AMS 102: MIDTERM 1 PRACTICE

SOLUTIONS

Chapter 2

2.47. Nonresponse bias.

2.48. (a) (i) selection bias (looks like a convenience sample);
(b) (ii) nonresponse bias;
(c) (iii) response bias (interviewees are interested in lowering the value of the variable).

2.50. (a) Simple random sampling.
(b) People who call cocaine help line; most likely cocaine users.
(c) No. The headline implies that drug use at work has risen in general, whereas the sampled population includes only people who use cocaine already.

2.56. (a) Stratified random sampling.
(b) There are $520 \times 80\% = 416$ members of the professional club, 75 of whom are chosen. The chance of being chosen is $75/416 \approx 18\%$.
(c) Proportion for local business: $15/25$; for professional club: $60/75$. Total proportion: $\dfrac{15}{25}20\% + \dfrac{60}{75}80\% = 76\%$.
(d) (i) statistic. (Numerical value for the sample)

Chapter 3

3.42. (a) 3 baking times $\times$ 3 baking temperatures $\times$ 2 amounts of cheese $= 18$ treatment groups.
(b) 18 treatment groups $\times$ 5 batches $= 90$ units total.

3.55, (a)-(e). (a) An experiment.
(b) Proportion of juice in the drink.
(c) Taste rating.
(d) Confounding variable.
(e) Single-blinded.

Chapter 4

4.59. (a) Quantitative continuous.
  (b) Quantitative continuous.
  (c) Quantitative continuous.
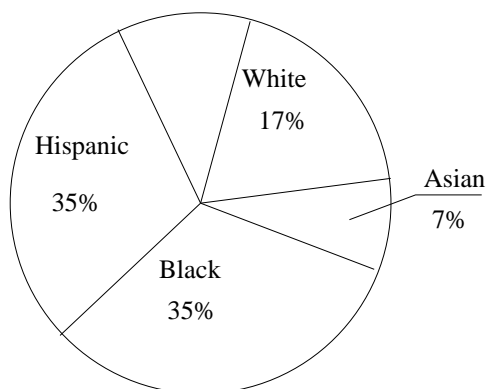 (d) Quantitative discrete.
  (e) Qualitative.
  (f) Quantitative discrete.
  (g) Quantitative continuous.

4.61. (a) $4179 + 3766 + 251 = 8196$
  (b) $88/251 = 35\%$.
  (c)

	Insurance Program		
	Traditional	H.M.O.	Other
Region Northeast	37	42	21
Midwest	40	37	23
South	42	29	30
West	20	51	29

4.62. (a)
  (b) The conditional distribution of Insurance Program given Region.

4.64. (a) Undegraduates: $1520+1035+876+950+600+610+1465+1328 = 8384$. Students total: $1520 + 1035 + 876 + 950 + 600 + 610 + 1465 + 1328 + 1210 + 2120 = 11,714$. Percentage of undergraduates: $\dfrac{8384}{11,714}100\% \approx 72\%$.

  (b) Male undergraduates: $1520 + 1035 + 876 + 950 = 4381$. Percentage: $\dfrac{4381}{11,714}100\% \approx 37\%$.

  (c) Female first- and second-years: $600 + 610 = 1210$. Female students: $600 + 610 + 1465 + 1328 + 2120 = 6123$. Percentage: $\dfrac{1210}{6123}100\% \approx 20\%$.

  (d) Graduate students: $1210+2120 = 3330$. Percentage of male graduate students: $\dfrac{1210}{2120}100\% \approx 36\%$.

(e) (iii) there are some departments that have more undergraduate students than graduate students. (Otherwise, there would be more graduate students in each department and thus more graduate students total.)

(f) (i) percentage of males out of the third-year undergraduate students and percentage of females out of fourth-year undergraduate students.

(g) (iii) percentage of undergraduate and graduate students among all female students.

4.68. (a) $70 - 75 : 4$, $75 - 80 : 3$. Total number for $70 - 80 : 3 + 4 = 7$. Percentage: $\frac{7}{25}100\% = 28\%$.

(b) Predominantly younger; skewed to the right.
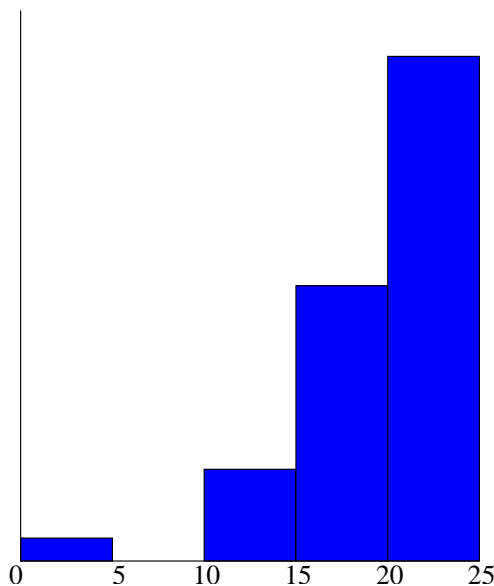
4.69. (a) Radiation emitted.

