Math 10 – Discrete Random Variables **ANSWERS (gw08)**

1. Explain the difference between population parameters and sample statistics. What symbols do we use for the mean and standard deviation for each of these?

   parameters are values that describe the population, statistics are measures that describe the sample.

   μ = Population Mean $\bar{X}$ = Sample Mean

   σ = Population Standard Deviation s = Sample Standard Deviation

2. Consider the following probability distribution function of the random variable X which represents the number of people in a group(party) at a restaurant. The blank columns are to help you answer parts b and c.

x	$p(x)$	$x \cdot p(x)$	$x-\mu$	$(x-\mu)^2$	$p(x)\cdot(x-\mu)^2$
1	**.10**	**.10**	**-2.55**	**6.5025**	**0.650250**
2	**.25**	**.50**	**-1.55**	**2.4025**	**0.600625**
3	**.20**	**.60**	**-0.55**	**0.3025**	**0.060500**
4	**.20**	**.80**	**0.45**	**0.2025**	**0.040500**
5	**.10**	**.50**	**1.45**	**2.1025**	**0.210250**
6	**.05**	**.30**	**2.45**	**6.0025**	**0.300125**
7	**.05**	**.35**	**3.45**	**11.9025**	**0.595125**
8	**.05**	**.40**	**4.45**	**19.8025**	**0.990125**
Totals	**1**	**3.55 = μ**			**3.4475 = σ^2**

   a. Fill in the missing value, P(X=4)

      p(4) = 0.20 (must add to 1)

   b. Find μ, the population mean of X.

      μ = 3.55

   c. Find the σ^2, the population variance and σ, standard deviation of X.

      σ^2 = 3.4475

      σ = $\sqrt{3.4475} = 1.86$

   d. Find the probability that the next party will be over 4.

      P(X>4) = P(5) + P(6) + P(7) + P(8) = **0.25**

   e. Find the probability that the next three parties (assuming independence) will all be over 4.

      Assume Independence P(over 4 for 3 times)= P(X>4) x P(X>4) x P(X>4)

      = 0.25 x 0.25 x 0.25 = **0.015625**

3. 70% of the US population are troubled by the economy. You randomly sample 20 people. Let X be the number in your sample who are troubled by the economy.

   a. What type of random variable is this? What are the parameters of the model?

      Binomial. Parameters are n = 20 and p = 0.70. This means q = 1 - p = 0.30

   b. Find the population mean, variance and standard deviation.

      $\mu = np = (20)(0.70) = 14$
      $\sigma^2 = npq = (20)(0.70)(0.30) = 4.2$
      $\boldsymbol{\sigma} = \sqrt{4.2} = 2.05$

   c. Find the probability that exactly 15 people in your sample are troubled by the economy.

      From table: P(15) = 0.179

   d. Find the probability that more than 15 people in your sample are troubled by the economy.

      From table: P(X>15) = P(16) + P(17) + P(18) + P(19) + P(20) = 0.238

   e. Would it be unusual if only 7 people in your sample were troubled by the economy? Justify your answer.

      Yes, because the probability of 7 or less is 0.001, an extremely low (unusual) probability.