Chapter 3
Basic Statistical Review

Problems involving Excel are not shown.

3.1.
(a) $\overline{x} = 6.14$ min
(b) $s = 5.9239$ min
(c) $\Pr\{T > 10\} = 0.2$
(d) $\Pr\{T > 10\} = 0.2573$
(e) $\Pr\{T > 10\} = 0.1962$

3.3. (a) $\hat{X}_{med} = 2.25$
(b) $\hat{X}_{quar} = 0.9$, $\hat{X}_{Quar} = 4.63$
(c)

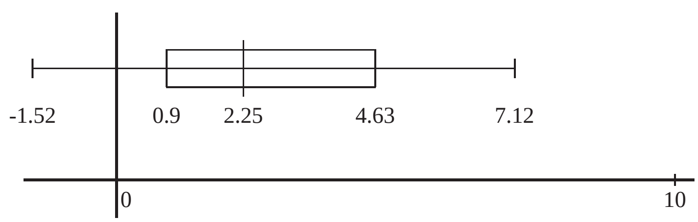

Fig. 3.1 Box plot for Problem 3.3

3.5. (a) Estimators (a) through (d) are unbiased.
(b) Estimator (e) has the smallest variance.
(c) Estimator (d) should be used because it has the smallest mean squared error. If it is known ahead of time that μ is small, then possibly (e) has a smaller MSE, but in that case an estimator is not needed if it is already known that μ is very small.

3.7. This is an Excel problem. Please refer to the Excel workbook associated with this chapter.

3.9. The estimates for the scale and shape parameters are

$$\hat{\alpha} = \overline{x}^2/s^2 = (4.885/2.966)^2 = 2.713$$
$$\hat{\beta} = \overline{x}/\hat{\alpha} = 1.801$$

3.13. (a) $\overline{x} = 4.8632$/hr

(b) There is more than one way to form cells. We used 9 cells, where the integers formed cells except the first cell included 0 and 1 and the last cell included 9 and greater; thus, there were 7 degrees of freedom. The chi-squared values were

$$\chi^2_{test} = 3.2185 \text{ and } \chi^2_{critical} = 14.0671$$

thus, the hypothesis that the data are Poisson is not rejected.

(c) The cells for the normal were the same as for the Poisson except the division was halfway between the integers. In other words, the first cell was all values less than 1.5, the second cell was between 1.5 and 2.5, etc. The last cell was all values greater than 9.5. Since two parameters were estimated, there were 6 degree of freedom. The chi-squared values were

$$\chi^2_{test} = 2.7115 \text{ and } \chi^2_{critical} = 12.5916$$

thus, the hypothesis that the data are normally distributed is not rejected.

(d) The Poisson hypothesis is much better because if the normal is used as the approximation, there would be a positive probability that the value could be negative.

3.15. $y = 0.2043$ yields $x = 19.253$.