Chapter 6

6.1 a Relative frequency approach

b If the conditions today repeat themselves an infinite number of days rain will fall on 10% of the next days.

6.2 a Subjective approach

b If all the teams in major league baseball have exactly the same players the New York Yankees will win 25% of all World Series.

6.3 a {a is correct, b is correct, c is correct, d is correct, e is correct}

b P(a is correct) = P(b is correct) = P(c is correct) = P(d is correct) = P(e is correct) = .2

c Classical approach

d In the long run all answers are equally likely to be correct.

6.4 a Subjective approach

b The Dow Jones Industrial Index will increase on 60% of the days if economic conditions remain unchanged.

6.5 a P(even number) = P(2) + P(4) + P(6) = 1/6 + 1/6 + 1/6 = 3/6 = 1/2

b P(number less than or equal to 4) = P(1) + P(2) + P(3) + P(4) = 1/6 + 1/6 + 1/6 +1/6 = 4/6 = 2/3

c P(number greater than or equal to 5) = P(5) + P(6) = 1/6 + 1/6 = 2/6 = 1/3

6.6 {Adams wins. Brown wins, Collins wins, Dalton wins}

6.7a P(Adams loses) = P(Brown wins) + P(Collins wins) + P(Dalton wins) = .09 + .27 + .22 = .58

b P(either Brown or Dalton wins) = P(Brown wins) + P(Dalton wins) = .09 + .22 = .31

c P(either Adams, Brown, or Collins wins) = P(Adams wins) + P(Brown wins) + P(Collins wins)

= .42 + .09 + .27 = .78

6.8 a {0, 1, 2, 3, 4, 5}

b {4, 5}

c P(5) = .10

d P(2, 3, or 4) = P(2) + P(3) + P(4) = .26 + .21 + .18 = .65

e P(6) = 0

6.9 {Contractor 1 wins, Contractor 2 wins, Contractor 3 wins}

6.10 P(Contractor 1 wins) = 2/6, P(Contractor 2 wins) = 3/6, P(Contractor 3 wins) = 1/6

6.11 a {Shopper pays cash, shopper pays by credit card, shopper pays by debit card}

b P(Shopper pays cash) = .30, P(Shopper pays by credit card) = .60, P(Shopper pays by debit card) = .10

c Relative frequency approach

6.12 a P(shopper does not use credit card) = P(shopper pays cash) + P(shopper pays by debit card)

= .30 + .10 = .40

b P(shopper pays cash or uses a credit card) = P(shopper pays cash) + P(shopper pays by credit card)

= .30 + .60 = .90

6.13 {single, divorced, widowed}

6.14 a P(single) = .15, P(married) = .50, P(divorced) = .25, P(widowed) = .10

b Relative frequency approach

6.15 a P(single) = .15

b P(adult is not divorced) = P(single) + P(married) + P(widowed) = .15+ .50 + .10 = .75

c P(adult is either widowed or divorced) = P(divorced) + P(widowed) = .25 + .10 = .35

6.16 $P(A_1) = .4 + .2 = .6$, $P(A_2) = .3 + .1 = .4$. $P(B_1) = .4 + .3 = .7$, $P(B_2) = .2 + .1 = .3$.

6.17 $P(A_1) = .1 + .2 = .3$, $P(A_2) = .3 + .1 = .4$, $P(A_3) = .2 + .1 = .3$.

$P(B_1) = .1 + .3 + .2 = .6$, $P(B_2) = .2 + .1 + .1 = .4$.

6.18 a $P(A_1 \mid B_1) = \frac{P(A_1 \text{ and } B_1)}{P(B_1)} = \frac{.4}{.7} = .57$

b $P(A_2 \mid B_1) = \frac{P(A_2 \text{ and } B_1)}{P(B_1)} = \frac{.3}{.7} = .43$

c Yes. It is not a coincidence. Given B_1 the events A_1 and A_2 constitute the entire sample space.

6.19 a $P(A_1 \mid B_2) = \frac{P(A_1 \text{ and } B_2)}{P(B_2)} = \frac{.2}{.3} = .67$

b $P(B_2 \mid A_1) = \frac{P(A_1 \text{ and } B_2)}{P(A_1)} = \frac{.2}{.6} = .33$

c One of the conditional probabilities would be greater than 1, which is not possible.

6.20 The events are not independent because $P(A_1 \mid B_2) \neq P(A_1)$.

6.21 a $P(A_1 \text{ or } B_1) = P(A_1) + P(B_1) - P(A_1 \text{ and } B_1)$ = .6 + .7 - .4 = .9

b $P(A_1 \text{ or } B_2) = P(A_1) + P(B_2) - P(A_1 \text{ and } B_2)$ = .6 + .3 - .2 = .7

c $P(A_1 \text{ or } A_2) = P(A_1) + P(A_2)$ = .6 + .4 = 1

6.22 $P(A_1 | B_1) = \frac{P(A_1 \text{ and } B_1)}{P(B_1)} = \frac{.20}{.20 + .15} = .571$; $P(A_1) = .20 + .60 = .80$; the events are dependent.

6.23 $P(A_1 | B_1) = \frac{P(A_1 \text{ and } B_1)}{P(B_1)} = \frac{.20}{.20 + .60} = .25$; $P(A_1) = .20 + .05 = .25$; the events are independent.

6.24 $P(A_1)$ = .20 + .25 = .45, $P(A_2)$ = .15 + .25 = .40, $P(A_3)$ = .10 + .05 = .15.

$P(B_1)$ = .20 + 15 + .10 = .45, $P(B_2)$ = .25 + .25 + .05 = .55.

6.25 a $P(A_2 | B_2) = \frac{P(A_2 \text{ and } B_2)}{P(B_2)} = \frac{.25}{.55} = .455$

b $P(B_2 | A_2) = \frac{P(A_2 \text{ and } B_2)}{P(A_2)} = \frac{.25}{.40} = .625$

c $P(B_1 | A_2) = \frac{P(A_2 \text{ and } B_1)}{P(A_2)} = \frac{.15}{.40} = .375$

6.26 a $P(A_1 \text{ or } A_2) = P(A_1) + P(A_2)$ = .45 + .40 = .85

b $P(A_2 \text{ or } B_2) = P(A_2) + P(B_2) - P(A_2 \text{ and } B_2)$ = .40 + .55 - .25 = .70

c $P(A_3 \text{ or } B_1) = P(A_3) + P(B_1) - P(A_3 \text{ and } B_1)$ = .15 + .45 - .10 = .50

6.27 a P(debit card) = .04 + .18 + .14 = .36

b P(over \$100 | credit card) = $\frac{\text{P(credit card and over \$100}}{\text{P(credit card)}} = \frac{.23}{.03 + .21 + .23} = .49$

c P(credit card or debit card) = P(credit card) + P(debit card) = .47 + .36 = .83

6.28 a P(promoted | female) = $\frac{\text{P(promoted and female)}}{\text{P(female)}} = \frac{.05}{.05 + .12} = .294$

b P(promoted | male) = $\frac{\text{P(promoted and male)}}{\text{P(male)}} = \frac{.15}{.15 + .68} = .181$

c Yes, because promotion and gender are not independent events.

6.29 a P(voted) = .25 + .18 = .43

b P(voted | female) = $\frac{\text{P(voted and female)}}{\text{P(female)}} = \frac{.25}{.25+.33} = .431$, P(voted) = .43, Subject to rounding the events are independent.

6.30 a P(He is a smoker) = .10 + .21 = .31

b P(He does not have lung disease) = .21 + .66 = .87

c P(He has lung disease | he is a smoker) = $\frac{\text{P(he has lung disease and he is a smoker)}}{\text{P(he is a smoker)}} = \frac{.10}{.31} = .323$

d P(He has lung disease | he does not smoke) = $\frac{\text{P(he has lung disease and he does not smoke)}}{\text{P(he does not smoke)}} = \frac{.03}{.69} = .044$

6.31 The events are dependent because P(he has lung disease) = .13, P(he has lung disease | he is a smoker) = .323

6.32 a P(manual | math-stats) = $\frac{\text{P(manual and math} - \text{stats)}}{\text{P(math} - \text{stats)}} = \frac{.23}{.23+.36} = .390$

b P(computer) = .36 + .30 = .66

c No, because P(manual) = .23 + .11 = .34, which is not equal to P(manual | math-stats).

6.33 a P(customer will return and good rating) =.35

b P(good rating | will return) = $\frac{\text{P(good rating and will return)}}{\text{P(will return)}} = \frac{.35}{.02+.08+.35+.20} = \frac{.35}{.65} = .538$

c P(will return| good rating) $\frac{\text{P(good rating and will return)}}{\text{P(good rating)}} = \frac{.35}{.35+.14} = \frac{.35}{.49} = .714$

d (a) is the joint probability and (b) and (c) are conditional probabilities

6.34 a P(ask | male) = $\frac{\text{P(ask and male)}}{\text{P(male)}} = \frac{.12}{.23+.12+.15} = \frac{.12}{.50} = .24$

b P(consult a map) = .23 + .14 = .37

c No, because P(consult map | male) = $\frac{\text{P(consult a map and male)}}{\text{P(male)}} = \frac{.23}{.23+.12+.15} = \frac{.25}{.50} = .46$, which is not equal to P(consult map)

6.35 a P(ulcer) = .03 + .03 + .03 + .04 = .13

b P(ulcer | none) = $\frac{\text{P(ulcer and none)}}{\text{P(none)}} = \frac{.03}{.03+.20} = \frac{.03}{.23} = .130$

c P(none | ulcer) = $\frac{\text{P(ulcer and none)}}{\text{P(ulcer)}} = \frac{.03}{.03+.03+.03+.04} = \frac{.03}{.13} = .231$

d P(two | no ulcer) = $\frac{\text{P(no ulcer and two)}}{\text{P(no ulcer)}} = \frac{.32}{.20+.19+.32+.16} = \frac{.32}{.87} = .368$

6.36 a P(remember) = .12 + .18 = .30

b P(remember | violent) = $\frac{\text{P(remember and violent)}}{\text{P(violent)}} = \frac{.12}{.12+.38} = \frac{.12}{.50} = .24$

c Yes, the events are dependent.

6.37 a P(above average | murderer) = $\frac{\text{P(above average and murderer)}}{\text{P(murderer)}} = \frac{.27}{.27+.21} = \frac{.27}{.48} = .563$

b No, because P(above average) = .27 + .24 = .51, which is not equal to P(above average testosterone | murderer).

