HW2

5.1 Explaining probability. The answer in the back of the book emphasizes uncertainty in the individual and the "long run expectation" nature of probability.

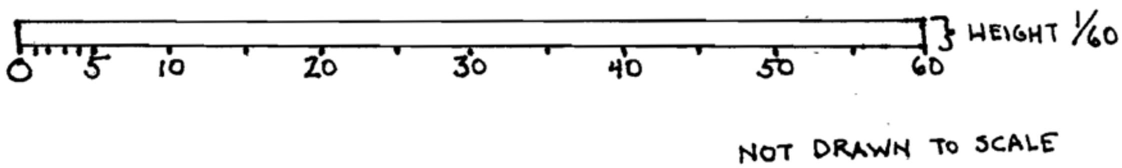
5.4 Childhood leukemia. The *estimated* probability is 475 in 601, or 0.7903. This is only an estimate of the true probability because it is based on a finite number of observations. True probabilities are long run expectations (see p. 90).

5.8 Natality. (a) Pr(mother less than 19) = Pr(mother 10 – 14) + Pr(mother 15 – 19) = 0.003 + 0.100 = 0.103 **(b)** Pr(mother at least 30) = 0.300 + 0.097 + 0.000 = 0.397

5.10 U.S. Census. Pr(self identify as Hispanic) = 0.000 + 0.003 + 0.060 + 0.062 = 0.125.

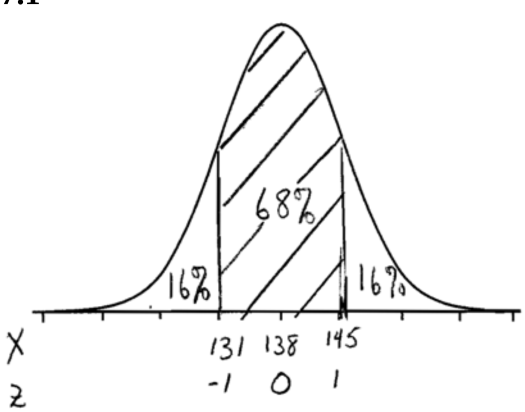
5.13 The sum of two uniform (0,1) random variables: Answers are provided on p. 506.

5.14 (a) The *pdf* is rectangular with base of 0 to 60 and height 1/60. Outcomes must be rounded up to the next integer to allow for a discrete sample space of 1 to 60.



5.15 (a) The area of the curve equals 1: the area is a (1/5) × 5 rectangle; any given probability is more than 0 and less than 1. **(b)** One-fifth of the accidents occur in the first mile; this is a (1/5) × 1 rectangle. **(c)** Thirty percent of the accident occur on this stretch; this is a (1/5) × 1.5 rectangle =.3 square units.

7.1

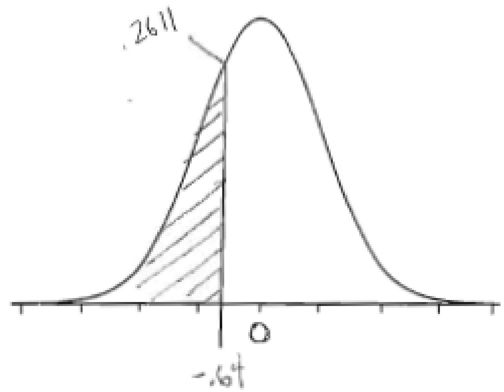


7.2 Middle 95% of heights = $\mu \pm 2\sigma = 138 \pm (2)(7) = (124 \text{ to } 152)$.
The tallest 2.5% are at least 152 cm. tall.

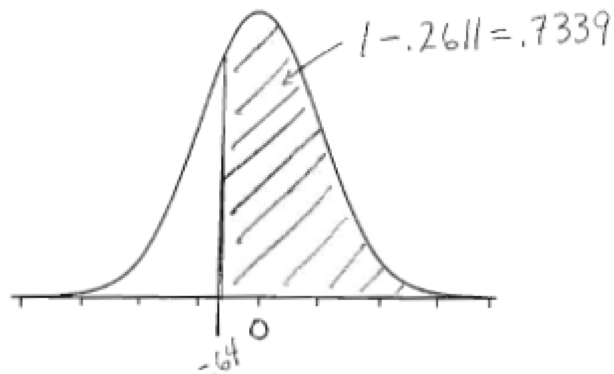
7.3 Visualizing the distribution of gestational length. See Figure 7.13 on p. 143.

