MT 143, Quiz #5, Spring 2020 Name _____

Instructions: Show all work. Answers without work can only be graded all or nothing. Partial credit is available only when work is shown. Answer all parts of each problem. Provide explanations as indicated. You may use Minitab or any other statistical software (such as a calculator or Excel) to complete any required statistical calculations or graphs.

1. A raffle sells 400 tickets. The first prize giveaway is $500. There are two second prizes worth $200 each. There are three third prizes worth $100 each, and a five fourth prizes worth $25 each. Find the expected value of each ticket, if each ticket sells for $10.

x	\$490	\$190	\$90	\$15	−\$10
$p(x)$	$\frac{1}{400}$	$\frac{2}{400}$	$\frac{3}{400}$	$\frac{5}{400}$	$\frac{389}{400}$

$$E(x) = 490\left(\frac{1}{400}\right) + 190\left(\frac{2}{400}\right) + 90\left(\frac{3}{400}\right) + 15\left(\frac{5}{400}\right) - 10\left(\frac{389}{400}\right) = -\$6.6875$$

2. A consumer research company determines that 75% of time, when a driver gets into a car, they will put on their seat belt before starting the engine. Researchers collect a sample of 25 participants.
   a. What is the probability that exactly 15 of the 25 will put on their seatbelts when they get into the driver's seat, before starting the engine?

$$\binom{25}{15}(0.75)^{15}(0.25)^{10} = 0.041658\ldots$$

   b. What is the probability that fewer than 3 of the participants will do so?

$$\binom{25}{0}(0.75)^{0}(0.25)^{25} + \binom{25}{1}(0.75)^{1}(0.25)^{24} + \binom{25}{2}(0.75)^{2}(0.25)^{23} = 2.47 \times 10^{-12}$$

   c. What is the probability that more than 23 participants will do so?

$$\binom{25}{24}(0.75)^{24}(0.25)^{1} + \binom{25}{25}(0.75)^{25}(0.25)^{0} = 0.007$$

   d. What is the mean number of people that will put on their seatbelts before starting the engine? What is the standard deviation?

$$\mu = np = 25(0.75) = 18.75$$
$$\sigma = \sqrt{npq} = \sqrt{25(0.75)(0.25)} = 2.165$$