1. (a) iv (b) v (c) ii (d) i

2. First, $$\bar{x} = \frac{1}{4}(23+44+35+18) = \left(\frac{1}{4}\right)(120) = 30$$

Then the sample variance is

$$s^2 = \frac{1}{3}\left[(23-30)^2 + (44-30)^2 + (35-30)^2 + (18-30)^2\right]$$

$$= \frac{1}{3}\left[(-7)^2 + (14)^2 + (5)^2 + (-12)^2\right]$$

$$= \frac{1}{3}(49+196+25+144) = \left(\frac{1}{3}\right)(414) = 138$$

So, the sample standard deviation is

$$s = \sqrt{138} \approx 11.747$$

3. (a) iii (b) ii (c) iv (d) i

4. (a) It is unimodal and right-skewed

(b) mean

(c) range $\approx 23 - 5 = 18$

5-number summary: 5, 8.5, 13, 19, 23

IQR $\approx 19 - 8.5 = 10.5$

5. (a) The observation that pet ownership and contentment have an association should not be confused — at least without an experiment to establish as fact — with a causal relationship.

(b) The two variables under consideration — "lives with 2 parents (yes/no)", and "avoids gang membership (yes/no)" — are categorical. Correlation is a concept of statistics reserved for pairs of quantitative variables.

6. Let A = "will take a biology course"

B = "will take a chemistry course"

(a) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) = 0.3 + 0.4 - 0.12 = 0.58$

(b) We check that

$P(A \text{ and } B) = 0.12$ and $P(A) \cdot P(B) = (0.3)(0.4) = 0.12$

indeed are equal. Hence, at Red Hill U., A and B are independent.

7. resistant in this list are the mode, the median, and the IQR.

8. True statements: (ii), (iii) and (v)

9. We are given these probabilities, when a random message from the week is selected:

$P(\text{marked as spam}) = 0.101$

$P(\text{"free"}) = 0.041$

$P(\text{marked as spam and "free"}) = 0.0291$

(a) $$P(\text{"free"} \mid \text{marked as spam}) = \frac{P(\text{marked as spam and "free"})}{P(\text{marked as spam})}$$

$$= \frac{0.0291}{0.101} \doteq \boxed{0.288}$$

(b) $$P(\text{marked as spam} \mid \text{"free"}) = \frac{P(\text{marked as spam and "free"})}{P(\text{"free"})}$$

$$= \frac{0.0291}{0.041} \doteq \boxed{0.710}$$

10. (a) The study is observational in nature. No conditions are imposed on participants by the researchers.

(b) Is there an association between time spent watching TV and the number of aggressive acts committed?

(c) Explanatory variable (quantitative): time spent watching TV
Response variable (quantitative): number of aggressive acts committed

(d) Many possibilities here. For instance:

- level of parental supervision
- number of activities in which the individual participates as a teen