7.4 Standard Normal probabilities.

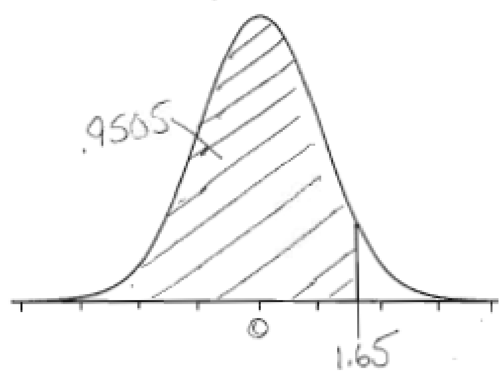
(a) Pr(Z ≤ −0.64) = 0.2611



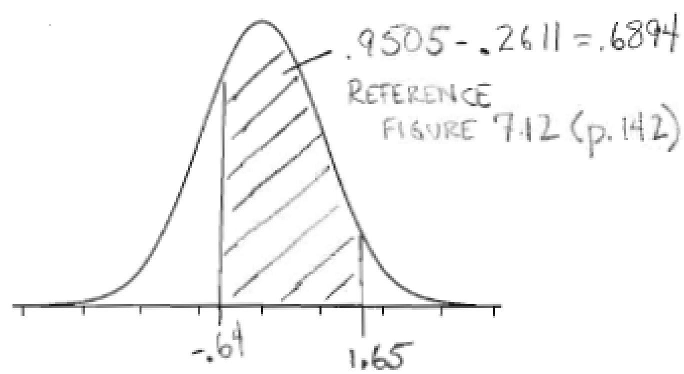
(b) Pr(Z > −0.64)
= 1 − 0.2611
= 0.73**8**9



(c) Pr(Z ≤ 1.65) = 0.9505

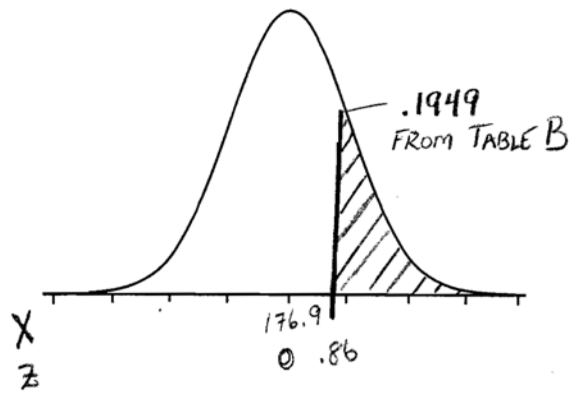


(d) Pr(-0.64 ≤ Z ≤ 1.65)
= Pr(Z ≤ 1.65) – Pr(Z ≤ -0.64)
= 0.9505 − 0.2611
= 0.6894



7.6 ***Heights of 20-year olds.***

(a) Statement of problem: What percentage of men are at least 6 feet tall? Note: 6 feet ≈ 183 centimeters.
Let $X_{♂}$ represent male height.
Given: $X_{♂} \sim N(176.9, 7.1)$.

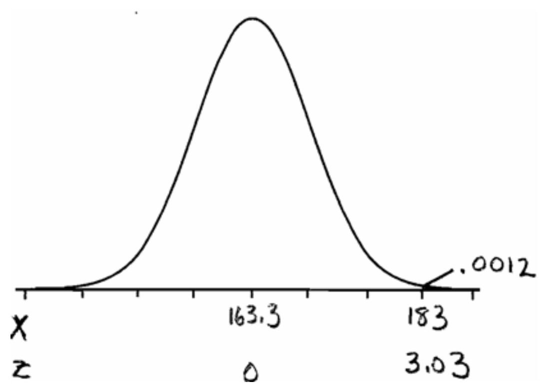


Standardize: $z = (183 – 176.9) / 7.1 = 0.86$.

