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

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

6.17 $P(A_1) = .4 + .2 = .6$, $P(A_2) = .3 + .1 = .4$. $P(B_1) = .4 + .3 = .7$, $P(B_2) = .2 + .1 = .3$.

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

6.23 $P(A_1 \mid B_1) = \frac{P(A_1 \text{ and } B_1)}{P(B_1)} = \frac{.20}{.20 + .15} = .571$; $P(A_1) = .20 + .60 = .80$; the events are dependent.

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

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

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

b $P(B_2 \mid A_2) = \frac{P(A_2 \text{ and } B_2)}{P(A_2)} = \frac{.25}{.45} = .556$

c $P(B_1 \mid A_2) = \frac{P(A_2 \text{ and } B_1)}{P(A_2)} = \frac{.20}{.45} = .444$

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

b $P(A_2 \text{ or } B_2) = P(A_2) + P(B_2) - P(A_2 \text{ and } B_2)$ = .45 + .55 - .25 = .75

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 $P(\text{promoted} \mid \text{female}) = \frac{P(\text{promoted and female})}{P(\text{female})} = \frac{.03}{.03 + .12} = .20$

b $P(\text{promoted} \mid \text{male}) = \frac{P(\text{promoted and male})}{P(\text{male})} = \frac{.17}{.17 + .68} = .20$

c No, because promotion and gender are independent events.

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

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

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

6.29 a P(Less than high school) = .083 + .109 = .192

b P(college/university | female) = $\frac{\text{P(college / university and female)}}{\text{P(female)}} = \frac{.091}{.083 + .153 + .132 + .091} = .198$

c b P(high school | male) = $\frac{\text{P(high school and male)}}{\text{P(male)}} = \frac{.190}{.153 + .190} = .554$

6.30 a P(He is a smoker) = .12 + .19 = .31

b P(He does not have lung disease) = .19 + .66 = .85

c P(He has lung disease | he is a smoker) = $\frac{\text{P(he has lung disease and he is a smoker)}}{\text{P(he is a smoker)}} = \frac{.12}{.31} = .387$

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) = .15, P(he has lung disease | he is a smoker) = .387

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(ulcer) = .01 + .03 + .03 + .04 = .11

b P(ulcer | none) = $\frac{\text{P(ulcer and none)}}{\text{P(none)}} = \frac{.01}{.01 + .22} = \frac{.01}{.23} = .043$

c P(none | ulcer) = $\frac{\text{P(ulcer and none)}}{\text{P(ulcer)}} = \frac{.01}{.01 + .03 + .03 + .04} = \frac{.01}{.11} = .091$

d P(One, two, or more than two | no ulcer) = $1 - \frac{\text{P(ulcer and none)}}{\text{P(ulcer)}} = 1 - .091 = .909$

6.35 a P(Insufficient work | 25-54) = $\frac{P(\text{Insufficient work and } 25-54)}{P(25-54)} = \frac{.225}{.324+.225+.219} = .293$

b P(65 and over) = .017 + .014 + .008 = .039

c P(65 and over |plant or company closed or moved) =

$$\frac{P(\text{65 and over and plant or company closed or moved})}{P(\text{plant or company closed or moved})} = \frac{.017}{.015+.324+..075+.017} = .039$$

6.36 a P(remember) = .15 + .18 = .33

b P(remember | violent) = $\frac{P(\text{remember and violent})}{P(\text{violent})} = \frac{.15}{.15+.35} = \frac{.15}{.50} = .30$

c Yes, the events are dependent.

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

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

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

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

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

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

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

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

6.41 a P(new | overdue) = $\frac{P(\text{new and overdue})}{P(\text{overdue})} = \frac{.06}{.06+.52} = \frac{.06}{.58} = .103$

b P(overdue | new) = $\frac{P(\text{new and overdue})}{P(\text{new})} = \frac{.06}{.06+.13} = \frac{.06}{.19} = .316$

c Yes, because P(new) = .19 $\neq$ P(new | overdue)

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

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

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

6.43 a P(fully repaid) = .19 + .64 = .83

b $P(\text{fully repaid} \mid \text{under 400}) = \frac{P(\text{fully repaid and under 400})}{P(\text{under 400})} = \frac{.19}{.19 + .13} = \frac{.19}{.32} = .594$

c $P(\text{fully repaid} \mid \text{400 or more}) = \frac{P(\text{fully repaid and 400 or more})}{P(\text{400 or more})} = \frac{.64}{.64 + .04} = \frac{.64}{.68} = .941$

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

6.44 $P(\text{purchase} \mid \text{see ad}) = \frac{P(\text{purchase and see ad})}{P(\text{see ad})} = \frac{.18}{.18 + .42} = \frac{.18}{.60} = .30$; P(purchase) = .18 + .12 = .30. The events are independent and thus the ads are not effective.

