MTH 245, Quiz #6, Spring 2023 Name KEY

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 Excel to complete any required statistical calculations or graphs. Submit any Excel work with assignment. Do not say "see Excel" for answers, but write or paste them into this document. Exact answers are preferred unless specifically asked to round.

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
$p(x)$	$1/400$	$2/400$	$3/400$	$5/400$	$389/400$

$$490\left(\tfrac{1}{400}\right) + \underline{\quad} \times \tfrac{2}{400} + 90 \times \tfrac{3}{400} + 15\left(\tfrac{5}{400}\right) - 10\left(\tfrac{389}{400}\right) =$$

$$-\$6.6875$$

One can expect to lose, on average, about \$6.69 for every ticket purchased.

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?

$$\binom{25}{15}(.75)^{15}(.25)^{10} = 0.041658$$

   b. What is the probability that fewer than 3 of the participants will do so? 0, 1, 2

$$\binom{25}{0}(.75)^{0}(.25)^{25} + \binom{25}{1}(.75)^{1}(.25)^{24} + \binom{25}{2}(.75)^{2}(.25)^{23} =$$

$$2.46 \times 10^{-12}$$

   c. What is the probability that more than 23 participants will do so? 24, 25

$$\binom{25}{24}(.75)^{24}(.75)^{1} + \binom{25}{25}(.75)^{25}(.25)^{0} = 0.00702$$

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

$$25(.75) = 18.75$$

$$\sqrt{25(.75)(.25)} = 2.165$$