Practice Midterm I Solutions

1.
(1) **D**
(2) **A**
(3) **B**
(4) **C**
(5) **B**

2.
a) mean = (15+17+99+11+15+16)/6 = **28.83**
median: first arrange numbers from least to greatest:
11 15 15 16 17 99
Now, take middle two numbers, average them.
So, median = (15+16)/2 = **15.5**
mode: **15**, since it is the number occurring the most frequently
b) variance = [(15-28.83)^2+(17-28.83)^2+(99-28.83)^2+(11-28.83)^2+(15-28.83)^2+(16-28.83)^2]/(6-1) = 5,928.83/5 = **1,185.77**
c) Looking at ordered data in increasing order:
11 15 15 16 17 99, divide data into two sets: 11 15 15, and 16 17 99 for data to the left and to the right of the median. The median of the first set, **15**, is the First Quartile, and the median of the second set, **17**, is the Third Quartile. The Interquartile Range, IQR, is equal to 17-15 = **2**.

3.

Quarts SD	Frequency	**Relative Frequency**	**Cumulative Frequency**
0 --3	4	0.20	0.20
4 --7 5	5	0.25	0.45
8 --11 6	6	0.30	0.75
12 -- 15 3	2	0.10	0.85
16 --19 2	3	0.15	1.00
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	20	1.00	

4.
a) Let event T = event that Tom passes the test
Let event D = event that Dick passes the test
Since T and D are independent events, then P(T and D) = P(T)*P(D).
P(T) = 0.7, P(D) = 0.8, P(not T) = 1-0.7 = 0.3, P(not D) = 1-0.8 = 0.2
P(at most one of Tom or Dick passes the test) = 1 – P(not(T or D or neither)) = 1 – P(T and D) = 1 – P(T)*P(D) = 1-(0.7*0.8) = **0.44**.
b) Since T and D are independent events, then P(T and D) = P(T)*P(D), as well as P(D and notT) = P(D)*P(not T) and P(notD and T) = P(not D)*P(T).
So, P(D | one of Tom or Dick passes)= P(D and notT)/[P(D and notT)+P(notD and T)

= [P(D)*P(notT)]/[P(D)*P(notT) + P(notD)*P(T)] = [0.8*0.3]/[0.8*0.3 + 0.2*0.7] = **0.6316**.

5.
a) First, it is imperitive to fill in the table wit the sums of each row, each column, and the sum of the rows' sums and the columns' sums, which should each be the same.

	Men (M)	Women (W)	**TOTAL**
Promoted (P)	288	36	**324**
Not Promoted (NP)	672	204	**876**
TOTAL	**960**	**240**	**1,200**

Now, P(W and NP) = 204/1,200 = **0.17**.

b) P(NP | M) = 672/960 = **0.7**, which is NOT equal to P(M | NP) = 672/876 = 0.767.

c) Mutually Exclusive? P and W = 36, which is nonempty. So, P(P and W) = 36/1,200, which is NOT equal to 0. Thus, P and W are **NOT Mutually Exclusive.** Independent? Determine whether P(P | W) = P(P). P(P) = 324/1,200 = 0.27. However, P(P | W) = 36/240 = 0.15, which is NOT equal to 0.27. So, P(P | W) is not equal to P(P). So, P and W are **NOT Independent.**

6.
a) Since A and B are Mutually Exclusive, then P(A and B) = 0.3 + 0.5 = **0.8**, since P(A and B) = 0.

b) P(D) = P(A and notB) = P(A) = **0.3**. Draw a Venn-diagram of A and B to see why A and notB is equivalent to A, for mutually exclusive events A and B.

c) If A and B are independent events, then P(A and B) = P(A)*P(B). However, P(A and B) = 0, but P(A)*P(B) = 0.3*0.5 = 0.15, which is not equal to 0. So, since P(A and B) is not equal to P(A)*P(B), then A and B are **NOT independent.**

7 (a) 0.2
(b) 0.5
(c) E(X)= 0*(0.5)+1*(0.3)+2*(0.2)=0.7

8. a. $P(X = k) = f(k) = \binom{n}{k}(p)^k(1-p)^{n-k}$

n = 10, p=0.3

$$f(3) = \frac{10!}{3!(10-3)!}(.30)^3(1-.30)^{10-3}$$

$$f(3) = \frac{10(9)(8)}{3(2)(1)}(.30)^3(1-.30)^7 = .2668$$

b. $P(x \geq 3) = 1 - f(0) - f(1) - f(2)$

$$f(0) = \frac{10!}{0!(10)!}(.30)^0(1-.30)^{10} = .0282$$

$$f(1) = \frac{10!}{1!(9)!}(.30)^1(1-.30)^9 = .1211$$

$$f(2) = \frac{10!}{2!(8)!}(.30)^2(1-.30)^8 = .2335$$

$P(x \geq 3) = 1 - .0282 - .1211 - .2335 =$ **.6172**