Problem # 3.1 Four candidates are running for mayor. The four candidates are Adams, Brown, Collins, and Dalton. Determine the sample space of the results of the election.

Problem # 3.2 A telemarketer calls people and tries to sell them a subscription to a daily newspaper. On 20% of her calls, there is no answer or the line is busy. She sells subscriptions to 5% of the remaining calls. For what proportion of calls does she make a sale?

Problem # 3.3 Computer the number of ways you can select n elements from N elements for each of the following:

a. n=2, N=5

b. n=3,N=6

c. n=5,N=20

Problem # 3.4 Investing in stocks. From a list of 15 preferred stocks recommended by your broker, you will select three to invest in. How many different ways can you select the three stocks from the 15 recommenced stocks?

Problem # 3.5 An investor tells you that in her estimation there is 60% probability that the Dow Jones Industrial Index will increase tomorrow.
a. Which approach was used to produce this figure?
b. Interpret the 60% probability.

Problem # 3.6 Employing the subjective approach a political scientist has assigned the following probabilities:
P (Adams wins) = .42
P (Brown wins) = .09
P (Collins wins) = .27
P (Dalton wins) = .22

Determine the probabilities of the following events.

a. Adams loses.
b. Either Brown or Dalton wins.
c. Adams, Brown, or Collins wins

Problem # 3.7 A quiz contains a multiple-choice question with five possible answers, only one of which is correct. A student plans to guess the answer because he knows absolutely nothing about the subject.

a. Produce the sample space for each question
b. Assign probabilities to the simple events in the sample space you produced.
c. Which approach did you use to answer part (b)?
d. Interpret the probabilities you assigned in part (b).

Problem # 3.8 The sample space for an experiment contains five sample points with probabilities as shown in the table. Find the probability of each of the following events:

Sample Points	Probabilities
1	.05
2	.20
3	.30
4	.30
5	.15

A: {Either 1,2, or 3 occurs}
B: {Either 1,3, or 5 occurs}
C: {4 does not occur }

Problem # 3.9 The manager of a computer store has kept track of the number of computers sold per day. On the basis of this information, the manager produced the following list of the number of daily sales.

Number of computers Sold	Probability
0	.08
1	.17
2	.26
3	.21
4	.18
5	.10

a. If we define the experiment as observing the number of computers sold tomorrow, determine the sample space.
b. Use set notation to define the event, sell more than 3 computers.
c. What is the probability of selling 5 computers?
d. What is the probability of selling 2, 3, or 4 computers?
e. What is the probability of selling 6 computers?

Problem # 3.10 Two marbles are drawn at random and without replacement from a box containing two blue marbles and three red marbles.

a. List the sample points for this experiment

b. Assign probabilities to the sample points
c. Determining the probability of observing each of the following events:

A: {two blue marbles are drawn}

B: {A red and a blue marble are drawn}

C: {two red marbles are drawn}

Problem # 3.11 If there are 30 red and blue marbles in a jar, and the ratio of red to blue marbles is 2:3, what is the probability that, drawing twice, you will select two red marbles if you return the marbles after each draw?

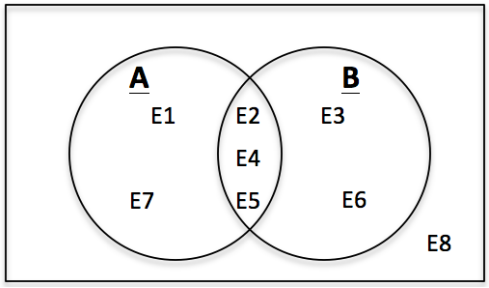
Problem # 3.12 Survey on energy conservation. A state energy agency mailed questionnaires on energy conservation to 1,000 homeowners in the state capital. Five hundred questionnaires were returned. Suppose an experiment consists of randomly selecting and reviewing one of the returned questionnaires. Consider the events:

A: {The home is constructed of brick}
B: {The home is more than 30 years old}
C: {The home is heated with oil}

Describe each of the following events in terms of unions, intersections and complements (ie., A U B, A ∩ B, A^c, etc.):

a. The home is more than 30 years old and is heated with oil.
b. The home is not constructed of brick
c. The home is heated with oil or is more than 30 years old.
d. The home is constructed of brick and is not heated with oil.

Problem # 3.13 Draw the Venn diagram where
$P(E_1) = .10$, $P(E_2) = .05$, $P(E_3) = P(E_4) = .2$, $P(E_5) = .06$, $P(E_6) = .3$, $P(E_7) = .06$ and $P(E_8) = .03$.



Find the following probabilities:

a. $P(A^c)$ =

b. $P(B^c)$ =

c. $P(A^c \cap B)$ =

d. $P(A \cup B)$ =

e. $P(A \cap B)$ =

f. $P(A^c \cap B^c)$ =

g. Are events A and B mutually exclusive? Why?

Problem # 3.14 Given that $P(A \cap B) = .4$ and $P(A|B) = .8$, find $P(B)$

Problem # 3.15 Suppose we have the following joint probabilities.
Compute the marginal probabilities

	A_1	A_2	A_3	
B_1	.15	.20	.10	
B_2	.25	.25	.05	

Problem # 3.16

a. Compute $P(A_2|B_2)$
b. Compute $P(B_2|A_2)$
c. Compute $P(B_1|A_2)$

Problem # 3.17

a. Compute $P(A_1 \text{ or } A_2)$
b. Compute $P(A_2 \text{ or } B_2)$
c. Compute $P(A_3 \text{ or } B_1)$

Problem # 3.18 A firm has classified its customers in two ways: (1) according t whether the account is overdue and (2) whether the account is new (less than 12 months) or old. An analysis of the firm's records provided the input for the following table of joint probabilities.

