AMS 102.7 Homework #4

DUE: 3/15/2012

SHOW ALL WORK!!

There is a z-table in your book, or using google "z-table" will give you many options. Remember to make sure you are aware what type of z-table you are looking at (which area it is giving you)

1) An aptitude test is given to a group of students. The distribution of scores is believed to follow a Normal distribution with a mean of 150 and a Standard Deviation of 15.

   a) If a student gets a perfect score of 200, what is the Z-score associated with it?

$$Z = \frac{x - \mu}{\sigma} = \frac{200 - 150}{15} = \frac{50}{15} \approx \mathbf{3.33}$$

   b) Based on the empirical rule, what two scores do the middle 68% of data fall between?

Empirical rule says 68% of the data is between (μ - σ, μ + σ)
Therefore (150-15, 150+15) ➔ **(135,165)**

   c) What is the probability of a randomly selected student getting between 130 and 160?

$$P(130 \le X \le 160) = P\left(\frac{130-150}{15} \le Z \le \frac{160-150}{15}\right) = P\left(-\frac{20}{15} \le Z \le \frac{10}{15}\right) \approx$$
$$P(-1.33 \le Z \le .667) \approx 0.7470 - 0.0910 = \mathbf{0.6560}$$

   d) What is the IQR of this distribution (Recall: IQR = 75th percentile – 25th percentile)?

75th Percentile ➔ Z = 0.67 25th Percentile ➔ Z = -0.67

$0.67(15) + 150 = X_{75} = 160.05$ $-0.67(15) + 150 = X_{25} = 139.95$

IQR = 160.05 – 139.95 = **20.10**

2) The amount of time it takes a dryer to completely dry a load of laundry is uniformly distributed between 25 and 35 minutes.

a. What is the Probability that the laundry is dry within 28 minutes?

$$\text{Let } Y \sim U(25,35)$$

$$\text{Height of Density curve} = \frac{1}{b-a} = \frac{1}{35-25} = \frac{1}{10}$$

$$P(Y \leq 28) = \text{Area under the curve from 25 to 28}$$

$$A = 3 * \frac{1}{10} = \frac{3}{10} = \mathbf{0.30}$$

b. Which has a greater probability of occurring: (Show your work)

i. The laundry is dry between the 40th percentile and 31 minutes.

40th Percentile is where A = .40

$$.40 = (Y - 25) * \frac{1}{10} \quad \rightarrow \quad Y = 4 + 25 = 29$$

$$P(29 \leq Y \leq 31) = \text{ Area under the curve from 29 to 31}$$

$$A = 2 * \frac{1}{10} = \mathbf{0.20}$$

ii. The laundry takes longer than 32.5 minutes to dry.

$$P(Y \geq 32.5) = \text{ Area under the curve from 32.5 to 35}$$

$$A = 2.5 * \frac{1}{10} = \mathbf{0.25}$$

Therefore (<u>ii) The laundry takes longer than 32.5 minutes to dry</u>) has a greater probability of occurring.