Homework 4 Solutions
Chapter 7: # 17, 27, 28
Chapter 7: #35, 51, 53 (answer in back, show work), 55
Chapter 8: #1, 14, 27

Assigned Wed, October 20

7.17 **a.** BY, BS, BA, YS, YA, SA.
b. 1/6.

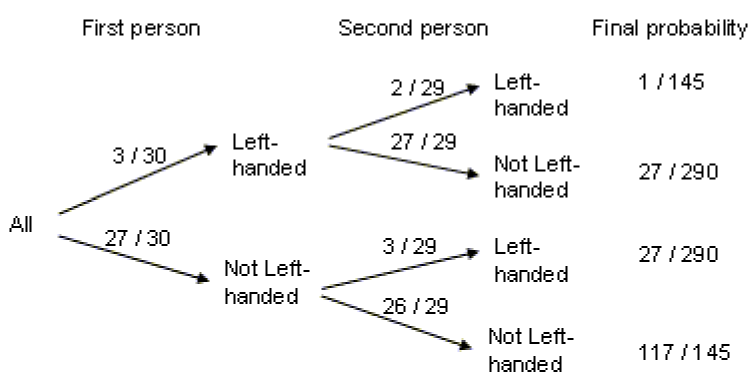
7.27 A = event that a woman is between the ages of 20 and 24.
B = event that a woman is between the ages of 40 and 44.
C = event a woman is fertile (can bear a child).
P(C|A) = .90. P(C|B) = .37.

7.28 Observing the relative frequency over the long run was the method used to find the 90 percent chance and 37 percent chance. Researchers probably repeatedly observed women of various age groups trying to bear children and recorded the proportion who were able to do so.

Assigned Fri, October 22

7.35 **a.** No, they are not independent. P(A in both classes) ≠ P(A English)×P(A in history), as it would for independent events.
b. P(A in either English or history) = P(A in English) + P(A in history) – P(A in both classes) =
.70 + .60 – .50 = .80.

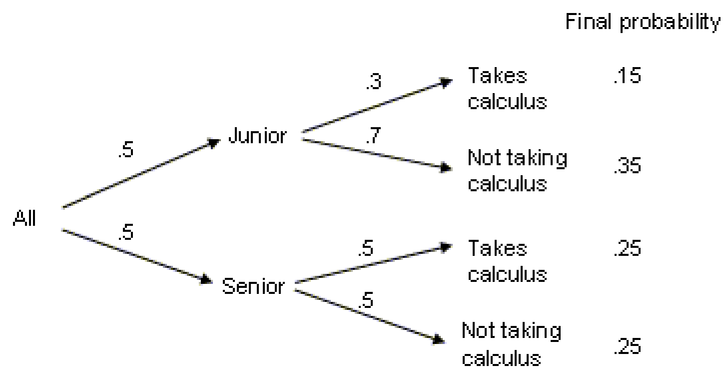
7.51 The tree diagram illustrates the desired probability as well as probabilities for all other outcomes.



7.53 You can construct a table as instructed in 7.52, or use a tree diagram. The table is as follows.

Grade	Calculus	No calculus	Total
Junior	15	35	50
Senior	25	25	50
Total	40	60	100

Based on the information in the table, the probability is 15/40 = .375.
Using a tree diagram:
Make the first set of branches correspond to the two different classes and the second set of branches correspond to taking calculus or not.



The desired conditional probability is P(junior | taking calculus).

$$P(\text{junior} \mid \text{taking calculus}) = \frac{P(\text{junior and taking calculus})}{P(\text{taking calculus})}.$$

A student taking calculus is either a junior or a senior, so (using Rule 2b):
P(taking calculus) = P(junior and taking calculus)+ P(senior and taking calculus)
From the "final probability" in the tree diagram:
P(junior and taking calculus) = (.5)(.3) = .15
P(senior and taking calculus)= (.5)(.5) = .25
This leads to P(taking calculus) = .15 + .25 = .40.

