

**20. Singers.**

- a) (5 points ) Five-number summary: 60, 65, 66, 70, 76, so the median is 66 inches and the IQR is  $70 - 65 = 5$  inches.
- b) The mean height of the singers is 67.12 inches, and the standard deviation of the heights is 3.79 inches.
- c) Histogram of heights
- d) The distribution of the heights of the choir members is bimodal (probably due to differences in height of men and women) and skewed slightly to the right. The median is 66 inches. The distribution is fairly spread out, with the middle 50% of the heights falling between 65 and 70 inches. There are no gaps or outliers in the distribution.

## Chapter 5

6. (5 points ) b) In any distribution, 50% of scores lie between Quartile 1 and Quartile 3. In this case, Quartile 1 = 192.238 seconds and Quartile 3 = 200.625 seconds.
- c) The distribution of Men's Combined times is skewed to the right, so the median and IQR are the preferred measures of centre and spread.
- d) The distribution of the Men's Combined times at the 2006 Olympics is unimodal and skewed to the right. (Possibly, there is a second mode, but that's a matter of opinion.) The median time was 193.27 seconds. The times are not spread out very much. Half the times fall between 192.238 seconds and 200.265 seconds, and the winning time of 189.35 is less than 3 seconds faster.

**14. Wines.**

- a) (4 points ) A Seneca Lake vineyard had the maximum case price of approximately \$150.
- b) A Seneca Lake vineyard had the minimum case price of approximately \$50.
- c) The Keuka Lake vineyards were consistently high.
- d) Cayuga Lake vineyards and Seneca Lake vineyards have approximately the same average case price, at about \$100, while a typical Keuka Lake vineyard has a case price of about \$130. Keuka Lake vineyards have consistently high case prices, between \$120 and \$140, with one low outlier at about \$85 per case.
- Cayuga Lake vineyards have case prices from \$70 to \$135, and Seneca Lake vineyards have highly variable case prices, from \$50 to \$150

## 21. Caffeine.

a) (5 points ) *Who* – 45 volunteers.

*What* – Level of caffeine consumption and memory test score.

*When* – Not specified.

*Where* – Not specified.

*Why* – The student researchers want to see the possible effects of caffeine on memory.

*How* – It appears that the researchers imposed the treatment of level of caffeine consumption in an experiment. However, this point is not clear. Perhaps they allowed the subjects to choose their own level of caffeine.

b) *Variables* – Caffeine level is a categorical variable with three levels: no caffeine, low caffeine, and high caffeine. Test score is a quantitative variable, measured in number of items recalled correctly.

$$Q3 + 1.5(IQR) = 55 + 1.5(55 - 18.5)$$

$$= 55 + 54.75$$

$$= 109.75$$

$$Q1 - 1.5(IQR) = 18.5 - 1.5(55 - 18.5)$$

$$= 18.5 - 54.75$$

$$= -36.25$$

c) Box plots

d) The groups consuming no caffeine and low caffeine had comparable memory test scores. A typical score from these groups was around 21. However, the scores of the group consuming no caffeine were more consistent, with a smaller range and smaller interquartile range than the scores of the group consuming low caffeine. The group consuming high caffeine had lower memory scores in general, with a median score of about 19. No one in the high caffeine group scored above 24, but 25% of each of the other groups scored above 24.

## Chapter 6

### 39. Helmet sizes. (5 points )

a) The smallest size is  $56.0 - 2.96 \times 1.8 = 50.672$  cm and the biggest is  $56.0 + 2.96 \times 1.8 = 61.328$  cm.

b) In order to fit 60 percent of the heads in the range  $56.0 - 0.84 \times 1.8 = 54.488$  cm and  $56.0 + 0.84 \times 1.8 = 57.512$  cm.

c) z- values for 51 cm and 54 cm are  $(51-56)/1.8 = -2.78$  and  $(54 - 56)/1.8 = -1.11$  respectively.

The proportion between for 51 cm and 54 cm is  $0.1335 - 0.0027 = 0.1308 = 13.08$  percent.

d) The smallest of the biggest 15 percent of heads is  $56.0 + 1.04 \times 1.8 = 57.872$  cm.

e) Circumferences less than or equal to  $56 - 2.05 \times 1.8 = 52.31$  cm.