer:

a) exactly 7 questions correctly

b) at least 2 questions correctly.