6.38 a P(uses a spreadsheet) = .311 + .312 = .623

b P(uses a spreadsheet | male) = $\frac{\text{P(uses a spreadsheet and male)}}{\text{P(male)}} = \frac{.312}{.312+.168} = \frac{.312}{.480} = .650$

c b P(female | uses a spreadsheet) = $\frac{\text{P(uses a spreadsheet and female)}}{\text{P(uses a spreadsheet)}} = \frac{.311}{.311+.209} = \frac{.311}{.520} = .598$

6.39 No, because P(uses a spreadsheet) $\neq$ P(uses a spreadsheet | male)

6.40 a P(under 20) = .2307 + .0993 + .5009 = .8309

b P(retail) = .5009 + .0876 + .0113 = .5998

c P(20 to 99 | construction) = $\frac{\text{P(20 to 99 and construction)}}{\text{P(construction)}} = \frac{.0189}{.2307+.0189+.0019} = \frac{.0189}{.2515} = .0751$

6.41 a P(provided by employer) = .166 + .195 + .230 = .591

b P(provided by employer | professional/technical) =

$$\frac{\text{P(provided by employer and professional / technical)}}{\text{P(professional / technical)}} = \frac{.166}{.166+.094} = \frac{.166}{.260} = .638$$

c $\frac{\text{P(provided by employer and blue – collar / services)}}{\text{P(blue – collar / services)}} = \frac{.230}{.230+.180} = \frac{.230}{.410} = .561$

6.42 a P(new | overdue) = $\frac{\text{P(new and overdue)}}{\text{P(overdue)}} = \frac{.08}{.08+.50} = \frac{.08}{.58} = .138$

b P(overdue | new) = $\frac{\text{P(new and overdue)}}{\text{P(new)}} = \frac{.08}{.08+.13} = \frac{.08}{.21} = .381$

c Yes, because P(new) = .21 $\neq$ P(new | overdue)

6.43 P(purchase | see ad) = $\frac{\text{P(purchase and see ad)}}{\text{P(see ad)}} = \frac{.18}{.18+.42} = \frac{.18}{.60} = .30$; P(purchase | do not see ad) =

$\frac{\text{P(purchase and do not see ad)}}{\text{P(do not see ad)}} = \frac{.12}{.12+.28} = \frac{.12}{.40} = .30$; the ads are not effective

6.44 a P(unemployed | high school graduate) =

$\frac{\text{P(unemployed and high school graduate)}}{\text{P(high school graduate)}} = \frac{.0128}{.3108+.0128} = \frac{.0128}{.3236} = .0396$

b P(employed) = .0975 + .3108 + .1785 + .0849 + .1959 + .0975 = .9651

c P(advanced degree | unemployed) =

$\frac{\text{P(advanced deg ree and unemployed)}}{\text{P(unemployed)}} = \frac{.0015}{.0080+.0128+.0062+.0023+.0041+.0015} = \frac{.0015}{.0349} = .0430$

d P(not a high school graduate) = .0975 + .0080 = .1055

6.45 a P(fully repaid) = .17 + .66 = .83

b P(fully repaid | under 400) = $\frac{\text{P(fully repaid and under 400)}}{\text{P(under 400)}} = \frac{.17}{.17+.13} = \frac{.17}{.30} = .567$

c P(fully repaid | 400 or more) = $\frac{\text{P(fully repaid and 400 or more)}}{\text{P(400 or more)}} = \frac{.66}{.66+.04} = \frac{.66}{.70} = .943$

d No, because P(fully repaid) $\neq$ P(fully repaid | under 400)

6.46 a P(bachelor’s degree | west)

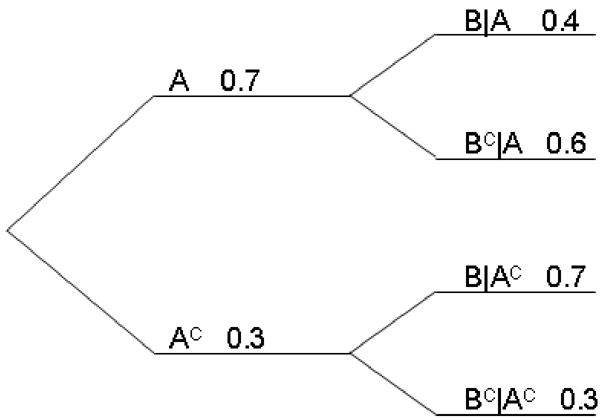
$= \frac{\text{P(bachelor's deg ree and west)}}{\text{P(west)}} = \frac{.0418}{.0359+.0608+.0456+.0181+.0418+.0180} = \frac{.0418}{.2202} = .1898$

b P(northwest | high school graduate)

$= \frac{\text{P(northwest and high school graduate)}}{\text{P(high school graduate)}} = \frac{.0711}{.0711+.0843+.1174+.0608} = \frac{.0711}{.3336} = .2131$

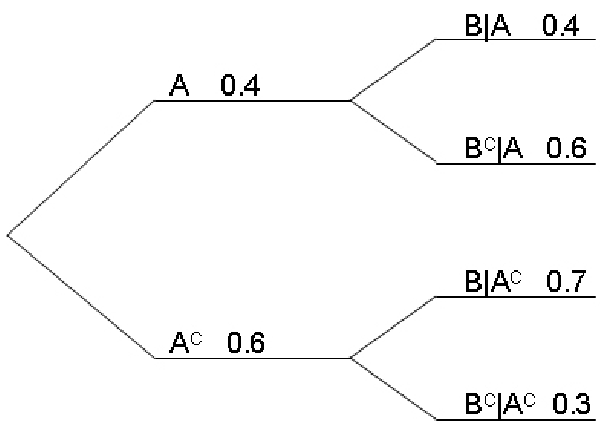
c P(south) = .0683 + .1174 + .0605 + .0248 + .0559 + .0269 = .3538

6.47



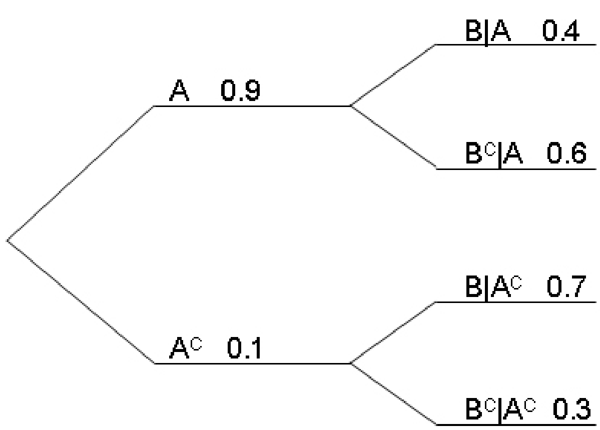
Joint events	Probabilities
A and B	(0.7)(0.4) = 0.28
A and B^C	(0.7)(0.6) = 0.42
A^C and B	(0.3)(0.7) = 0.21
A^C and B^C	(0.3)(0.3) = 0.09

6.48



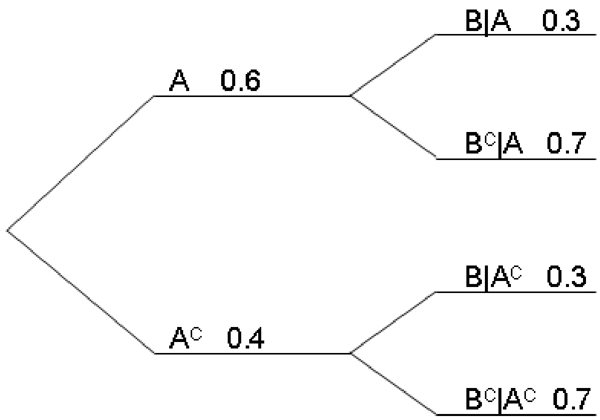
Joint events	Probabilities
A and B	(0.4)(0.4) = 0.16
A and B^C	(0.4)(0.6) = 0.24
A^C and B	(0.6)(0.7) = 0.42
A^C and B^C	(0.6)(0.3) = 0.18

6.49



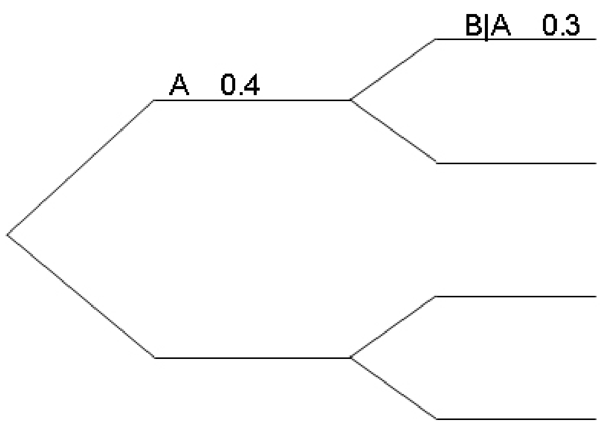
Joint events	Probabilities
A and B	(0.9)(0.4) = 0.36
A and B^C	(0.9)(0.6) = 0.54
A^C and B	(0.1)(0.7) = 0.07
A^C and B^C	(0.1)(0.3) = 0.03

6.50



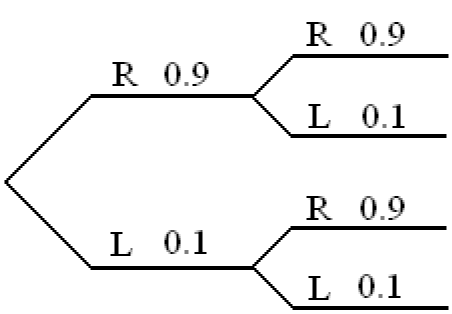
Joint events	Probabilities
A and B	(0.6)(0.3) = 0.18
A and B^C	(0.6)(0.7) = 0.42
A^C and B	(0.4)(0.3) = 0.12
A^C and B^C	(0.4)(0.7) = 0.28

6.51



Joint events	Probabilities
A and B	(0.4)(0.3) = 0.12

6.52



Joint events	Probabilities
R and R	(0.9)(0.9) = 0.81
R and L	(0.9)(0.1) = 0.09
L and R	(0.1)(0.9) = 0.09
L and L	(0.1)(0.1) = 0.01

