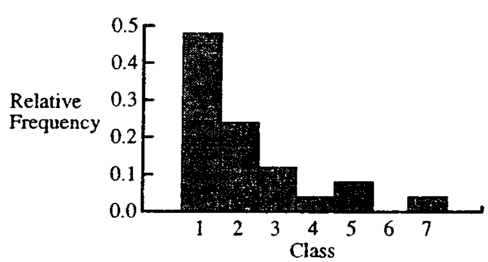
AM 165 Problem Set I 9/01

§1.2, #3

Solutions will depend on how one chooses the bins for the histogram. Intervals of length 2 are reasonable for the sample that ranges from 0.37 up to 12.48.

Similar to Exercise 1.2. We chose seven intervals of length 2.

Class Boundaries	Tally	Frequency	Relative Frequency
.005– 2.005	1111 1111 11	12	.48
2.005– 4.005	1111 1	6	.24
4.005– 6.005	111	3	.12
6.005– 8.005	1	1	.04
8.005–10.005	11	2	.08
10.005–12.005		0	.00
12.005–14.005	1	1	.04
		25	1.00



1.5 **a.** The categories with the largest grouping of students are 2.45 to 2.65 and 2.65 to 2.85. Each of these categories contains 7 of the 30 polled students.

b. 7/30 = .23

c. 7/30 + 3/30 + 3/30 + 3/30 = 16/30 = .53

1.12 **a.** Calculate $\Sigma y_i = 80.63$ and $\Sigma y_i^2 = 500.7459$. Then $\overline{y} = \frac{\Sigma y_i}{n} = \frac{80.63}{25} = 3.23$
$s^2 = \frac{1}{24}(500.7459 - 260.04788) = 10.03$
$s = \sqrt{10.03} = 3.17$

k	$\overline{y} \pm ks$	Interval Boundaries	Frequency	Expected Frequency
1	3.23 ± 3.1669	0.063 to 6.397	21	17
2	3.23 ± 6.3338	−3.104 to 9.564	23	23.75
3	3.23 ± 9.5007	−6.271 to 12.731	25	25

1.15 For Exercise 1.2, the approximation is
$\frac{\text{range}}{4} = \frac{3168-565}{4} = 650.75$, while $s = 393.75$.
Note the poor approximation due to the extreme values.
For Exercise 1.3, the approximation is
$\frac{\text{range}}{4} = \frac{12.48-.32}{4} = 3.04$, while $s = 3.17$.
For Exercise 1.4, the approximation is
$\frac{\text{range}}{4} = \frac{38.3-1.8}{4} = 9.125$, while $s = 7.48$.

1.20 $\sum_{i=1}^{n}(y_i - \overline{y}) = \sum_{i=1}^{n} y_i - n\overline{y} = \sum_{i=1}^{n} y_i - \frac{n\left[\sum_{i=1}^{n} y_i\right]}{n} = \sum_{i=1}^{n} y_i - \sum_{i=1}^{n} y_i = 0.$

1.25 Assuming that the distribution of scores is bell-shaped, the empirical rule provides a means for describing the variability of the data. The results of the empirical rule are shown below.

k	$\overline{y} \pm ks'$	Interval Boundaries	Percentage of Measurements Within the Interval
1	72 ± 8	64 to 80	Approximately 68%
2	72 ± 16	56 to 88	Approximately 95%
3	72 ± 24	48 to 96	Nearly 100%

Hence one would expect 68% of the 340 scores, that is, .68(340) = 231.2 or 231 scores, to fall in the interval 64 to 80. Similarly, 95% of the scores, that is, .95(340) = 323 scores, should fall in the interval 56 to 88.

1.26 We know $\mu = 27$ and $\sigma = 14$. For this normally distributed population, we expect 68.9% of the days to have a daily discharge between $\mu - \sigma = 13$ and $\mu + \sigma = 41$. Thus, we expect 16%, or half of 32%, to be less than 13 mg/ℓ.