(b) No. For instance the lowest measurement was between 0.1 and 0.2 but we do not know its precise value.

(c) $2 + 2 + 3 + 3 = 10$ stores out of 20. Thus 50%.

(d) $0.5/0.08 = 6.25$. Six sets.

Chapter 5

5.35. (a) Skewed to the left:

(b) Five-number-summary (because of the outlier). Min: 0, Q1: 17.5, Q2: 20, Q3: 22, Max: 24.

(c) Now can do mean and standard deviation (note that $n = 39$ after the outlier is removed). Mean: $\frac{\sum x}{39} = \frac{763}{39} \approx 19.6$; standard deviation: $\sqrt{\frac{39 \sum x^2 - (\sum x)^2}{39 \cdot 38}} \approx 2.9$.

5.45. (a) Yes.

(b) Yes. The "average" may stand for "mean" and some very low-scoring students (outliers) can make the mean fall below the median.

(c) 4. Smaller standard deviation indicates that less scores are well beyond the mean.

5.50. (a) a single-blinded experiment

(b) a quantitative variable; the response variable; a continuous variable
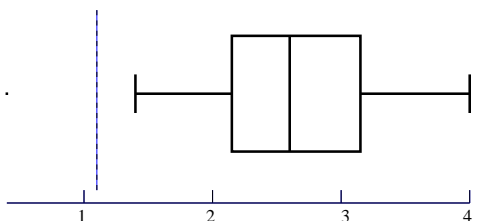
(c) a discrete variable; a quantitative variable

(d) $\sum x = 40.4$, $\sum x^2 = 113.2$. Mean, $\bar{x} = \dfrac{40.4}{16} \approx 2.53$. Standard deviation, $s = \sqrt{\dfrac{16 \cdot 113.2 - (40.4)^2}{16 \cdot 15}} \approx 0.86$.

(e) Interval $[\bar{x} - s, \bar{x} + s]$ is $[1.67, 3.39]$. Number of observations within the interval: 12.

(f) Min: 0.4, Q1: 2.15, Q2: 2.6, Q3: 3.15, Max: 4.0

(g) $1.5 \times$IQR$= 1.5(3.15 - 2.15) = 1.5$. Outliers lie outside the range 2.6 ± 1.5: 0.4.

(h)

5.54, (a)-(c). (a) Stratified random sampling.

(b) 6 out of 10 or 60%.

(c) Median: $(345 + 430)/2 = 387.5$. For mean and standard deviation: $\sum x = 4086, \sum x^2 = 1,837,436$. Mean, $\bar{x} = 4086/10 = 408.6$. Standard deviation, $s = \sqrt{\dfrac{10 \cdot 1,837,436 - (4086)^2}{10 \cdot 9}} \approx 137$.

Chapter 6

6.55. z-score for 36 months: $\dfrac{36 - 60}{8} = -3$. Proportion$(Z < -3) = 0.0013$.

6.57. (a) z-scores for 64.5 and 72: $\dfrac{64.5 - 63.6}{2.5} = 0.36, \dfrac{72 - 63.6}{2.5} = 3.36$. Proportion$(0.36 < Z < 3.36) = 0.9996 - 0.6406 = 0.3590$.

(b) $1000 \cdot 0.3590 = 359$ women.

(c) Proportion$(Z <?) = 0.95$, thus z-score is approximately 1.645. Height is $63.6 + 1.645 \cdot 2.5 = 67.7125$ inches.

**6.63.** Mean: $\mu = (9 + 10.5)/2 = 9.75$. 95% of resistors are in the range between 9 and 10.5 ohms. By the empirical rule, $9 = \mu - 2\sigma$. Thus $\sigma = 0.75/2 = 0.375$.

6.65. (a) z-score for 50: $\dfrac{50 - 45.5}{1.5} = 3$. Proportion$(Z < 3) = 0.9987$. Proportion$(Z > 3) = 0.0013$ or 0.13%.

(b) The score lies within 3 standard deviations of the mean, thus by the empirical rule Proportion$(X > 50)$ is half of 0.3% or 0.15%.

(c) Proportion$= 0.98$ corresponds to z-score of approximately 2.055. The candidate's score is then $45.5 + 1.5 \cdot 2.055 \approx 48.58$.

6.76. (a)
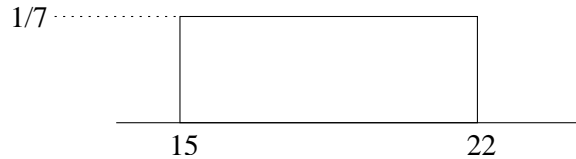
(b) $(15 + 22)/2 = 18.5$ minutes.
(c) The proportion of wait between 20 and 22 minutes is $2/7$.