A.P. Statistics
Assignment 1.12

As always, briefly explain your thinking in your responses. Be sure to convince me that you understand.

1.  In recent years there has been considerable discussion about the appropriateness of the body shapes and proportions of the Ken and Barbie dolls. These dolls are very popular, and there is some concern that the dolls may be viewed as having the "ideal body shape," potentially leading young children to risk anorexia in pursuit of that ideal. Researchers investigating the dolls' body shapes scaled Ken and Barbie up to a common height of 170.18 cm (5' 7") and compared them to body measurements of active adults. Common measures of body shape are the chest (bust), waist, and hip circumferences. These measurements for Ken and Barbie and their reference groups are presented in the table below:

### Doll and Human Reference Group Measurements (cm)

|  | Ken | | | Barbie | | |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Chest** | **Waist** | **Hips** | **Chest** | **Waist** | **Hips** |
| Doll | 75.0 | 56.5 | 72.0 | 82.3 | 40.7 | 72.7 |
| Human $\bar{x}$ | 91.2 | 80.9 | 93.7 | 90.3 | 69.8 | 97.9 |
| Human $s$ | 4.8 | 9.8 | 6.8 | 5.5 | 4.7 | 5.4 |

For the following questions, suppose that the researchers' scaled up dolls suddenly found themselves in the human world of actual men and women.

(a) Convert Ken's chest, waist, and hips measurements to z-scores. Which of those measures appears to be the most different from Ken's reference group (human males)? Justify your response with an appropriate statistical argument.

<type answer here>

(b) Convert Barbie's chest, waist, and hips measurements to z-scores. Do these z-scores provide evidence to justify the claim that the Barbie doll is too thin of a representation of adult women? Justify your response with an appropriate statistical argument.

2.  Jill scores 680 on the mathematics part of the SAT. The distribution of SAT scores in a reference population is normally distributed with mean 500 and standard deviation 100. Jack takes the ACT mathematics test and scores 27. ACT scores are normally distributed with mean 18 and standard deviation 6.

    a)  Find the standardized scores for both students.

<type answer here>

    b)  Assuming that both tests measure the same kind of ability, who has the higher score, and why?

<type answer here>

4.  A lunch stand in the business district has a mean daily gross income of $420 with a standard deviation of $50. Assume that the daily gross income is normally distributed.

    a)  If a randomly selected day has a gross income of $520, then how many standard deviations away from the mean is that day's gross income?

<type answer here>

    b)  Determine the standardized value for the daily income of $520.

<type answer here>

    c)  What is the relative frequency corresponding to a daily gross income of $520 or more?

**5.** Given that the mean height of young men is normally distributed with a mean of 68 inches and a standard deviation of 2.5 inches. Only about 5% of young men have heights outside the range

    (a)     65.5 inches to 70.5 inches

    (b)     63 inches to 73 inches

    (c)     60.5 inches to 75.5 inches

    (d)     58 inches to 78 inches

    (e)     none of the above