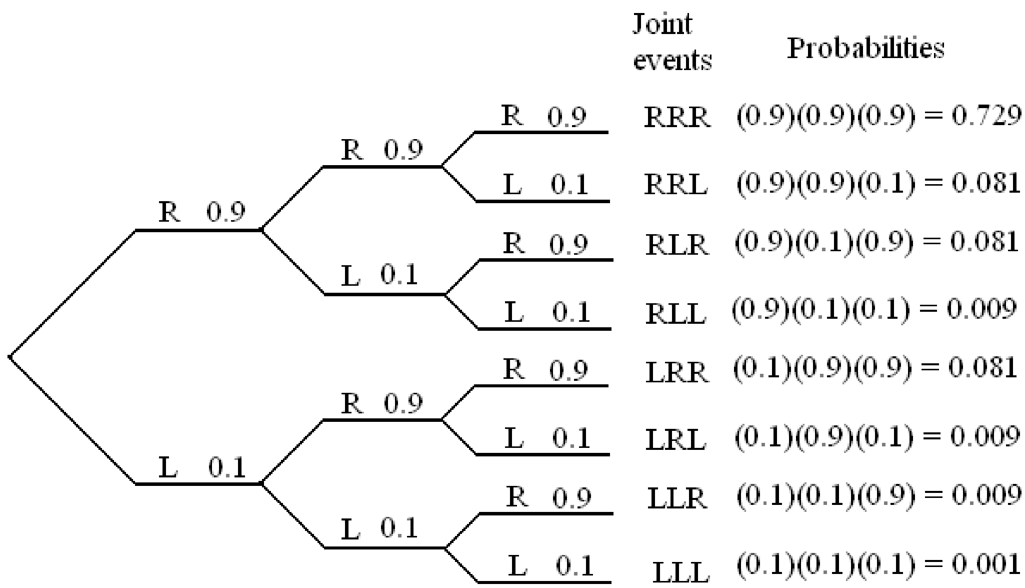
a P(R and R) = .81

b P(L and L) = .01

c P(R and L) + P(L and R) = .09 + .09 = .18

d P(Rand L) + P(L and R) + P(R and R) = .09 + .09 + .81 = .99

6.53 a & b



c	0 right-handers	1
	1 right-hander	3
	2 right-handers	3
	3 right-handers	1

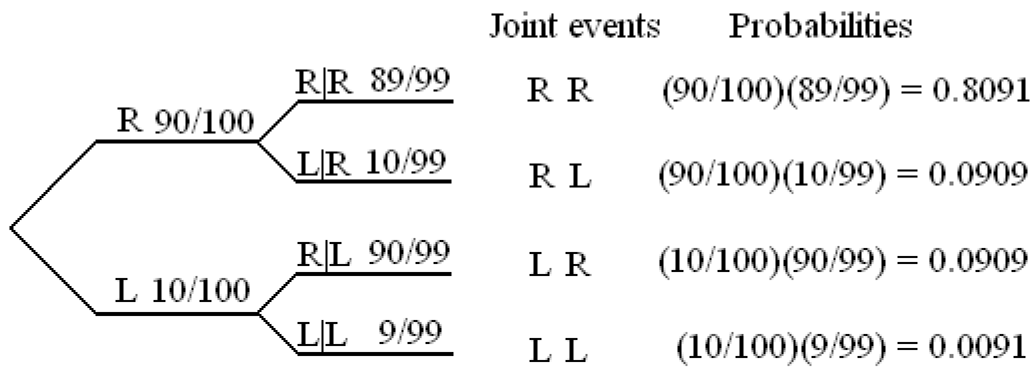
d P(0 right-handers) = .001

P(1 right-hander) = 3(.009) = .027

P(2 right-handers) = 3(.081) = .243

P(3 right-handers) = .729

6.54a



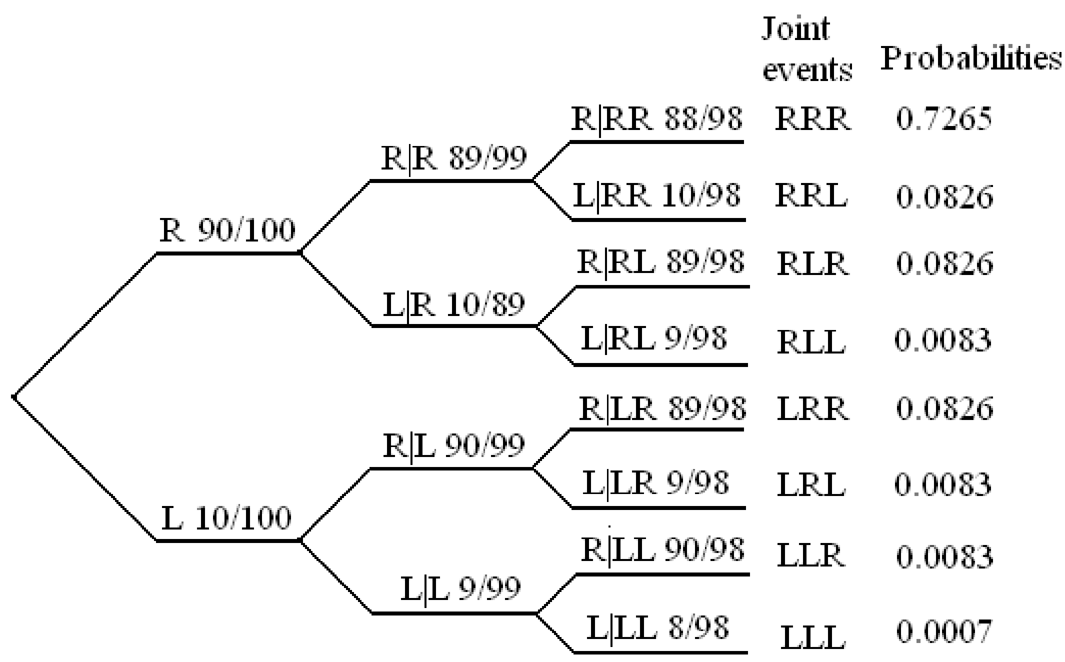
b P(RR) = .8091

c P(LL) = .0091

d P(RL) + P(LR) = .0909 + .0909 = .1818

e P(RL) + P(LR) + P(RR) = .0909 + .0909 + .8091 = .9909

6.55a



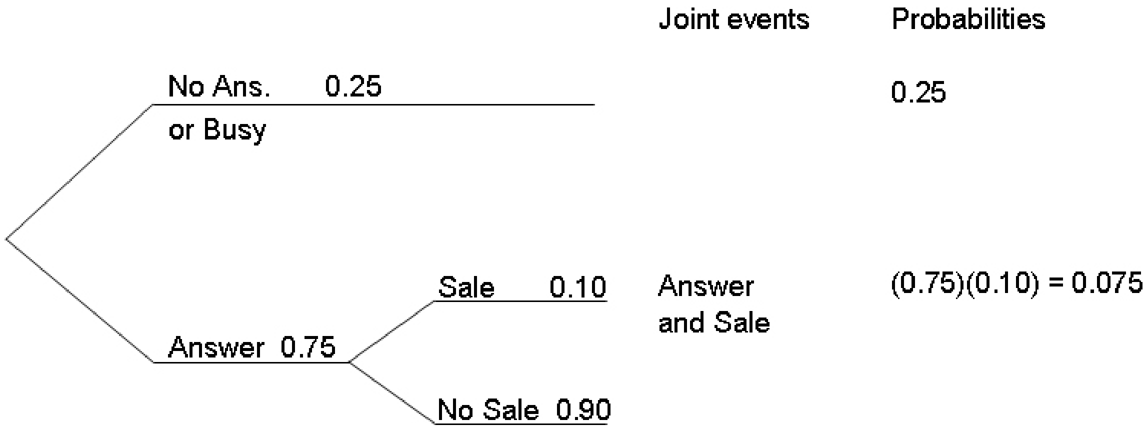
P(0 right-handers) = (10/100)(9/99)(8/98) = .0007

P(1 right-hander) = 3(90/100)(10/99)(9/98) = .0249

P)2 right-handers) = 3(90/100)(89/99)(10/98) = .2478

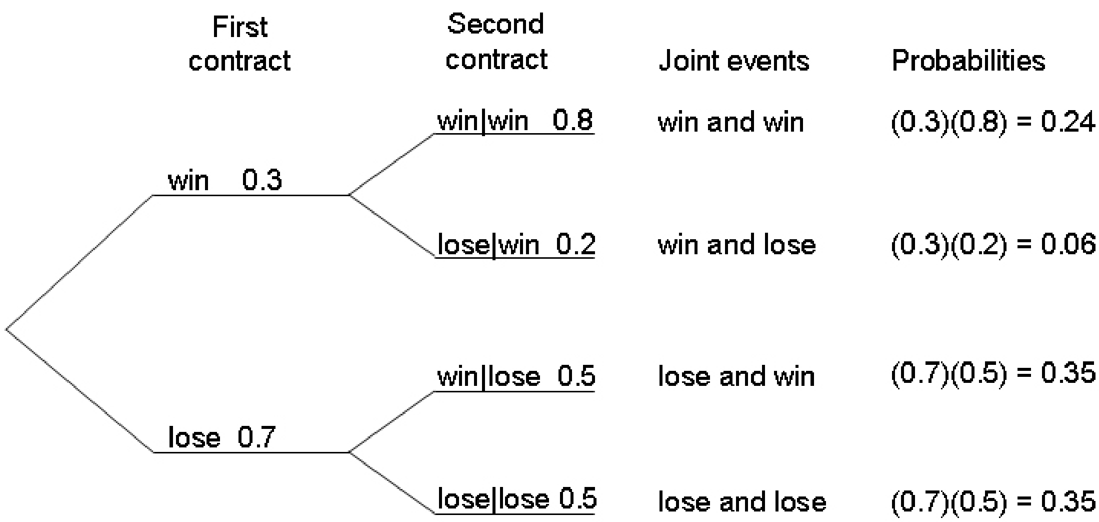
P(3 right-handers) = (90/100)(89/99)(88/98)= .7265