2.4

A:	(1, 2)	(2, 2)	(3, 2)	(4, 2)	(5, 2)	(6, 2)	(1, 4)	(2, 4)	(3, 4)
	(4, 4)	(5, 4)	(6, 4)	(1, 6)	(2, 6)	(3, 6)	(4, 6)	(5, 6)	(6, 6)
$\overline{C}$:	(2, 2)	(2, 4)	(2, 6)	(4, 2)	(4, 4)	(4, 6)	(6, 2)	(6, 4)	(6, 6)
$A \cap B$:	(2, 2)	(4, 2)	(6, 2)	(2, 4)	(4, 4)	(6, 4)	(2, 6)	(4, 6)	(6, 6)
$A \cap \overline{B}$:	(1, 2)	(3, 2)	(5, 2)	(1, 4)	(3, 4)	(5, 4)	(1, 6)	(3, 6)	(5, 6)
$\overline{A} \cup B$:	all pairs <u>except</u>								
	(1, 2)	(1, 4)	(1,6)	(3, 2)	(3, 4)	(3, 6)	(5, 2)	(5,4)	(5, 6)
$\overline{A} \cap C$:	(1, 1)	(2, 1)	(3, 1)	(4, 1)	(5, 1)	(6, 1)	(1, 3)	(2, 3)	(3, 3)
	(4, 3)	(5, 3)	(6, 3)	(1, 5)	(2, 5)	(3, 5)	(4, 5)	(5, 5)	(6, 5)

Note that $\overline{A} \cap C = \overline{A}$.

2.6 The grid below shows the information given in the exercise in a more convenient form. Note that known quantities are underlined. All unknown counts can be found by subtraction.

	Graduate	Undergraduate	Total
On	18	33	51
Off	6	<u>3</u>	<u>9</u>
Total	24	<u>36</u>	<u>60</u>

a. $36 + 6 = 42$
b. 33
c. 18

2.8 **a.** The sample space consists of the four possible blood phenotypes. That is,

$$S = \{A, B, AB, O\}.$$

b. The probabilities that a single caucasian has a given blood type may be assigned as follows.

$$P(\{A\}) = 0.41,\ P(\{B\}) = 0.10,\ P(\{AB\}) = 0.04,\ P(\{O\}) = 0.45$$

c. Since the events $\{A\}$ and $\{B\}$ are mutually exclusive

$$P(A \text{ or } B) = P(A) + P(B) = 0.41 + 0.10 = 0.51$$

2.13 **a.** We know that $P(S) = P(E_1 \cup E_2 \cup E_3 \cup E_4) = 1$ and, since the four events are pairwise mutually exclusive, $P(S) = P(E_1) + \ldots + P(E_4) = .01 + ? + .09 + .81$. Thus $? = P(E_2) = 1 - .91 = .09$.

b. $P(\text{at least one hit}) = P(E_1 \cup E_2 \cup E_3) = P(E_1) + P(E_2) + P(E_3) = .01 + .09 + .09 = .19$.

2.14 **a.** $\frac{1}{3}$

b. $\frac{1}{3} + \frac{1}{15} = \frac{6}{15}$

c. $\frac{1}{3} + \frac{1}{16} = \frac{19}{48}$

d. $1 - \left[\frac{6}{15} + \frac{19}{48}\right] = 1 - \left[\frac{191}{240}\right] = \frac{49}{240}$

2.15 Let B = assembly has bushing defect and S = shaft defect.

a. $P(B) = .06 + .02 = .08$.

b. $P(B \cup S) = .06 + .08 + .02 = .16$.

c. $P(B\overline{S} \cup S\overline{B}) = .06 + .08 = .14$.

d. $P(\overline{B} \cup \overline{S}) = 1 - .16 = .84$.

2.19 **a.** $\{SS, SR, SL, RS, RR, RL, LS, LR, LL\}$

b. $P(SL) + P(RL) + P(LS) + P(LR) + P(LL) = \frac{5}{9}$

c. $P(SS) + P(SR) + P(SL) + P(RS) + P(LS) = \frac{5}{9}$