

Math 153 - Quiz 7

October 19, 2017

Name key

Score _____

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

1. (5 points) The probability distribution for the random variable x is shown below.

x	2	3	4	5	6	7	8
$P(x)$	0.01	0.03	0.02	0.32	0.56	0.03	0.03

- (a) Confirm that the table describes a probability distribution.

$$0 \leq P(x) \leq 1 \quad \text{AND} \quad \sum P(x) = 0.01 + 0.03 + 0.02 + 0.32 + 0.56 + 0.03 + 0.03 = 1.00$$

For All x .

- (b) What is the mean value of x ?

$$\begin{aligned} \mu &= 2(0.01) + 3(0.03) + 4(0.02) + \dots + 8(0.03) \\ &= \boxed{5.6} \end{aligned}$$

- (c) What is the standard deviation in x ?

$$\begin{aligned} \sigma^2 &= 4(0.01) + 9(0.03) + 16(0.02) + \dots + 64(0.03) - (5.6)^2 \\ &= 0.82 \\ \sigma &= \sqrt{0.82} \approx 0.9 \end{aligned}$$

- (d) Use the mean and standard deviation to determine the unusual values of x .

$$\begin{aligned} \mu - 2\sigma &\approx 3.8 \quad \Rightarrow \quad 2 \text{ \& } 3 \text{ ARE UNUSUALLY SMALL} \\ \mu + 2\sigma &\approx 7.4 \quad \Rightarrow \quad 8 \text{ IS UNUSUALLY LARGE} \end{aligned}$$

- (e) Use the 5% rule to determine the unusual values of x .

$$2 \text{ \& } 3 \text{ ARE UNUSUALLY SMALL BECAUSE } P(X \leq 3) = 0.04 < 0.05$$

(4 IS NOT UNUSUAL.)

$$8 \text{ IS UNUSUALLY LARGE BECAUSE } P(X \geq 8) = 0.03 < 0.05$$

(7, IS NOT UNUSUAL.)

2. (5 points) Based on a recent Gallup Poll, the probability that a random American adult is a fan of professional (American) football is 57%. Suppose 15 American adults are selected at random.

(a) What is the probability that 9 are fans?

$$P(x=9) = \text{binompdf}(15, 0.57, 9) \\ \approx 0.2010$$

(b) What is the probability that more than 10 are fans?

$$P(x > 10) = 1 - P(x \leq 10) \\ = 1 - \text{binomcdf}(15, 0.57, 10) \\ \approx 0.1546$$

(c) In the sample of 15, what would be an usually small number of fans? (Show your work.)

$$np - 2\sqrt{npq} \approx 4.715$$

\Rightarrow 4 OR FEWER ARE UNUSUAL