6.56



P(sale) = .075

6.57

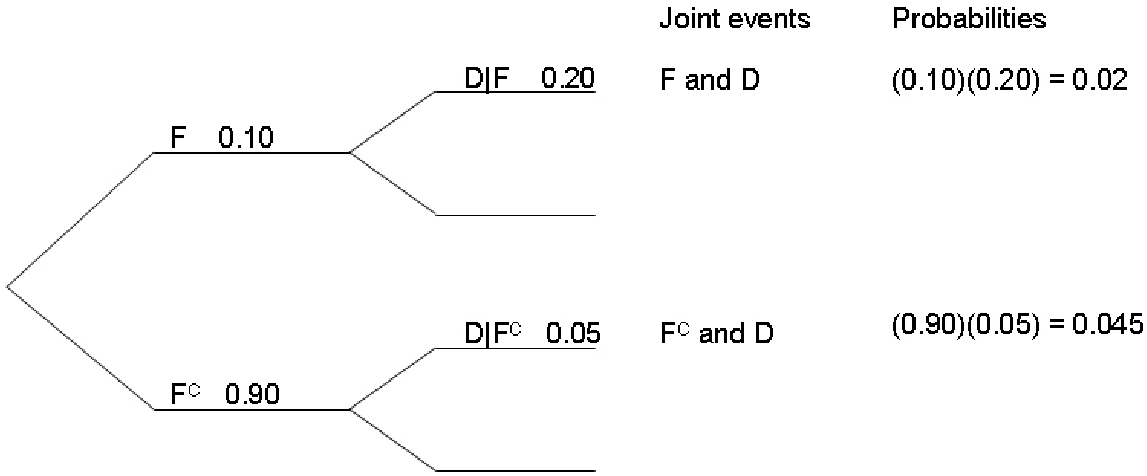


a P(win both) = .24

b P(lose both) = .35

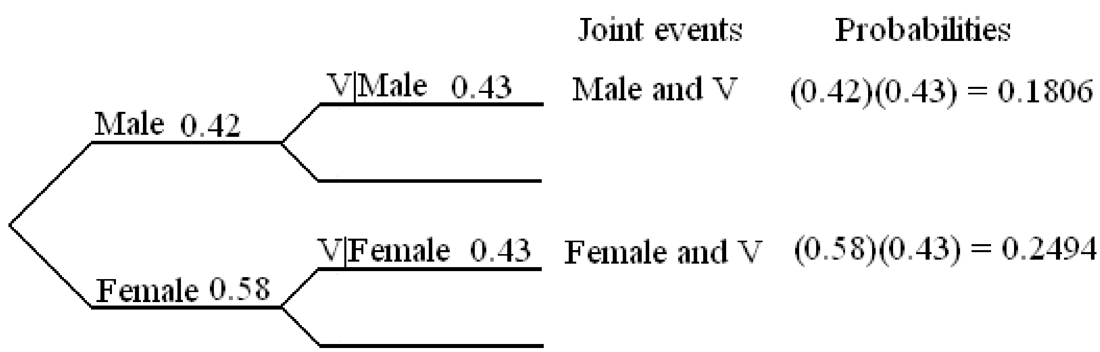
c P(win only one) = .06 + .35 = .41

6.58



P(D) = .02 + .045 = .065

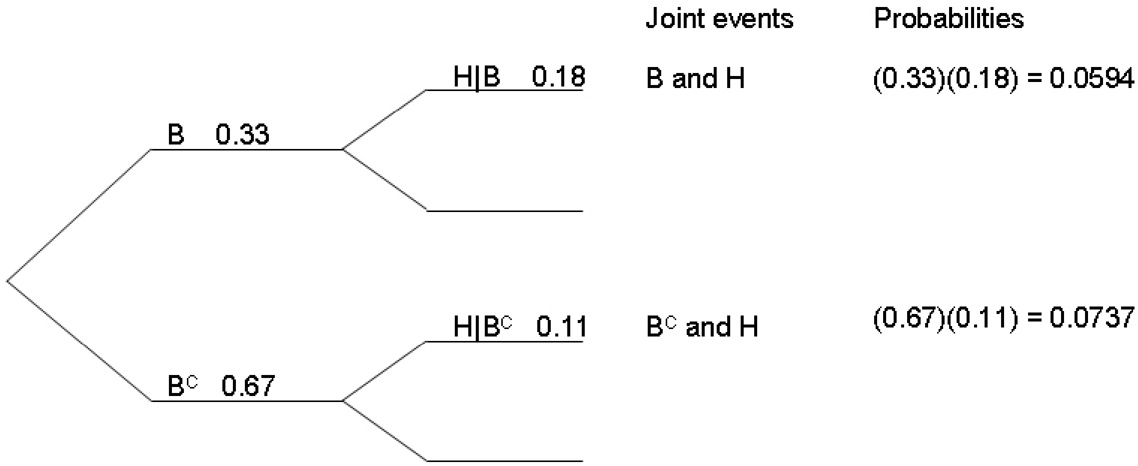
6.59



a P(vote in last election and male) = .1806

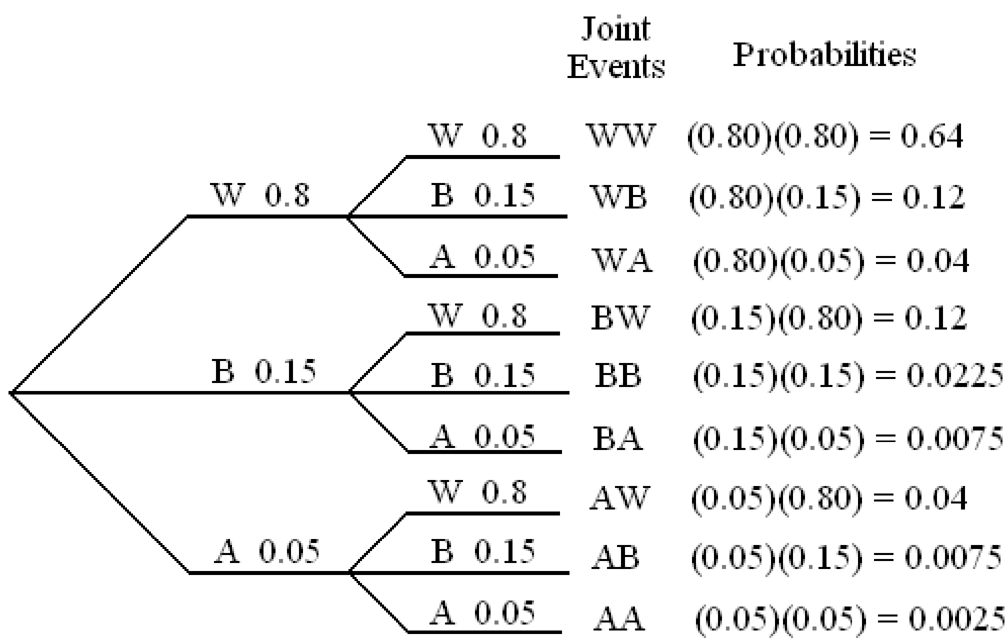
b P(vote in last election and female) = .2494

6.60



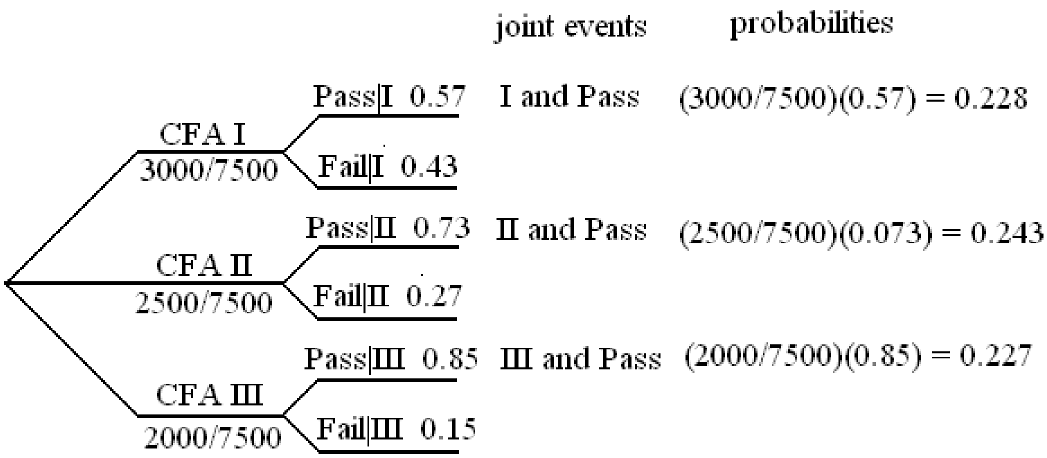
P(heart attack) = .0594 + .0737 = .1331

6.61



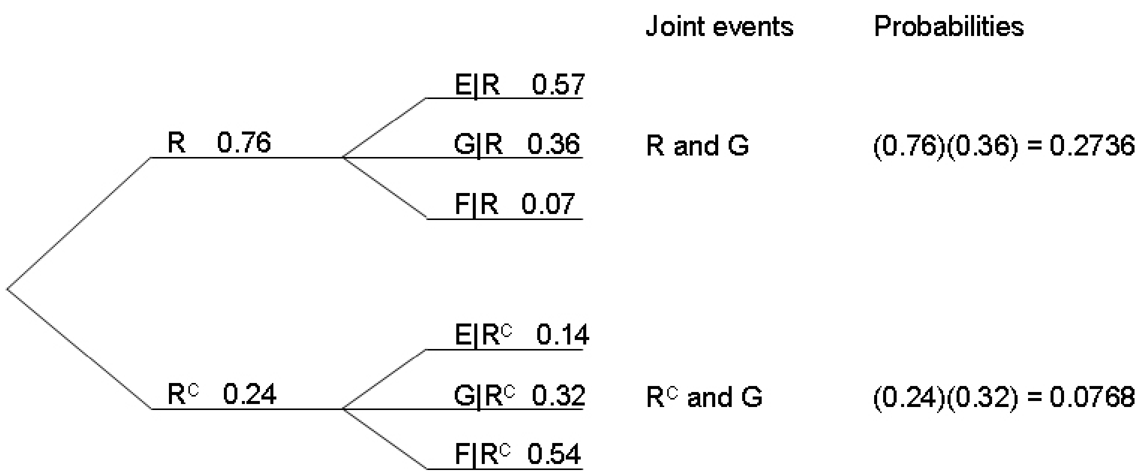
Diversity index = .12 + .04 + .12 + .0075 + .04 + .0075 = .335

6.62



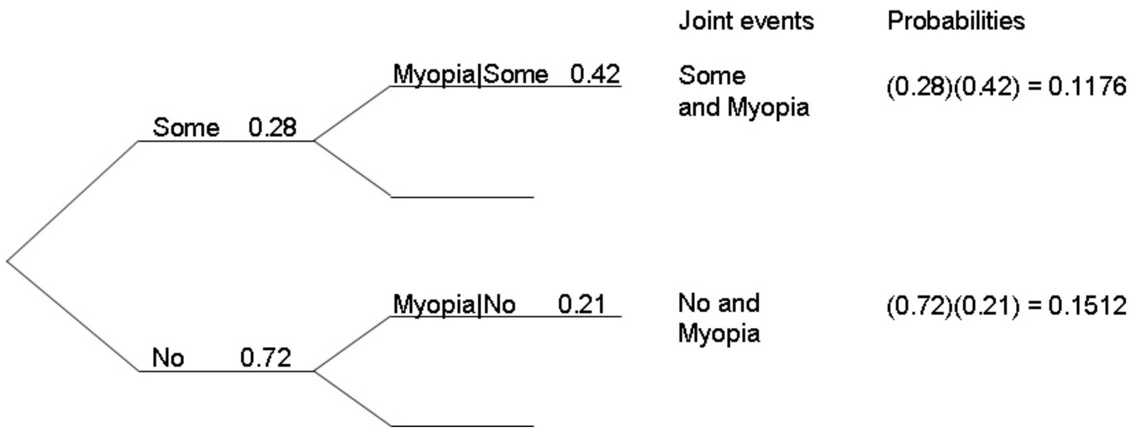
P(pass) = .228 + .243 + .227 = .698

6.63



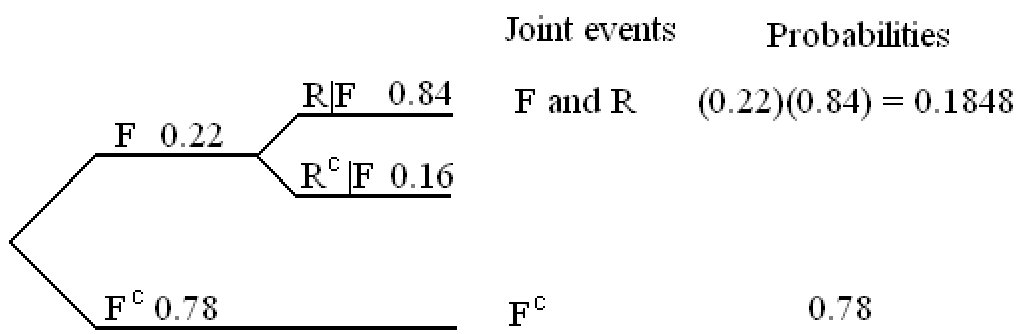
P(good) = .2736 + .0764 = .3504

6.64



P(myopic) = .1176 + .1512 = .2688

6.65



P(does not have to be discarded) = .1848 + .78 = .9648

6.66 Let A = mutual fund outperforms the market in the first year

B = mutual outperforms the market in the second year

P(A and B) = P(A)P(B | A) = (.15)(.22) = .033

6.67 P(wireless Web user uses it primarily for e-mail) = .69

P(3 wireless Web users use it primarily for e-mail) = (.69)(.69)(.69) = .3285

6.68 Define the events:

M: The main control will fail.

B_1: The first backup will fail.