$Pr(Z > 0.86) = 1 – 0.8051 = 0.1949$.

Conclude: About 19.5% of men are more than 6 feet tall.

(b) What percentage of women are at least 6 feet tall? Given: $X_{♀} \sim N(163.3\ 6.5)$.

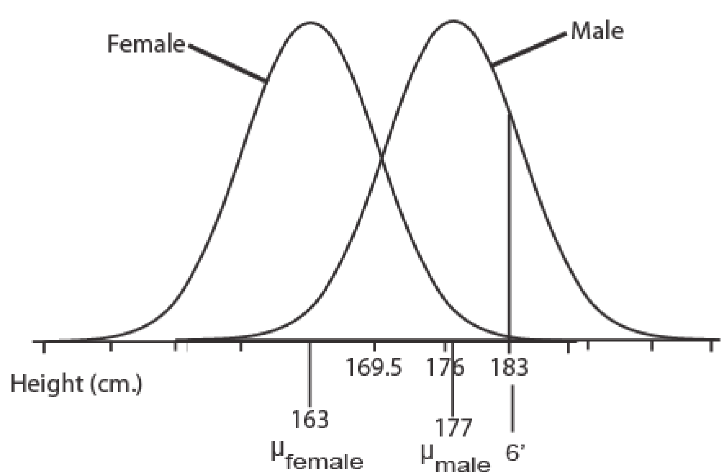


Standardize: $z = (183 – 163.3) / 6.5 = 3.03$.

$Pr(Z > 3.03) = 0.0012$.

Conclude: About 0.1% of females are at least 6 feet tall.

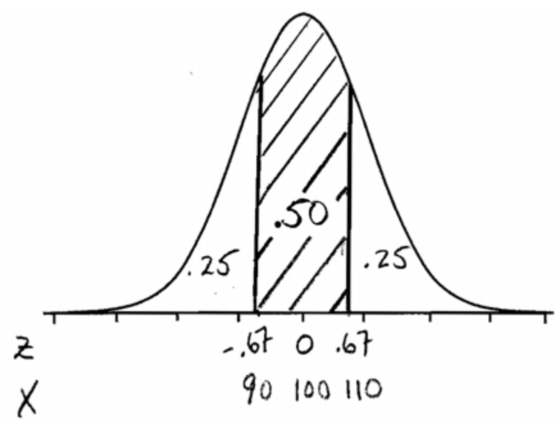
(c) The 6 foot tall man is less than 1 standard deviation above the mean; approximately 19.5% of men are at least this tall. The 6 foot tall woman is more than 3 standard deviations above the mean; about 1 in a 1000 women are this tall. This accounts for the fact that a 6 foot tall man is not surprising, but a 6 foot tall woman is striking.



Note: The male curve should be slightly broader; I could not draw this perfectly in Illustrator.

7.8 64*th* percentile on a Standard Normal z curve. A Standard Normal value of 0.36 has a cumulative probability of 0.6406, which is as close as Table B allows to .64, i.e., ≈ $z_{.64}$. ≈ $z_{.6406}$ = 0.36.

7.9 Middle 50 percent of WAIS. See pp. 508–509. Here's the sketch that goes along with that problem.



7.16 Gestation.
Statement of the problem: What is the 99^{th} percentile on X~N(39,2), i.e., what gestational length is greater than or equal to 99% of gestations?
z percentile: $z_{.99}$ = 2.33
Sketch: omitted
Unstandardize: $x = 39 + 2.33 \cdot 2 = 43.66$ weeks

7.17 Gestation.
Statement of the problem: What percentage of gestations are less that 32 weeks long?
Standardize: z = (32 – 39) / 2 = -3.50
Sketch: omitted
Table B: Pr(Z < -3.50) < .0002
Note: Table B does not include the cumulative probability for -3.50; it begins at -3.49. To determine the cumulative probability for a standard Normal value of -3.50, picture a Normal curve with z score of -3.5, far in the left tail. If the area to the left of -3.49 (which is on the table) is .0002, then the area to the left of -3.5 is slightly less.