

Math 153 - Quiz 6

October 16, 2014

Name key

Score _____

Show all work to receive full credit. Supply explanations when necessary.

(10 points) Three letters are selected, without replacement, from the English alphabet. Let x represent the number of vowels that are selected. The probability distribution for x is shown below.

x	$P(x)$
0	$\frac{7980}{15600}$
1	$\frac{6300}{15600}$
2	$\frac{1260}{15600}$
3	$\frac{60}{15600}$

1. How can you be certain that the table describes a probability distribution?

- THE PROBABILITIES ARE ALL BETWEEN 0 AND 1.
- THE PROBABILITIES ADD UP TO 1.

2. What is the expected value of x ?

$$\begin{aligned}\mu &= 0 \left(\frac{7980}{15600} \right) + 1 \left(\frac{6300}{15600} \right) + 2 \left(\frac{1260}{15600} \right) + 3 \left(\frac{60}{15600} \right) \\ &= \frac{9000}{15600} = \frac{15}{26} \approx 0.577\end{aligned}$$

3. What is the standard deviation in x ?

$$\begin{aligned}\sigma^2 &= 0 \left(\frac{7980}{15600} \right) + 1 \left(\frac{6300}{15600} \right) + 4 \left(\frac{1260}{15600} \right) + 9 \left(\frac{60}{15600} \right) - \left(\frac{15}{26} \right)^2 = \frac{1449}{3380} \\ &\approx 0.429 \\ \sigma &= \sqrt{\frac{1449}{3380}} \approx 0.655\end{aligned}$$

4. Are there any unusually large or small values of x ?

$$\mu - 2\sigma \approx -0.733$$

$$\mu + 2\sigma \approx 1.887 \rightarrow \text{THIS MAKES BOTH 2 \& 3 UNUSUALLY LARGE.}$$

NOTICE THAT $P(x \geq 2) = \frac{1320}{15600} \approx 8.5\%$, SO $X=2$ IS NOT UNUSUALLY LARGE BY OUR OTHER RULE.