B_2: The second backup will fail

The probability that the plane will crash is

$P(M \text{ and } B_1 \text{ and } B_2) = [P(M)][P(B_1)][P(B_2)]$

$= (.0001)(.01)(.01)$

$= .00000001$

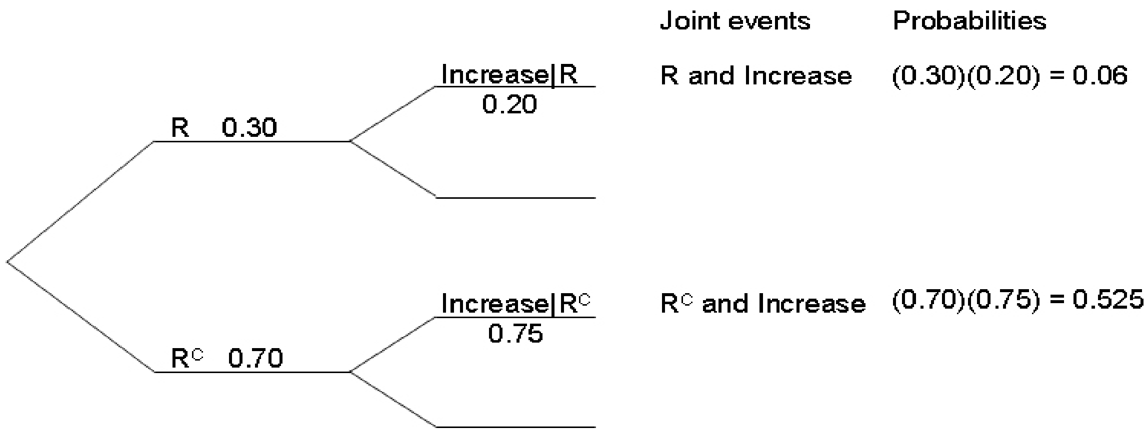
We have assumed that the 3 systems will fail independently of one another.

6.69 Let A = DJIA increase and B = NASDAQ increase

$P(A) = .60$ and $P(B \mid A) = .77$

$P(A \text{ and } B) = P(A)P(B \mid A) = (.60)(.77) = .462$

6.70



P(Increase) = .06 + .525 = .585

6.71 P(A and B) = .36, P(B) = .36 + .07 = .43

$P(A \mid B) = \frac{P(A \text{ and } B)}{P(B)} = \frac{.36}{.43} = .837$

6.72 $P(A \text{ and } B) = .32$, $P(A^C \text{ and } B) = .14$, $P(B) = .46$, $P(B^C) = .54$

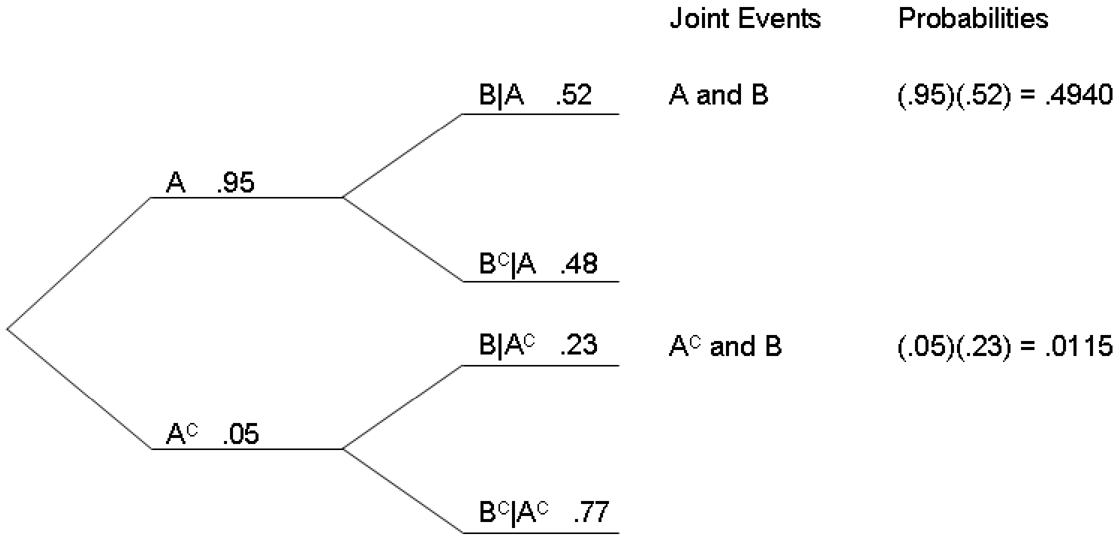
a $P(A \mid B) = \frac{P(A \text{ and } B)}{P(B)} = \frac{.32}{.46} = .696$

b $P(A^C \mid B) = \frac{P(A^C \text{ and } B)}{P(B)} = \frac{.14}{.46} = .304$

c $P(A \text{ and } B^C) = .48$; $P(A \mid B^C) = \frac{P(A \text{ and } B^C)}{P(B^C)} = \frac{.48}{.54} = .889$

d $P(A^C \text{ and } B^C) = .06$; $P(A^C \mid B^C) = \frac{P(A^C \text{ and } B^C)}{P(B^C)} = \frac{.06}{.54} = .111$

6.73



P(B) = .4940 + .0115 = .5055

$$P(A \mid B) = \frac{P(A \text{ and } B)}{P(B)} = \frac{.4940}{.5055} = .9773$$

6.74 $P(F \mid D) = \frac{P(F \text{ and } D)}{P(D)} = \frac{.020}{.038} = .526$

6.75 Define events: A = crash with fatality, B = BAC is greater than .09)

P(A) = .01, P(B | A) = .084, P(B) = .12

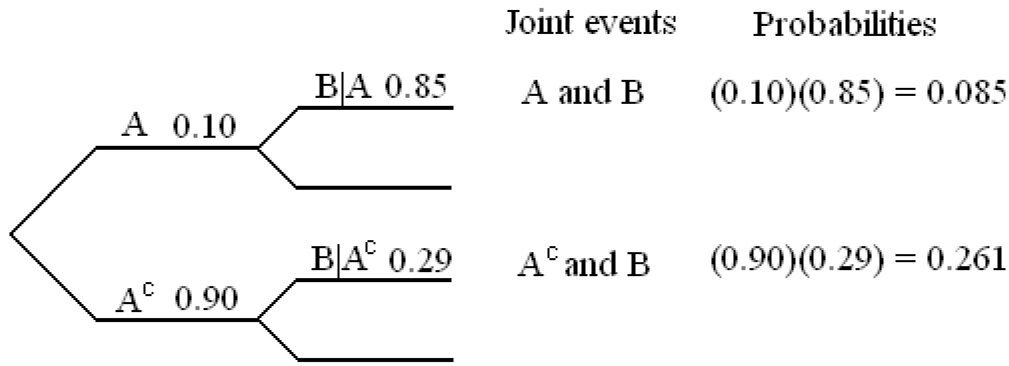
P(A and B) = (.01)(.084) = .00084

$$P(A \mid B) = \frac{P(A \text{ and } B)}{P(B)} = \frac{.00084}{.12} = .007$$

6.76 $P(\text{CFA I} \mid \text{passed}) = \frac{P(\text{CFA I and passed})}{P(\text{passed})} = \frac{.228}{.698} = .327$

6.77 Define events: A = heart attack, B = periodontal disease

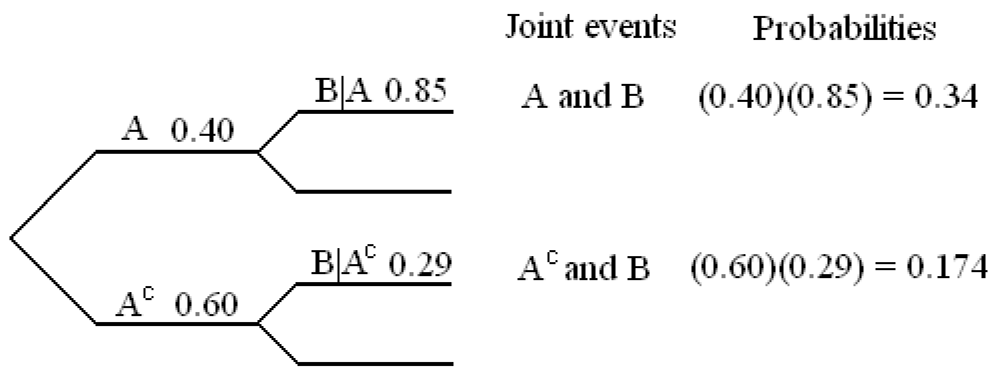
P(A) = .10, P(B | A) = .85, $P(B \mid A^C) = .29$



P(B) = .085 + .261 = .346

$$P(A \mid B) = \frac{P(A \text{ and } B)}{P(B)} = \frac{.085}{.346} = .246$$

6.78 P(A) = .40, P(B | A) = .85, P(B | A^C) = .29



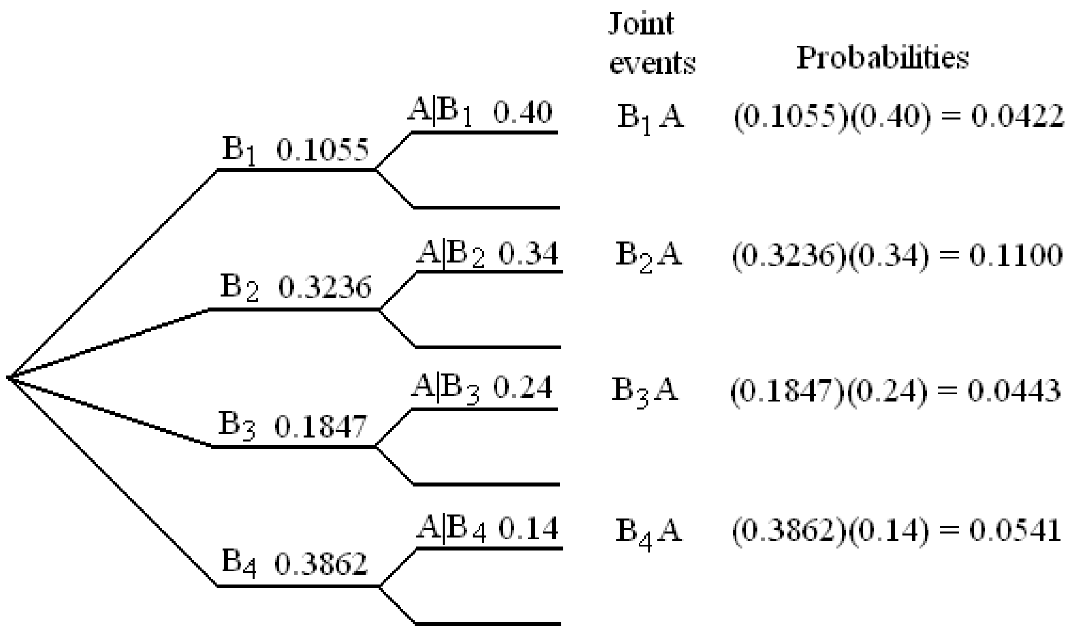
P(B) = .34 + .174 = .514

$$P(A \mid B) = \frac{P(A \text{ and } B)}{P(B)} = \frac{.34}{.514} = .661$$

6.79 Define events: A = smoke, B_1 = did not finish high school, B_2 = high school graduate, B_3 = some college, no degree, B_4 = completed a degree

