MATH-1110 (DUPRÉ) SPRING 2016 LECTURE QUIZ 4 ANSWERS

1. PRINT YOUR LAST NAME IN THE UPPER RIGHT CORNER IN LARGE CAPITAL LETTERS.

2. PRINT YOUR FIRST NAME UNDERNEATH YOUR LAST NAME IN THE UPPER RIGHT CORNER IN CAPITAL LETTERS.

3. PRINT YOUR LAB DAY AND LAB START TIME UNDERNEATH YOUR FIRST NAME IN THE UPPER RIGHT CORNER.

4. WRITE YOUR SPRING 2016 MATH-1110 COURSE SECTION NUMBER UNDERNEATH YOUR LAB DAY IN THE UPPER RIGHT CORNER.

GIVE the probability that:

5. among ten cards chosen from a standard deck of cards there will be 4 hearts and 6 spades.

ANSWER: $\dfrac{C(13;4)C(13;6)}{C(52;10)}$

6. among ten cards chosen from a standard deck of cards there will be 2 hearts, and 3 spades, and 5 diamonds.

ANSWER: $\dfrac{C(13;2)C(13;3)C(13;5)}{C(52;10)}$

7. Joe has to wait more than twenty minutes for a bus at a bus stop given he will have to wait at least 5 minutes, but not more than 25 minutes.

ANSWER: $\dfrac{25-20}{25-5} = \dfrac{5}{20} = \dfrac{1}{4}$

8. Joe sees at most 3 of ten cars observed to be speeding along a road where forty percent of the cars speed.

ANSWER: Suppose X is binomial with $n = 10$ and $p = .4$. Then the answer is $P(X \leq 3 = F_X(3)$, where F_X is the cdf for X. The values of F_X are tabulated in your textbook, and $F_X(3) = .382$, so

$$.382 = F_X(3) = P(X = 0) + P(X = 1) + P(X = 2) + P(X = 3)$$
$$= (.6)^{10} + C(10;1)(.4)(.6)^9 + C(10;2)(.4)^2(.6)^8 + C(10;3)(.4)^3(.6)^7$$

9. Joe sees exactly 3 of ten cars observed to be speeding along a road where forty percent of the cars speed.

ANSWER: Suppose X is binomial with $n = 10$ and $p = .4$. Then the answer is $P(X \leq 3 = F_X(3) - F_X(2)$, where F_X is the cdf for X. The values of F_X are tabulated in your textbook, where we find $F_X(3) = .382$ and $F_X(2) = .167$.

$$P(X = 3) = C(10;3)(.4)^3(.6)^7 = F_X(3) - F_X(2) = .382 - .167 = .215$$

10. the letters AAABBC randomly arranged in a row would end up back in alphabetical order from left to right.

ANSWER: If N denotes the number of 6 letter words that can be made by arranging these 6 letters, then the probability they end up back in alphabetical order is $1/N$. But,

$$N = \frac{6!}{3!\ 2!\ 1!} = 6 \cdot C(5;2) = (6)(10) = 60,$$

so the answer is

$$\frac{1}{N} = \frac{3!\ 2!}{6!} = \frac{1}{60}.$$

11. $Z \leq 1.2$ if Z is standard normal.

ANSWER: $P(Z \leq 1.2) = F_Z(1.2)$, where F_Z denotes the cdf for the standard normal distribution. This is tabulated and the tables are in your textbook, where we find $F_Z(1.2) = .8849$.

12. $|Z| \leq 1.2$ if Z is standard normal.

ANSWER: $P(|Z| \leq 1.2) = P(-1.2 \leq Z \leq 1.2) = F_Z(1.2) - F_Z(-1.2)$, where F_Z denotes the cdf for the standard normal distribution. This is tabulated and the tables are in your textbook, where we find $F_Z(1.2) = .8849$. By symmetry we know that $F_Z(-1.2) = 1 - F_Z(1.2) = 1 - .8849 = .1151$, which you will notice is the result of looking this up in the table directly. So, you really only need the table once. In any case, the final answer is therefore

$$P(|Z| \leq 1.2) = F_Z(1.2) - F_Z(-1.2) = .8849 - .1151 = .7698.$$

Alternately, you can easily see from symmetry of the bell curve, that $P(|Z| \leq 1.2) = P(-1.2 \leq Z \leq 1.2) = 2P(0 \leq Z \leq 1.2) = 2[.8849 - .5] = 2(.3849) = .7698$, the same result again. This last way is clearly the simplest, because subtracting .5 can be done in your head, and so can multiplying by 2.