6.45 a P(unemployed | high school graduate) =

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

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

c P(advanced degree | unemployed) =

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

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

6.46 a P(bachelor's degree | west)

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

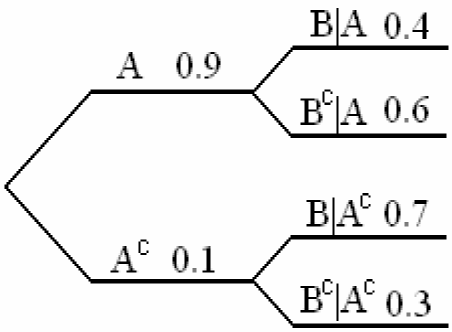
b P(northwest | high school graduate)

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

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

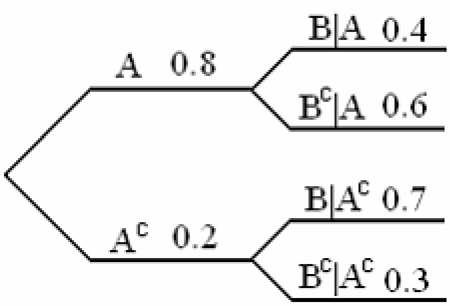
d P(not south) = 1 –P(south) = 1−.3538 = .6462

6.47



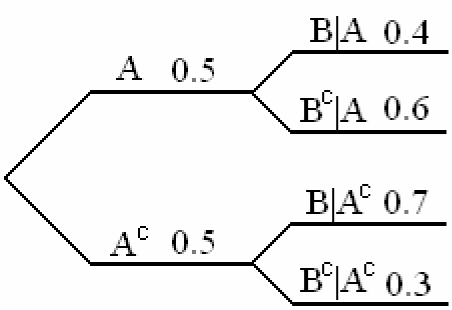
Joint events	Probabilities
A and B	(0.9)(0.4) = 0.36
A and B^c	(0.9)(0.6) = 0.54
A^c and B	(0.1)(0.7) = 0.07
A^c and B^c	(0.1)(0.3) = 0.03

6.48



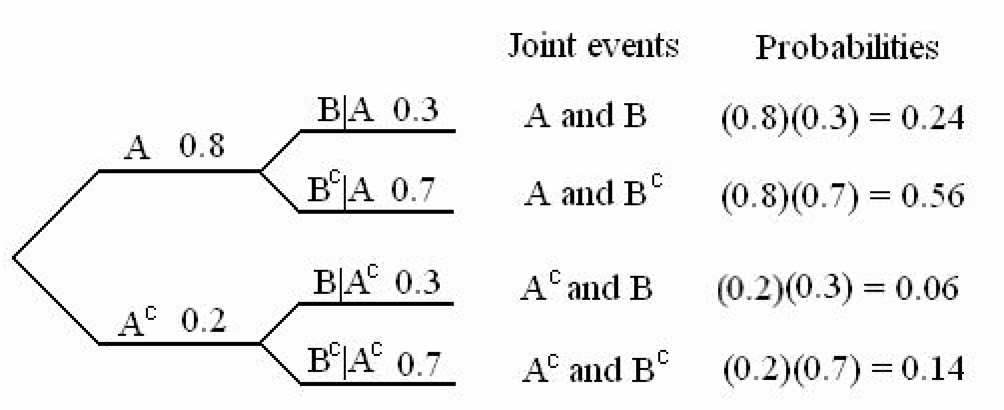
Joint events	Probabilities
A and B	(0.8)(0.4) = 0.32
A and B^c	(0.8)(0.6) = 0.48
A^c and B	(0.2)(0.7) = 0.14
A^c and B^c	(0.2)(0.3) = 0.06

6.49

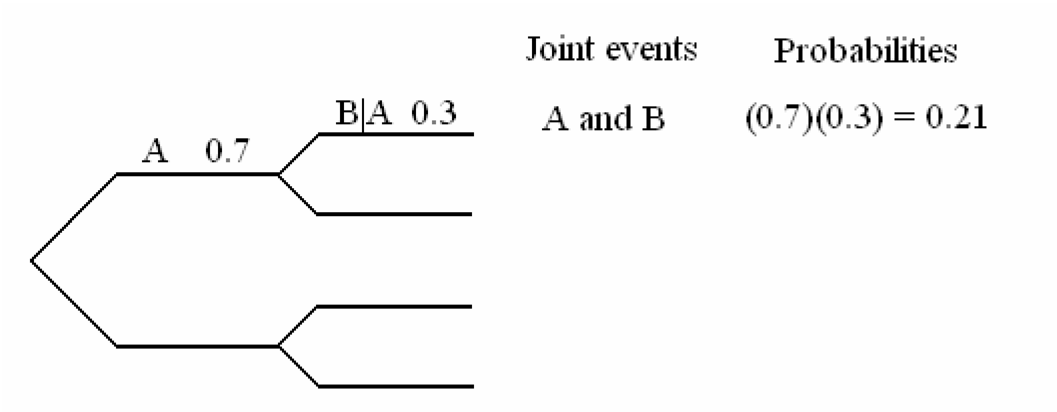


Joint events	Probabilities
A and B	(0.5)(0.4) = 0.20
A and B^c	(0.5)(0.6) = 0.30
A^c and B	(0.5)(0.7) = 0.35
A^c and B^c	(0.5)(0.3) = 0.15