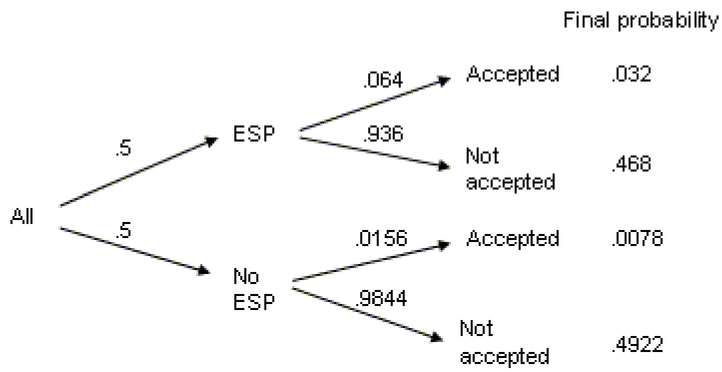
So, $$P(\text{junior} \mid \text{taking calculus}) = \frac{P(\text{junior and taking calculus})}{P(\text{taking calculus})} = \frac{.15}{.40} = .375$$

7.55 **a.** Probability = (.25)(.25)(.25) = .0156 that someone simply guessing gets three right and is accepted. Use the multiplication rule for independent events (Rule 3b extension).
b. Probability = (.4)(.4)(.4) = .064 this person will be accepted for the later experiment. Use the multiplication rule for independent events (Rule 3b extension).
c. The desired conditional probability is P(ESP | accepted for experiment).

$$P(\text{ESP} \mid \text{accepted for later experiment}) = \frac{P\,(\text{ESP and accepted})}{P(\text{accepted})}.$$

This is an application of Rule 4 for conditional probability.

A tree diagram (next page) is useful for seeing the steps here. The first set of branches represent ESP or no ESP and the second set of branches represent being accepted or not within each ESP category.



Note that a participant who is accepted either really has ESP or does not. So (using Rule 2b): P(accepted) = P(ESP and accepted) + P(no ESP and accepted)

Each element of the previous formula can be found using the multiplication rule (Rule 3a), as seen on the tree diagram:
P(ESP and accepted) = P(ESP) × P(accepted |ESP) = (.5)(064.) = .032
P(no ESP and accepted) = P(no ESP) × P(accepted | no ESP) = (.5)(.0156) = .0078

This leads to P(accepted) = .032 + .0078 = .0398.

So, $P(\text{ESP}\,|\,\text{accepted}) = \dfrac{P(\text{ESP and accepted})}{P(\text{accepted})} = \dfrac{.032}{.0398} = .804$.

Assigned Monday, October 25

8.1 **a.** Continuous
b. Discrete
c. Continuous
d. Discrete
e. Discrete

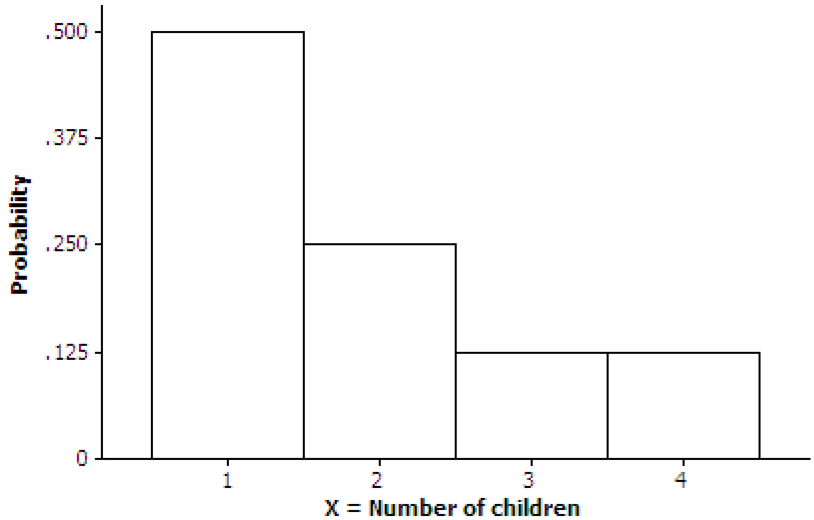
8.14 **a.** Simple events are {G, BG, BBG, BBBG, BBBB}
b. Probability of G = .5, probability of BG = .5×.5 = .25, probability of BBG = .5×.5×.5 = .125, probability of BBBG = 5×.5×.5 ×.5= .0625, and probability of BBBB = .0625.
c. For X = number of children, the probability distribution is:

k	1	2	3	4
$P(X=k)$	.5	.25	.125	.125

The probability for X = 4 is the sum of the probabilities for BBBG and BBBB, or you could find it by subtracting the sum of the other probabilities from one.

d. See picture on the next page.

Figure for Exercise 8.14d



8.27 $\mu = E(X) = \sum kP(X = k) = (500\times.1) + (0\times.9) =$ \$50 per person (in the long run).