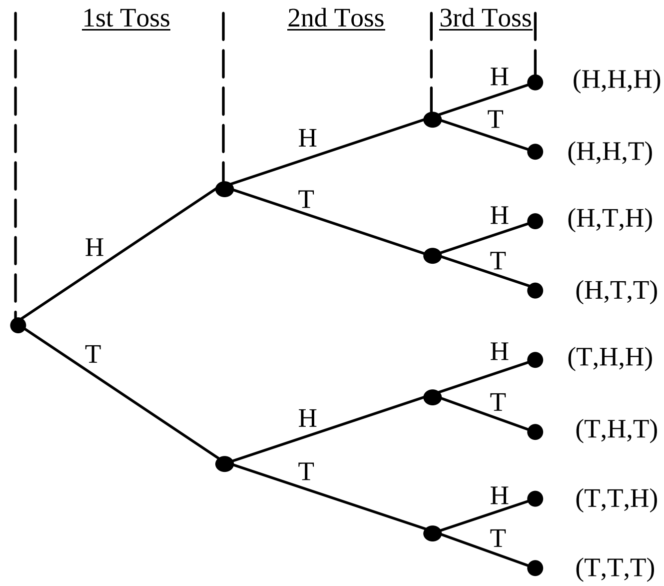
Solutions for the following select questions from Anderson, Sweeney, and Williams "Statistics for Business and Economics" 9th edition

Chapter 4
4, 5, 7, 14, 15, 16, 18, 22, 23, 27, 30, 31, 32, 33, 34, 39, 40, 41

Chapter 4

4. a.



b. Let: H be head and T be tail

(H,H,H)	(T,H,H)
(H,H,T)	(T,H,T)
(H,T,H)	(T,T,H)
(H,T,T)	(T,T,T)

c. The outcomes are equally likely, so the probability of each outcomes is 1/8.

5. $P(E_i) = 1 / 5$ for i = 1, 2, 3, 4, 5

$P(E_i) \geq 0$ for i = 1, 2, 3, 4, 5
$P(E_1) + P(E_2) + P(E_3) + P(E_4) + P(E_5) = 1 / 5 + 1 / 5 + 1 / 5 + 1 / 5 + 1 / 5 =1$

The classical method was used.

7. No. Requirement (4.4) is not satisfied; the probabilities do not sum to 1. $P(E_1) + P(E_2) + P(E_3) + P(E_4) = .10 + .15 + .40 + .20 = .85$

14. a. $P(E_2) = 1 / 4$

b. P(any 2 outcomes) = 1 / 4 + 1 / 4 = 1 / 2

c. P(any 3 outcomes) = 1 / 4 + 1 / 4 + 1 / 4 = 3 / 4

15. a. *S* = {ace of clubs, ace of diamonds, ace of hearts, ace of spades}

b. *S* = {2 of clubs, 3 of clubs, . . . , 10 of clubs, J of clubs, Q of clubs, K of clubs, A of clubs}

c. There are 12; jack, queen, or king in each of the four suits.

d. For a: 4 / 52 = 1 / 13 = .08

For b: 13 / 52 = 1 / 4 = .25

For c: 12 / 52 = .23

16. a. (6) (6) = 36 sample points

b.

Die 2

Die 1		1	2	3	4	5	6
	1	2	3	4	5	6	7
	2	3	4	5	6	7	8
	3	4	5	6	7	8	9
	4	5	6	7	8	9	10
	5	6	7	8	9	10	11
	6	7	8	9	10	11	12

← Total for Both

c. 6 / 36 = 1 / 6

d. 10 / 36 = 5 / 18

e. No. P(odd) = 18 / 36 = P(even) = 18 / 36 or 1 / 2 for both.

f. Classical. A probability of 1 / 36 is assigned to each experimental outcome.

18. a. P(0) = .05

b. P(4 or 5) = .20

c. P(0, 1, or 2) = .55

22. a. P(A) = .40, P(B) = .40, P(C) = .60

b. $P(A \cup B) = P(E_1, E_2, E_3, E_4) = .80$. Yes $P(A \cup B) = P(A) + P(B)$.

c. $A^c = \{E_3, E_4, E_5\}$ $C^c = \{E_1, E_4\}$ $P(A^c) = .60$ $P(C^c) = .40$

d. $A \cup B^c = \{E_1, E_2, E_5\}$ $P(A \cup B^c) = .60$

e. $P(B \cup C) = P(E_2, E_3, E_4, E_5) = .80$

23. a. $P(A) = P(E_1) + P(E_4) + P(E_6) = .05 + .25 + .10 = .40$

$P(B) = P(E_2) + P(E_4) + P(E_7) = .20 + .25 + .05 = .50$

$P(C) = P(E_2) + P(E_3) + P(E_5) + P(E_7) = .20 + .20 + .15 + .05 = .60$

b. $A \cup B = \{E_1, E_2, E_4, E_6, E_7\}$

$P(A \cup B) = P(E_1) + P(E_2) + P(E_4) + P(E_6) + P(E_7)$
$= .05 + .20 + .25 + .10 + .05 = .65$

c. $A \cap B = \{E_4\}$ $P(A \cap B) = P(E_4) = .25$

d. Yes, they are mutually exclusive.

e. $B^c = \{E_1, E_3, E_5, E_6\}$; $P(B^c) = P(E_1) + P(E_3) + P(E_5) + P(E_6)$
$= .05 + .20 + .15 + .10 = .50$

27.