P(A | B_1) = .40, P(A | B_2) = .34, P(A | B_3) = .24, P(A | B_4) = .14

From Exercise 6.45: P(B_1) = .1055, P(B_2) = .3236, P(B_3) = .1847, P(B_4) = .3862

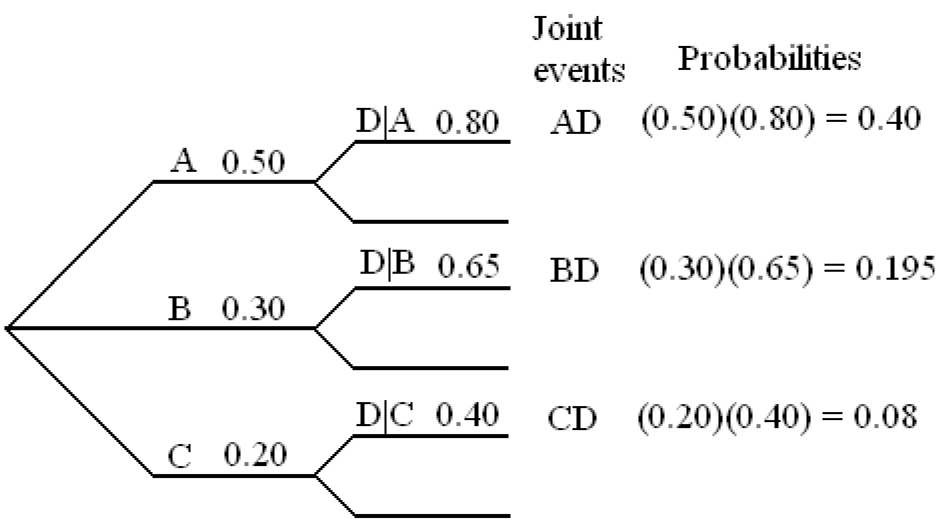


P(A) = .0422 + .1100 + .0443 + .0541 = .2506

P(B_4 | A) = .0541/.2506 = .2159

6.80 Define events: A, B, C = airlines A, B, and C, D = on time

P(A) = .50, P(B) = .30, P(C) = .20, P(D | A) = .80, P(D | B) = .65, P(D | C) = .40

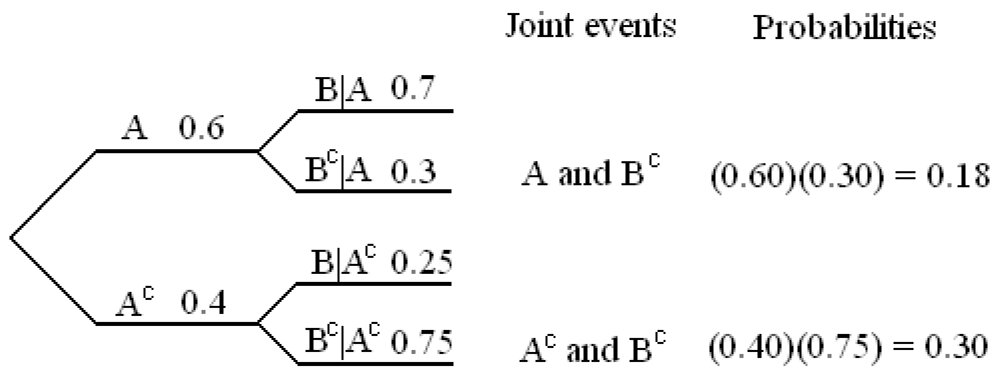


P(D) = .40 + .195 + .08 = .675

$$P(A \mid D) = \frac{P(\text{A and D})}{P(D)} = \frac{.40}{.675} = .593$$

6.81 Define events: A = win series, B = win first game

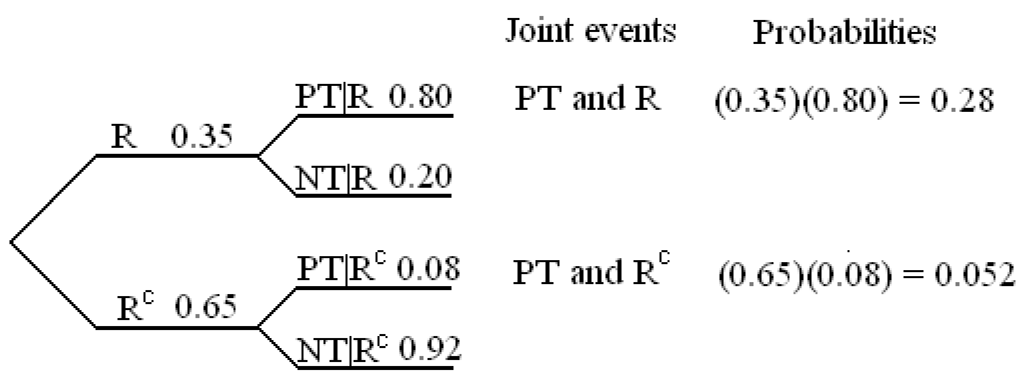
P(A) = .60, P(B | A) = .70, P(B | A^C) =.25



P(B^C) = .18 + .30 = .48

$$P(A \mid B^C) = \frac{P(A \text{ and } B^C)}{P(B^C)} = \frac{.18}{.48} = .375$$

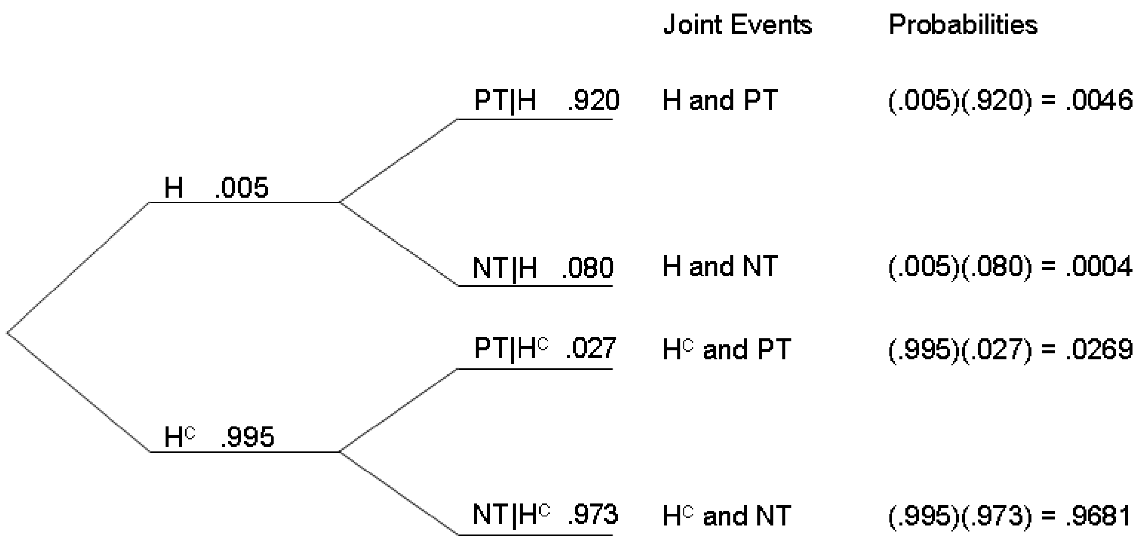
6.82



P(PT) = .28 + .052 = .332

$$P(R \mid PT) = \frac{P(R \text{ and } PT)}{P(PT)} = \frac{.28}{.332} = .843$$

6.83



$P(PT) = .0046 + .0269 = .0315$

$$P(H \mid PT) = \frac{P(H \text{ and } PT)}{P(PT)} = \frac{.0046}{.0315} = .1460$$

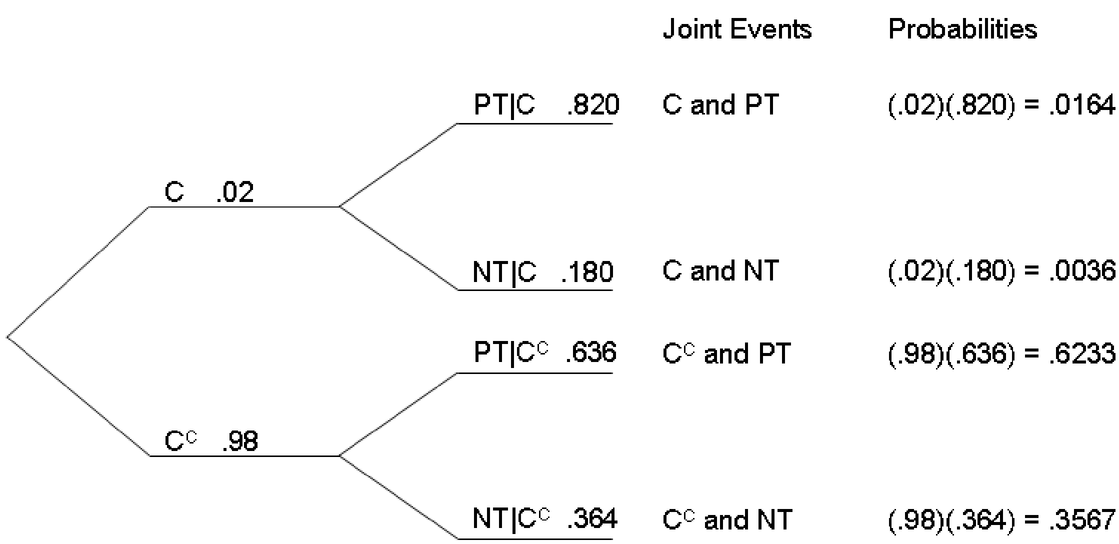
6.84 Sensitivity = $P(PT \mid H) = .920$

Specificity = $P(NT \mid H^C) = .973$

Positive predictive value = $P(H \mid PT) = .1460$

$$\text{Negative predictive value} = P(H^C \mid NT) = \frac{P(H^C \text{ and } NT)}{P(NT)} = \frac{.9681}{.0004 + .9681} = \frac{.9681}{.9685} = .9996$$

6.85



$P(PT) = .0164 + .6233 = .6397$

P(NT) = .0036 + .3567 = .3603

$$P(C \mid PT) = \frac{P(C \text{ and } PT)}{P(PT)} = \frac{.0164}{.6397} = .0256$$

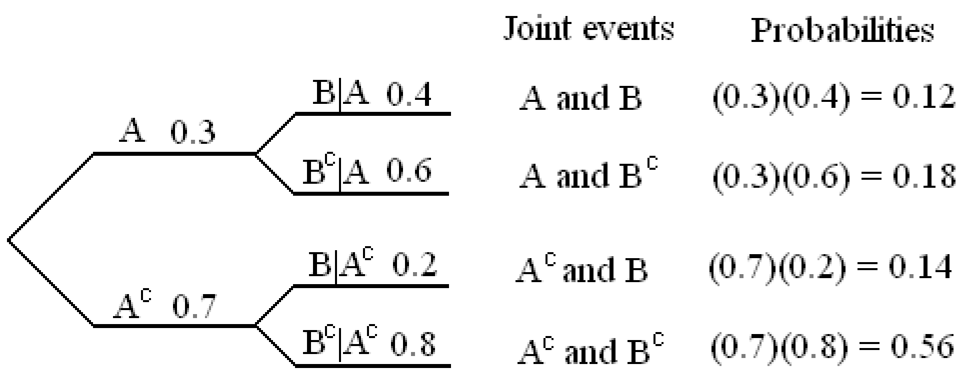
$$P(C \mid NT) = \frac{P(C \text{ and } NT)}{P(NT)} = \frac{.0036}{.3603} = .0010$$

