Name: *Caleb McWhorter — Solutions* **MAT 121**
Summer 2018 **Lab 4**

Problem 1: In a certain Biology class, each of two exams are worth 15%, the final exam is 20% of the final course grade, the labs are worth 30% of the course grade, and the quizzes are worth 20% of the grade. If a student received a 86% and 76% on the exams, a 84% on the final exam, a 92% average on the labs, and a 95% quiz average, what is the students course grade?

$$92 \cdot 0.30 + 95 \cdot 0.20 + 86 \cdot 0.15 + 76 \cdot 0.15 + 84 \cdot 0.20 = 87.7$$

Problem 2: Suppose A and B are *independent events* with probabilities $P(A) = 0.3$ and $P(B) = 0.7$. Find $P(A \text{ and } B)$ and $P(A \text{ or } B)$.

$$P(A \textit{ and } B) = P(A)P(B) = 0.3 \cdot 0.7 = 0.21$$

$$P(A \textit{ or } B) = P(A) + P(B) - P(A \textit{ and } B) = 0.3 + 0.7 - 0.21 = 0.79$$

Problem 3: Waiting times for a certain type of building permit is normally distributed with mean 18 months and standard deviation 4 months.

(a) Find the probability that has person has to wait more than 17 months for this permit.

$$z_{17} = \frac{17 - 18}{4} = -0.25 \rightsquigarrow 0.4013$$

$$1 - 0.4013 = 0.5987$$

(b) Find the number of months that marks the top 40% of wait times.

$$z_{60\%} = 0.25$$

$$\begin{aligned} z &= \frac{x - \mu}{\sigma} \\ 0.25 &= \frac{x - 18}{4} \\ x &= 18 + 4 \cdot 0.25 \\ x &= 18 + 1 \\ x &= 19 \end{aligned}$$

Problem 4: The scores of the Math GRE exam follow a normal distribution. A sample of 20 scores is randomly selected and the sample mean and standard deviation are $\overline{x} = 784$, $s = 105$. Use these sample results to construct the 98% confidence interval for the mean σ of all Math GRE test scores.

$$\begin{aligned} \overline{x} &\pm t_{\alpha/2} \frac{s}{\sqrt{n}} \\ 784 &\pm 2.528 \cdot \frac{105}{\sqrt{20}} \\ 784 &\pm 59.35 \end{aligned}$$

$$(\, 724.65, 843.35 \,)$$

Problem 5: Suppose you wish to construct a 98% confidence interval for μ with a sample size of 41. If it is known that $\sigma = 10$ and the population appears to be very skewed, choose which one of the following critical values should be used:

(i) $t_{\alpha/2} = 2.423$

(ii) $z_{\alpha/2} = 2.33$

(iii) $z_{\alpha/2} = 1.96$

(iv) neither

A critical value of $z_{\alpha/2} = 2.33$ must be used.