Unit 2
Introduction to Probability
Practice Quiz

1. Consider the experiment of dealing a card from a standard deck. The outcome noted is the denomination (ace, 2, 3, …, Jack, Queen, King) and suit (spade, heart, club, diamond). Let Q denote the event that the card is a queen and H the event that the card is a heart.

   (a) What is the union of Q and H?
   (b) What is the intersection of Q and H?
   (c) What is the conditional probability Pr(Q|H)?
   (d) What is the conditional probability Pr(H|Q)?
   (e) Are Q and H independent?

---

2. A diagnostic test for high intracranial pressure is based on observing retinal vein pulsation. The idea is that if the pressure is too high, the normal pulsation may not be observed. The following table shows the results of classifying 189 subjects according to their test results and their intracranial pressure status.

		True Status		
		High Pressure	Normal	Total
Test Result	+ = No Pulse	43	18	61
	- = Pulse	0	128	128
		43	146	189

   Using these results, calculate

   (a) sensitivity
   (b) specificity
   (c) false positive rate
   (d) false negative rate
   (e) positive predictive value
   (f) negative predictive value

---

3. Suppose that an experiment consists of flipping three coins – a penny, a nickel, and a dime – all at the same time. Assume that (1) all coins are “fair”, and (2) the coin flips are independent. Consider the following circumstances.

E = event that two or more coins land heads and

If the event E occurs, you get to keep all three coins
Otherwise, win = 0.

X = random variable representing the amount of money you get

(a) Construct the probability distribution of the random variable X. *Recall – As this variable is discrete, this exercise is asking you to list all possible values of X and their associated probabilities.*

(b) How much money would you expect to get from one run of the experiment? *Note – This might seem a little hard to solve. Think of it this way. Imagine repeating the experiment 1000 times. How much money would you expect to win over such a long run? Now divide this answer by 1000 to obtain the expected winning from one run. This is the idea of statistical expectation which we are about to learn.*