6.86 a P(Marketing-A) = .06 + .23 = .29

b $P(\text{Marketing A} \mid \text{Statistics not A}) = \frac{P(\text{Marketing A and Statistics not A})}{P(\text{Statistics not A})} = \frac{.23}{.23+.58} = \frac{.23}{.81} = .2840$

c No, the probabilities in (a) and (b) differ

6.87 Define events: A = win contract A and B = win contract B



a P(A and B) = .12

b P(A and B^C) + P(A^C and B) = .18 + .14 = .32

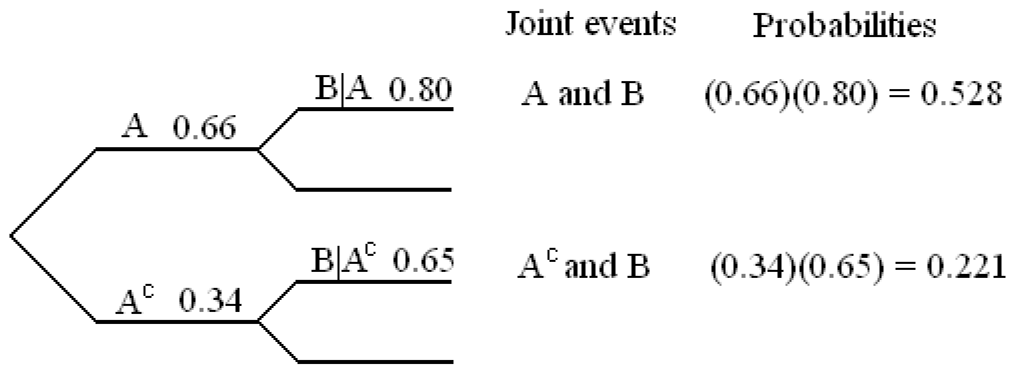
c P(A and B) + P(A and B^C) + P(A^C and B) = .12 + .18 + .14 = .44

6.88 a P(second) = .05 + .14 = .19

b $P(\text{successful} \mid -8 \text{ or less}) = \frac{P(\text{successful and } -8 \text{ or less})}{P(-8 \text{ or less})} = \frac{.15}{.15+.14} = \frac{.15}{.29} = .517$

c No, because P(successful) = .66 + .15 = .81, which is not equal to P(successful | –8 or less) .

6.89 Define events: A = woman, B = drug is effective



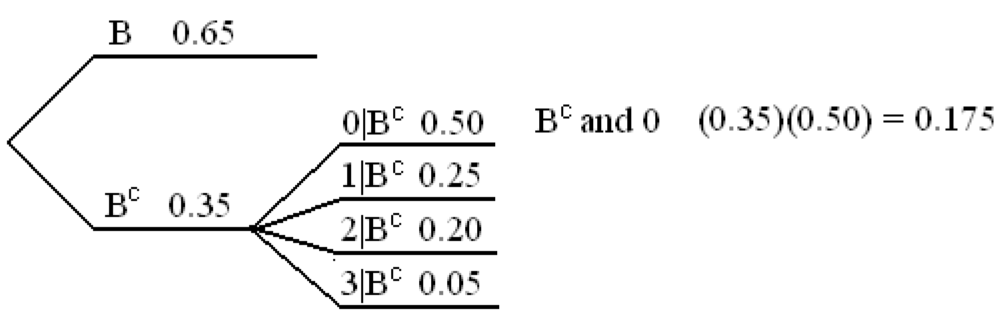
P(B) = .528 + .221 = .749

6.90 $P(A^C \mid B) = \dfrac{P(A^C \text{ and } B)}{P(B)} = \dfrac{.221}{.749} = .295$

6.91 P(Idle roughly)

= P(at least one spark plug malfunctions) = 1– P(all function) = 1 – $(.90^4)$ = 1-.6561 = .3439

6.92



P(no sale) = .65 + .175 = .825

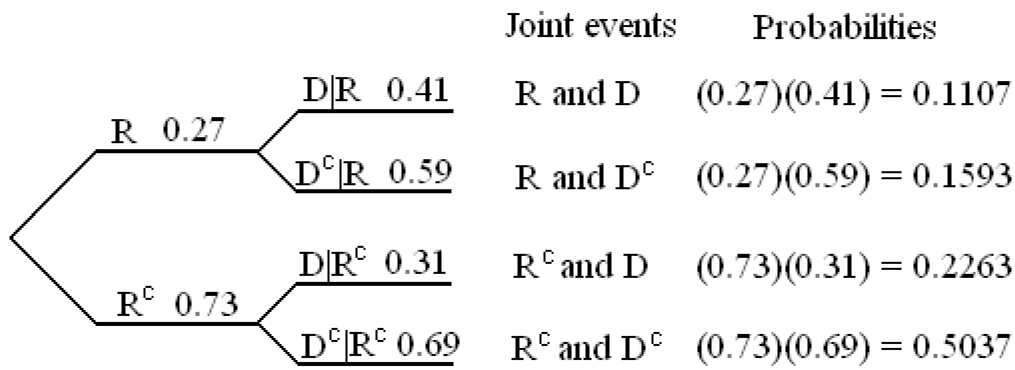
6.93 a P(pass) = .86 + .03 = .89

b $P(\text{pass} \mid \text{miss 5 or more classes}) = \dfrac{P(\text{pass and miss or more classes})}{P(\text{miss 5 or more classes})} = \dfrac{.03}{.09+.03} = \dfrac{.03}{.12} = .250$

c $P(\text{pass} \mid \text{miss less than 5 classes}) = \dfrac{P(\text{pass and miss less than 5 classes})}{P(\text{miss less than 5 classes})} = \dfrac{.86}{.86+.02} = \dfrac{.86}{.88} = .977$.

d No since P(pass) $\neq$ P(pass | miss 5 or more classes)

6.94



a P(D) = P(R and D) + P(R^C and D) = .1107 + .2263 = .3370

$$P(R|\ D) = \frac{P(R \text{ and } D)}{P(D)} = \frac{.1107}{.3370} = .3285$$

b P(D^C) = P(R and D^C) + P(R^C and D^C) = .1593 + .5037 = .6630

$$P(R|\ D^C) = \frac{P(R \text{ and } D^C)}{P(D^C)} = \frac{.1593}{.6630} = .2403$$

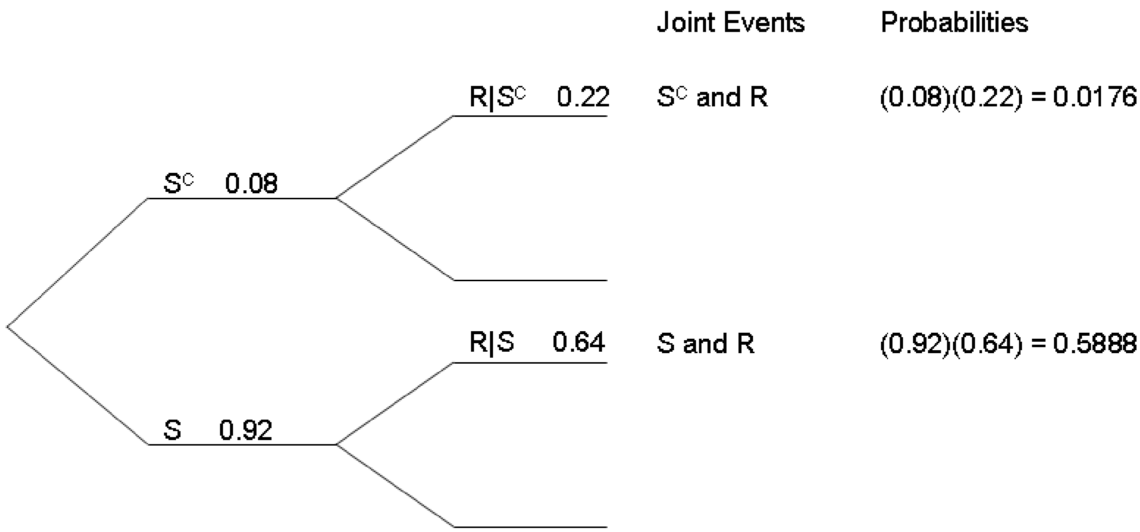
6.95 a P(excellent) = .27 + .22 = .49

b P(excellent | man) = .22/(.22 + .10 + .12 + .06) = .44

c $$P(\text{man} \mid \text{excellent}) = \frac{P(\text{man and excellent})}{P(\text{excellent})} = \frac{.22}{.27 + .22} = \frac{.22}{.49} = .449$$

d No, since P(excellent) $\neq$ P(excellent | man)

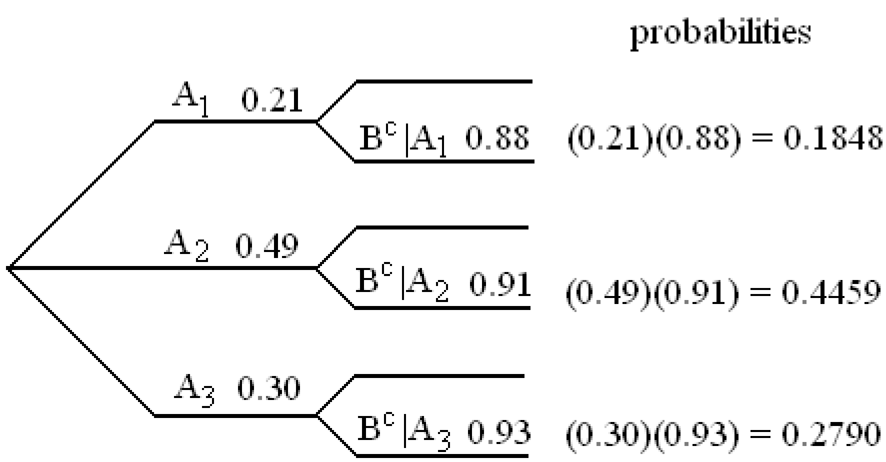
6.96



P(R) = .0176 + .5888 = .6064

$P(S \mid R) = \dfrac{P(S \text{ and } R)}{P(R)} = \dfrac{.5888}{.6064} = .9710$

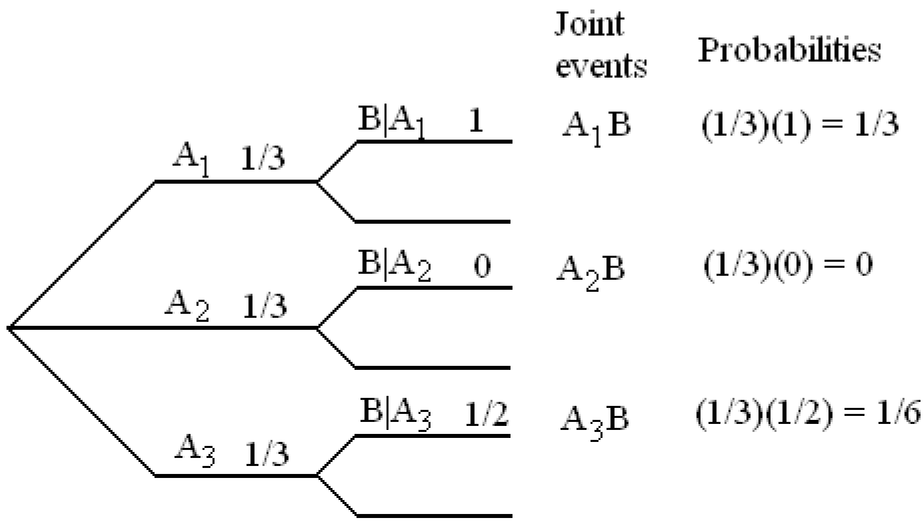
6.97 Define events: A_1 = Low-income earner, A_2 = medium-income earner, A_3 = high-income earner, B = die of a heart attack



$P(B^C) = .1848 + .4459 + .2790 = .9097$

$P(A_1 \mid B^C) = \dfrac{P(A_1 \text{ and } B^C)}{P(B^C)} = \dfrac{.1848}{.9097} = .2031$

6.98 Define the events: A_1 = envelope containing two Maui brochures is selected, A_2 = envelope containing two Oahu brochures is selected, A_3 = envelope containing one Maui and one Oahu brochures is selected. B = a Maui brochure is removed from the selected envelope.



