

1.13 A manufacturer of electronic components is interested in determining the lifetime of a certain type of battery. A sample, in hours of life, is as follows:

123, 116, 122, 110, 175, 126, 125, 111, 118, 117.

- (a) Find the sample mean and median.
(b) What feature in this data set is responsible for the substantial difference between the two?

- (a) mean = 124.3
median = 120
(b) extreme observation = 175

1.14 A tire manufacturer wants to determine the inner diameter of a certain grade of tire. Ideally, the diameter would be 570 mm. The data are as follows:

572, 572, 573, 568, 569, 575, 565, 570.

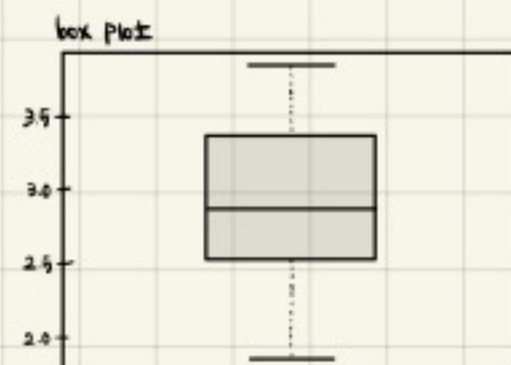
- (a) Find the sample mean and median.
(b) Find the sample variance, standard deviation, and range.
(c) Using the calculated statistics in parts (a) and (b), can you comment on the quality of the tires?

- (a) mean = 570.5
median = 571
(b) variance = $s^2 = 10$
standard deviation = $s = 3.162$
range = 10
(c) quality is questionable because variation of the diameters seems too big.

1.15 Five independent coin tosses result in HHHHH. It turns out that if the coin is fair the probability of this outcome is $(1/2)^5 = 0.03125$. Does this produce strong evidence that the coin is not fair? Comment and use the concept of P -value discussed in Section 1.1.

Yes. The value 0.03125 is actually a P -value and a small value of this quantity means that the outcome is very unlikely to happen with a fair coin.

1.29 Use the data in Exercise 1.24 to construct a box plot.



2.7 Four students are selected at random from a chemistry class and classified as male or female. List the elements of the sample space S_1 , using the letter M for male and F for female. Define a second sample space S_2 where the elements represent the number of females selected.

- $S_1 = \{MMMM, MMMF, MMFM, MFMM, FMMM, MMFF, MFMF, MFFM, FMFM, FMMF, FMMF, MFFF, FMFF, FFMM, FFFM, FFFF\}$
 $S_2 = \{0, 1, 2, 3, 4\}$

2.23 If an experiment consists of throwing a die and then drawing a letter at random from the English alphabet, how many points are there in the sample space?

die $\rightarrow n_1 = 6$

letter $\rightarrow n_2 = 26$

points $\rightarrow n_1 \cdot n_2 = 156$

2.45 How many distinct permutations can be made from the letters of the word *INFINITY*?

$$\frac{8!}{3!2!} = 3360$$

2.46 In how many ways can 3 oaks, 4 pines, and 2 maples be arranged along a property line if one does not distinguish among trees of the same kind?

$$\frac{9!}{3!4!2!} = 1260$$

2.63 According to *Consumer Digest* (July/August 1996), the probable location of personal computers (PC) in the home is as follows:

Adult bedroom:	0.03
Child bedroom:	0.15
Other bedroom:	0.14
Office or den:	0.40
Other rooms:	0.28

- (a) What is the probability that a PC is in a bedroom?
- (b) What is the probability that it is not in a bedroom?
- (c) Suppose a household is selected at random from households with a PC; in what room would you expect to find a PC?

(a) 0.32

(b) 0.68

(c) office or den

2.66 Factory workers are constantly encouraged to practice zero tolerance when it comes to accidents in factories. Accidents can occur because the working environment or conditions themselves are unsafe. On the other hand, accidents can occur due to carelessness or so-called human error. In addition, the worker's shift, 7:00 A.M.–3:00 P.M. (day shift), 3:00 P.M.–11:00 P.M. (evening shift), or 11:00 P.M.–7:00 A.M. (graveyard shift), may be a factor. During the last year, 300 accidents have occurred. The percentages of the accidents for the condition combinations are as follows:

Shift	Unsafe Conditions	Human Error
Day	5%	32%
Evening	6%	25%
Graveyard	2%	30%

If an accident report is selected randomly from the 300 reports,

- (a) what is the probability that the accident occurred on the graveyard shift?
- (b) what is the probability that the accident occurred due to human error?
- (c) what is the probability that the accident occurred due to unsafe conditions?
- (d) what is the probability that the accident occurred on either the evening or the graveyard shift?

(a) $0.02 + 0.30 = 0.32 = 32\%$

(b) $0.32 + 0.25 + 0.30 = 0.87 = 87\%$

(c) $0.05 + 0.06 + 0.02 = 0.13 = 13\%$

(d) $1 - 0.05 - 0.32 = 0.63 = 63\%$

2.75 A random sample of 200 adults are classified below by sex and their level of education attained.

Education	Male	Female
Elementary	38	45
Secondary	28	50
College	22	17

If a person is picked at random from this group, find the probability that

- (a) the person is a male, given that the person has a secondary education;
- (b) the person does not have a college degree, given that the person is a female.

M : male

S : secondary education

C : College degree

(a) $P(M|S) = \frac{28}{78} = \frac{14}{39}$

(b) $P(C'|M') = \frac{95}{112}$

2.76 In an experiment to study the relationship of hypertension and smoking habits, the following data are collected for 180 individuals:

	Nonsmokers	Moderate Smokers	Heavy Smokers
<i>H</i>	21	36	30
<i>NH</i>	48	26	19

where *H* and *NH* in the table stand for *Hypertension* and *Nonhypertension*, respectively. If one of these individuals is selected at random, find the probability that the person is

- (a) experiencing hypertension, given that the person is a heavy smoker;
- (b) a nonsmoker, given that the person is experiencing no hypertension.

A : experiencing hypertension

B : heavy smoker

C : nonsmoker

(a) $P(A|B) = \frac{30}{49}$

(b) $P(C|A') = \frac{48}{93} = \frac{16}{31}$