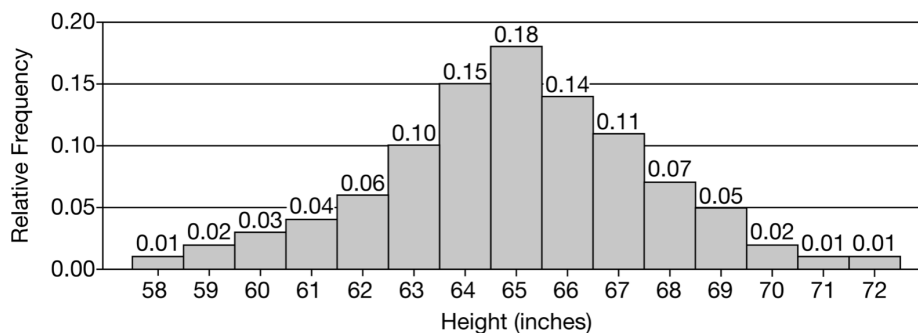**Deep Thoughts**
September 9, 2021

1. The following histogram shows the relative frequencies of the heights, recorded to the nearest inch, of a population of women. The mean of the population is 64.97 inches, and the standard deviation is 2.66 inches.

(a) Based on the histogram, what is the probability that the selected woman will have a height of at least 67 inches? Show your work.

(b) What is the area of the bar corresponding to a height of 67 inches in the graph, and what does the area represent in terms of probability?

(c) The histogram displays a discrete probability model for height. However, height is often considered a continuous variable that follows a normal model. Consider a normal model that uses the mean and standard deviation of the population of women as its parameters.

    i. Use the normal model and the relationship between area and relative frequency to find the probability that the randomly selected woman will have a height of at least 67 inches. Show your work.

    ii. Does your answer in part (c)i match your answer in question 1? If not, give a reason for why the answers might be different.

(d) Let the random variable H represent the height of a woman in the population. $P(H < 60)$ represents the probability of randomly selecting a woman with height less than 60 inches. Based on the information given, the probability can be found using either the discrete model or the normal model.

    i Give an example of a probability of H that can be found using the discrete model but not the normal model. Explain why.

    ii Give an example of a probability of H that can be found using the normal model but not the discrete model. Explain why.

2. A small coffee shop sells freshly squeezed juices in a refrigerated unit with slots where juice is displayed. These slots are called facings. The manager of the coffee shop suspects that the distribution of juice sales is different than the distribution of facings for each type of juice, so the manager records the sales of each juice over a two-week period. The proportion of facings and the sales for each type of juice are shown in the tables.

Juice	Mango	Orange	Apple	Pineapple	Grapefruit	Grape
Proportion of Facings	0.1875	0.250	0.250	0.125	0.125	0.0625

Juice	Mango	Orange	Apple	Pineapple	Grapefruit	Grape
Observed Number of Sales	23	35	46	12	10	5

(a) Construct a single bar chart that contains both the expected proportion of sales based on the proportion of facings and the observed proportion of sales for each type of juice.

3. The sizes, in square feet, of the 20 rooms in a student residence hall at a certain university are summarized in the following histogram.
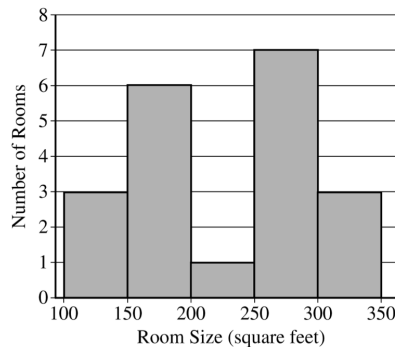

(a) Based on the histogram, write a few sentences describing the distribution of room size in the residence hall.

(b) Summary statistics for the sizes are given in the following table.

Mean	Standard Deviation	Min	Q1	Median	Q3	Max
231.4	68.12	134	174	253.5	292	315

Determine whether there are potential outliers in the data. Then use the following grid to sketch a boxplot of room size.

Room Size (square feet)
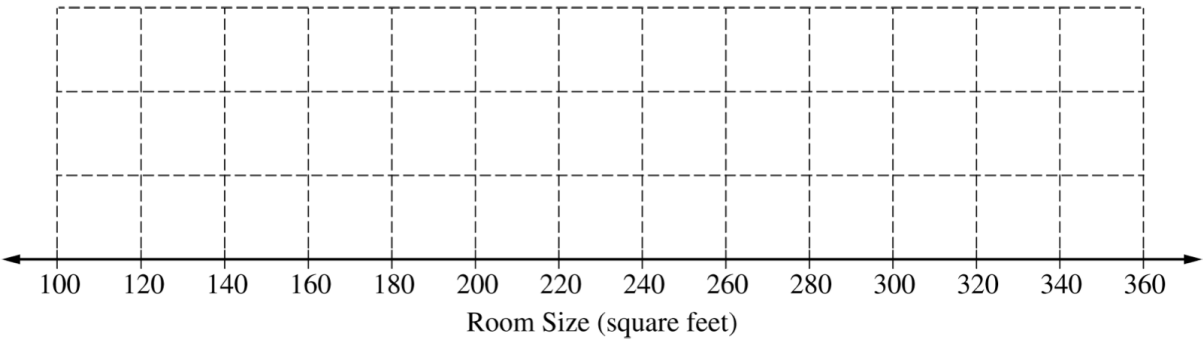
(c) What characteristic of the shape of the distribution of room size is apparent from the histogram but not from the boxplot?