	Overdue	**Not Overdue**
New	.06	.13
Old	.52	.29

One account is randomly selected.

a. If the account is overdue, what is the probability that it is new?
b. If the account is new, what is the probability that it is overdue?
c. Is the age of the account related to whether it is overdue? Explain.

Problem # 3.19 A and B are mutually exclusive events, with P(A) = 0.2 and P(B) = 0.3.

a. Find P(A|B)

b. Are A and B independent events?

Problem # 3.20 For two events, A and B, P(A) = .4, P(B) = .2, and $P(A \cap B) = .1$.

a. Find P (A|B).

b. Find P (B|A)

c. Are A and B independent events?

Problem # 3.21 An investor believes that on a day when the Dow Jones industrial Average (DJIA) increase, the probability that the NASDAQ also increases is 77%. If the investor believes that there is a 60% probability that the DJIA will increase tomorrow, what is the probability that the NASDAQ will increase as well?

Problem # 3.22 Calculate the marginal probabilities from the following table of joint probabilities.
Table 3.3

	A_1	A_2	
B_1	0.4	0.3	
B_2	0.2	0.1	

Problem # 3.23 Refer to 3-22 problem,
Determine $P(A_1 \mid B_1)$. Determine $P(A_2 \mid B_1)$

Did you answers to parts a and b sum to 1? Is this a coincidence? Explain

Problem #3.24 Refer to 3-22. Calculate the following probabilities.

a. $P(A_1 \mid B_2)$ =
b. $P(B_2 \mid A_1)$ =

c. Did you expect the answer to part a and b to be reciprocals? That is, did you expect that P ($A_1|B_2$) = 1/ P ($B_2|A_1$)? Why is this impossible (unless both probabilities are 1)?

Problem #3.25 In 2008, McDonald's had 31,967 restaurants system wide. Of these, 21,328 were operated by franchises, 6,502 by the company, and 4,137 by affiliates. What is the probability that a randomly selected McDonald's restaurant is operated by either a franchisee or an affiliate?
Source: McDonald's Corporation, 2008 Annual Report, p.44.

Problem # 3.26 (Attempt this problem on a separate sheet of paper as it is very long)
The U.S. Bureau of Justice released the following probabilities for those arrested for committing various felony crimes in the United States:

	Probability of Being		
Crime	**Prosecuted**	**Convicted**	**Jailed for > 1 Year**
Homicide	0.91	0.75	0.73
Assault	0.79	0.64	0.15
Burglary	0.88	0.81	0.28
Arson	0.88	0.72	0.28
Drug offenses	0.78	0.69	0.19
Weapons	0.83	0.70	0.13
Public disorder	0.92	0.85	0.12

Allen has been arrested for burglary, Bill has been arrested for a weapons offense, and Charlie has been arrested on a public-disorder charge. Assuming these individuals are typical perpetrators and the decisions regarding their respective fates are unrelated, determine the probability that Source: U.S. Bureau of Justice, as reported in Sam Meddis, "felony Arrests: short Terms: USA Today, January 18, 1988, p9A

a. Allen will be jailed for more than a year
b. Either Allen or Bill (or both) will be convicted.
c. None of the three will be jailed for more than a year.
d. Allen and Bill will be convicted, but Charlie will be found innocent.
e. None will be prosecuted.

Determine the number of possibilities in which

f. Just one person is convicted.
g. Exactly two of the three persons are convicted.
h. All three persons are convicted.

Understanding the Basics: Suggested Problems from the Book.

In **Bold** are the Suggested Problems, in Green are the problems on Connect and the book.

	Chapter 4																				
4.1	Probability, Sample Spaces, and Probability Models																				
4.2	Probability and Events	**4.01**	**4.02**	**4.03**	4.04	4.05	**4.06**	**4.07**													
4.3	Some Elementary Probability Rules	**4.08**	**4.09**	**4.10**	**4.11**	**4.12**	4.13	**4.14**	4.15												
4.4	Conditional Probability and Independence	4.16	**4.17**	**4.18**	**4.19**	**4.20**	**4.21**	**4.22**	4.23	**4.24**	**4.25**	**4.26**	**4.27**	**4.28**	4.29	4.30	4.31	**4.32**	**4.33**		
	Supplementary	4.54	4.55	4.56	**4.57**	4.58	4.59	4.60	4.61	4.62	4.63	4.64	4.65	4.66	4.67	4.68	4.69	**4.70**	4.71	4.72	4.73	4.74

This statistical workbook is compiled from the following books:

- Keller, G. (2012). *Statistics for management and economics*. Mason: Cengage Learning.
- McClave, J. T., Benson, G. P., & Sincich, T. (2008). *Statistics for Business and Economics*. New Jersey: Prentice Hall.
- Weiers, R. M. (2011). *Introduction to Business Statistics*. Mason: Cengage Learning.
- (GMAC), F. t. (Ed.). (2005). *GMAT -Quantitative Review.* Oxford, UK: Blackwell.
- Bowerman, B. L., O'Connell, R. T., Murphree, E., Huchendorf, S. C., & Porter, D. C. (2003). *Business statistics in practice*(pp. 728-730). New York: McGraw-Hill/Irwin.