		Big Ten		
		Yes	No	
Pac-	Yes	849	3645	4494
	No	2112	6823	8935
		2,961	10,468	13,429

a. $P(\text{Neither}) = \frac{6823}{13,429} = .51$

b. $P(\text{Either}) = \frac{2961}{13,429} + \frac{4494}{13,429} - \frac{849}{13,429} = .05$

c. $P(\text{Both}) = \frac{849}{13,429} = .06$

30. a. $P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{.40}{.60} = .6667$

b. $P(B|A) = \frac{P(A \cap B)}{P(A)} = \frac{.40}{.50} = .80$

c. No because P(A | B) $\neq$ P(A)

31. a. P(A $\cap$ B) = 0

b. $P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{0}{.4} = 0$

c. No. P(A | B) $\neq$ P(A); $\therefore$ the events, although mutually exclusive, are not independent.

d. Mutually exclusive events are dependent.

32. a.

	Single	Married	Total
Under 30	.55	.10	.65
30 or over	.20	.15	.35
Total	.75	.25	1.00

b. 65% of the customers are under 30.

c. The majority of customers are single: P(single) = .75.

d. .55

e. Let: A = event under 30
B = event single

$$P(B|A) = \frac{P(A \cap B)}{P(A)} = \frac{.55}{.65} = .8462$$

f. $P(A \cap B) = .55$

$P(A)P(B) = (.65)(.75) = .49$

Since $P(A \cap B) \neq P(A)P(B)$, they cannot be independent events; or, since $P(A | B) \neq P(B)$, they cannot be independent.

33. a.

	Reason for Applying			
	Quality	Cost/Convenience	Other	Total
Full Time	.218	.204	.039	.461
Part Time	.208	.307	.024	.539
	.426	.511	.063	1.00

b. It is most likely a student will cite cost or convenience as the first reason - probability = .511. School quality is the first reason cited by the second largest number of students - probability = .426.

c. P(Quality | full time) = .218/.461 = .473

d. P(Quality | part time) = .208/.539 = .386

e. For independence, we must have $P(A)P(B) = P(A \cap B)$.

From the table, $P(A \cap B) = .218$, $P(A) = .461$, $P(B) = .426$

$P(A)P(B) = (.461)(.426) = .196$

Since $P(A)P(B) \neq P(A \cap B)$, the events are not independent.

34. a. P(O) = 0.38 + 0.06 = 0.44

b. P(Rh-) = 0.06 + 0.02 + 0.01 + 0.06 = 0.15

c. P(both Rh-) = P(Rh-) P(Rh-) = (0.15)(0.15) = 0.0225

d. P(both AB) = P(AB) P(AB) = (0.05)(0.05) = 0.0025

e. $P(Rh-|O) = \frac{P(Rh - \cap O)}{P(O)} = \frac{0.06}{0.44} = 0.136$

f. P(Rh+) = 1 - P(Rh-) = 1 - 0.15 = 0.85

$P(B|Rh+) = \frac{P(B \cap Rh+)}{P(Rh+)} = \frac{0.09}{0.85} = 0.106$

39. a. Yes, since $P(A_1 \cap A_2) = 0$

b. $P(A_1 \cap B) = P(A_1)P(B \mid A_1) = .40(.20) = .08$

$P(A_2 \cap B) = P(A_2)P(B \mid A_2) = .60(.05) = .03$

c. $P(B) = P(A_1 \cap B) + P(A_2 \cap B) = .08 + .03 = .11$

d. $P(A_1|B) = \frac{.08}{.11} = .7273$

$P(A_2|B) = \frac{.03}{.11} = .2727$

40. a. $P(B \cap A_1) = P(A_1)P(B \mid A_1) = (.20)(.50) = .10$

$P(B \cap A_2) = P(A_2)P(B \mid A_2) = (.50)(.40) = .20$

$P(B \cap A_3) = P(A_3)P(B \mid A_3) = (.30)(.30) = .09$

b. $P(A_2|B) = \frac{.20}{.10 + .20 + .09} = .51$

c.

Events	$P(A_i)$	$P(B \mid A_i)$	$P(A_i \cap B)$	$P(A_i \mid B)$

A_1	.20	.50	.10	.26
A_2	.50	.40	.20	.51
A_3	.30	.30	.09	.23
	1.00		.39	1.00

41. S_1 = successful, S_2 = not successful and B = request received for additional information.

a. $P(S_1) = .50$

b. $P(B \mid S_1) = .75$

c. $P(S_1 \mid B) = \frac{(.50)(.75)}{(.50)(.75)+(.50)(.40)} = \frac{.375}{.575} = .65$