P(B) = 1/3 + 0 + 1/6 = 1/2

$P(A_1 \mid B) = \frac{P(A_1 \text{ and } B)}{P(B)} = \frac{1/3}{1/2} = 2/3$

6.99 Define events: A = purchase extended warranty, B = regular price

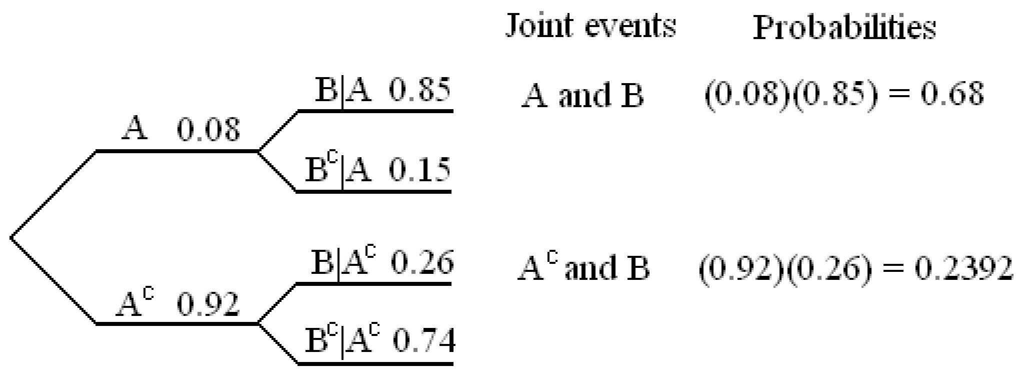
a $P(A \mid B) = \frac{P(A \text{ and } B)}{P(B)} = \frac{.21}{.21 + .57} = \frac{.21}{.78} = .2692$

b P(A) = .21 + .14 = .35

c No, because $P(A) \neq P(A \mid B)$

6.100 Define events: A = company fail, B = predict bankruptcy

P(A) = .08, P(B | A) = .85, $P(B^C \mid A^C)$ = .74



P(B) = .068 + .2392 = .3072

$$P(A \mid B) = \frac{P(A \text{ and } B)}{P(B)} = \frac{.068}{.3072} = .2214$$

6.101 Define events: A = job security is an important issue, B = pension benefits is an important issue

P(A) = .74, P(B) = .65, P(A | B) = .60

a P(A and B) = P(B)P(A | B) = (.65)(.60) = .39

b P(A or B) = .74 + .65 – .39 = 1

6.102 Probabilities of outcomes: P(HH) = .25, P(HT) = .25, P(TH) = .25, P(TT) .25

P(TT | HH is not possible) = .25/(.25 + .25 + .25) = .333

6.103 P(T) = .5

Case 6.1

1. P(Curtain A) = 1/3, P(Curtain B) = 1/3

2. P(Curtain A) = 1/3, P(Curtain B) = 2/3

Case 6.2

Outcome	Probability of outcome	Bases Occupied	Outs	Probability of scoring	Joint Probability
1	.75	2nd	1	.42	.3150
2	.10	1st	1	.26	.0260
3	.10	none	2	.07	.0070
4	.05	1st and 2nd	0	.59	.0295

P(scoring) = .3775

Because the probability of scoring with a runner on first base with no outs (.39) is greater than the probability of scoring after bunting (.3775) you should not bunt.

Case 6.3

0 outs:

Probability of scoring any runs from first base = .39

Probability of scoring from second base = probability of successful steal × probability of scoring any runs from second base = (.68)(.57) = .3876

Decision: Do not attempt to steal.

1 out:

Probability of scoring any runs from first base = .26

Probability of scoring from second base = probability of successful steal × probability of scoring any runs from second base = (.68) × (.42) = .2856

Decision: Attempt to steal.

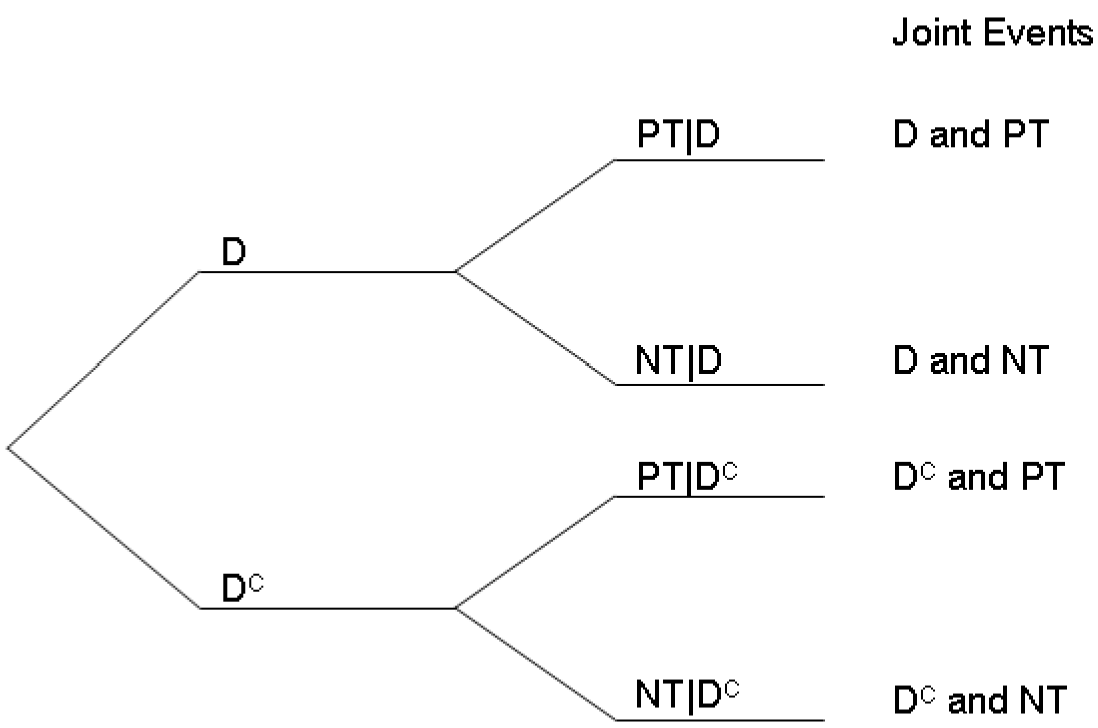
2 outs:

Probability of scoring any runs from first base = .13

Probability of scoring from second base = probability of successful steal × probability of scoring any runs from second base = (.68) × (.24) = .1632

Decision: Attempt to steal.

Case 6.4



Age 25: P(D) = 1/1,300

P(D and PT) = (1/1,300)(.624) = .00048

P(D and NT) = (1/1,300)(.376) = .00029

P(D^C and PT) = (1,299/1,300)(.04) = .03997

P(D^C and NT) = (1,299/1,300)(.96) = .95926

P(PT) = .00048 + .03997 = .04045

P(NT) = .00029 + .95926 = .95955

P(D | PT) = .00048/.04045 = .01187

P(D | NT) = .00029/.95955 = .00030

Age 30: P(D) = 1/900

P(D and PT) = (1/900)(.710) = .00079

P(D and NT) = (1/900)(.290) = .00032

P(D^C and PT) = (899/900)(.082) = .08190

P(D^C and NT) = (899/900)(.918) = .91698

P(PT) = .00079 + .08190 = .08269

P(NT) = .00032 + .91698 = .91730

P(D | PT) = .00079/.08269 = .00955

P(D | NT) = .00032/.91730 = .00035

Age 35: P(D) = 1/350

P(D and PT) = (1/350)(.731) = .00209

P(D and NT) = (1/350)(.269) = .00077

P(D^C and PT) = (349/350)(.178) = .17749

P(D^C and NT) = (349/350)(.822) = .81965

P(PT) = .00209 + .17749 = .17958

P(NT) = .00077 + .81965 = .82042

P(D | PT) = .00209/.17958 = .01163

P(D | NT) = .00077/.82042 = .00094

Age 40: P(D) = 1/100

P(D and PT) = (1/100)(.971) = .00971

P(D and NT) = (1/100)(.029) = .00029

P(D^C and PT) = (99/100)(.343) = .33957

P(D^C and NT) = (99/100)(.657) = .65043

P(PT) = .00971 + .33957 = .34928

$P(NT) = .00029 + .65043 = .65072$

$P(D \mid PT) = .00971/.34928 = .02780$

$P(D \mid NT) = .00029/.65072 = .00045$

Age 45: $P(D) = 1/25$

$P(D \text{ and } PT) = (1/25)(.971) = .03884$

$P(D \text{ and } NT) = (1/25)(.029) = .00116$

$P(D^C \text{ and } PT) = (24/25)(.343) = .32928$

$P(D^C \text{ and } NT) = (24/25)(.657) = .63072$

$P(PT) = .03884 + .32928 = .36812$

$P(NT) = .00116 + .63072 = .63188$

$P(D \mid PT) = .03884/.36812 = .10551$

$P(D \mid NT) = .00116/.63188 = .00184$

Age 49: $P(D) = 1/12$

$P(D \text{ and } PT) = (1/12)(.971) = .08092$

$P(D \text{ and } NT) = (1/12)(.029) = .00242$

$P(D^C \text{ and } PT) = (11/12)(.343) = .31442$

$P(D^C \text{ and } NT) = (11/12)(.657) = .60255$

$P(PT) = .08092 + .31442 = .39533$

$P(NT) = .00242 + .60255 = .60467$

$P(D \mid PT) = .08092/.39533 = .20468$

$P(D \mid NT) = .00242/.60467 = .00400$