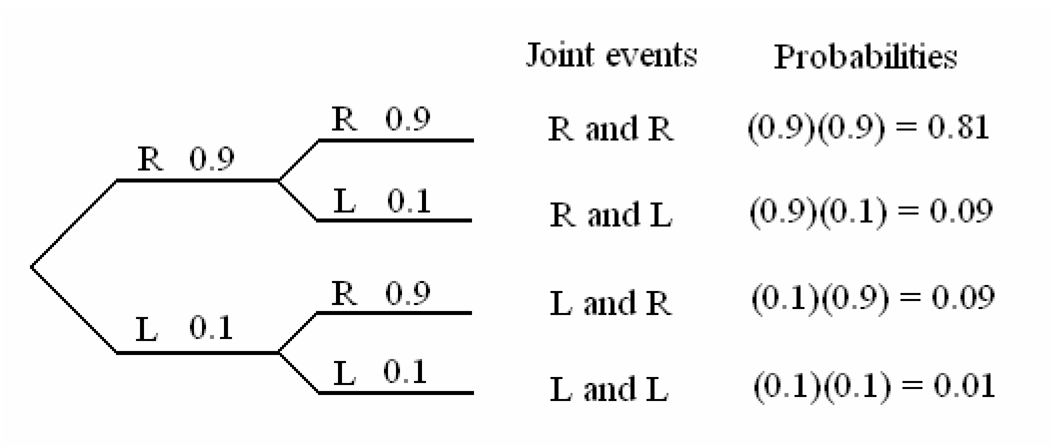
6.50



6.51



6.52



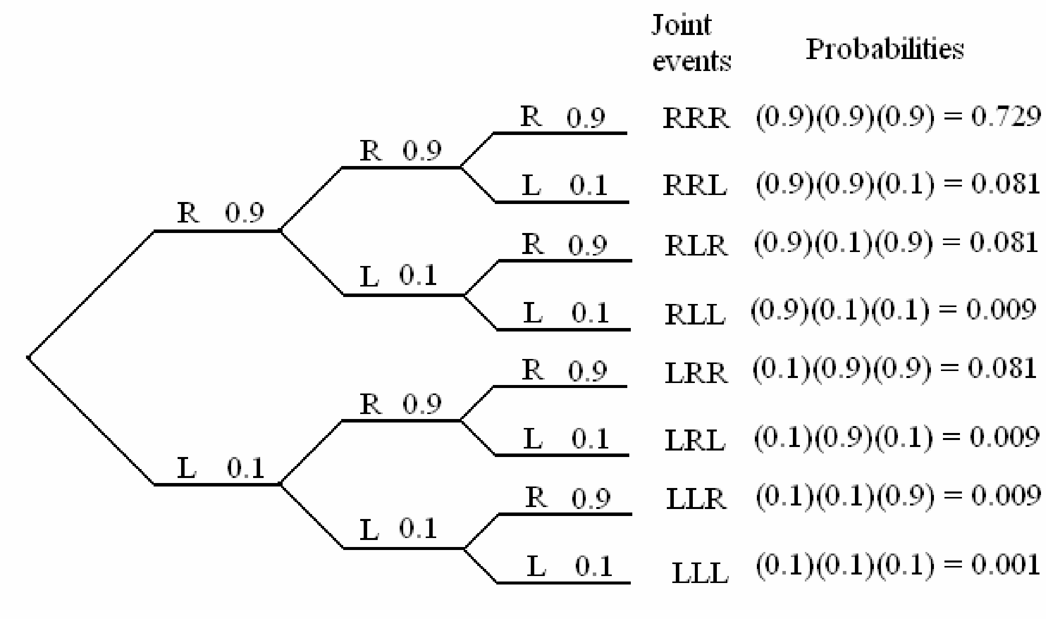
a P(R and R) = .81

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

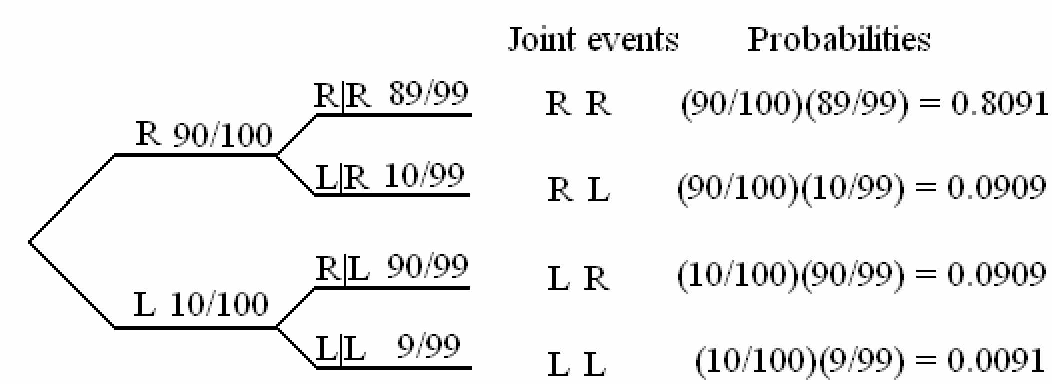
d P(0 right-handers) = .001

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

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

P(3 right-handers) = .729

6.54a



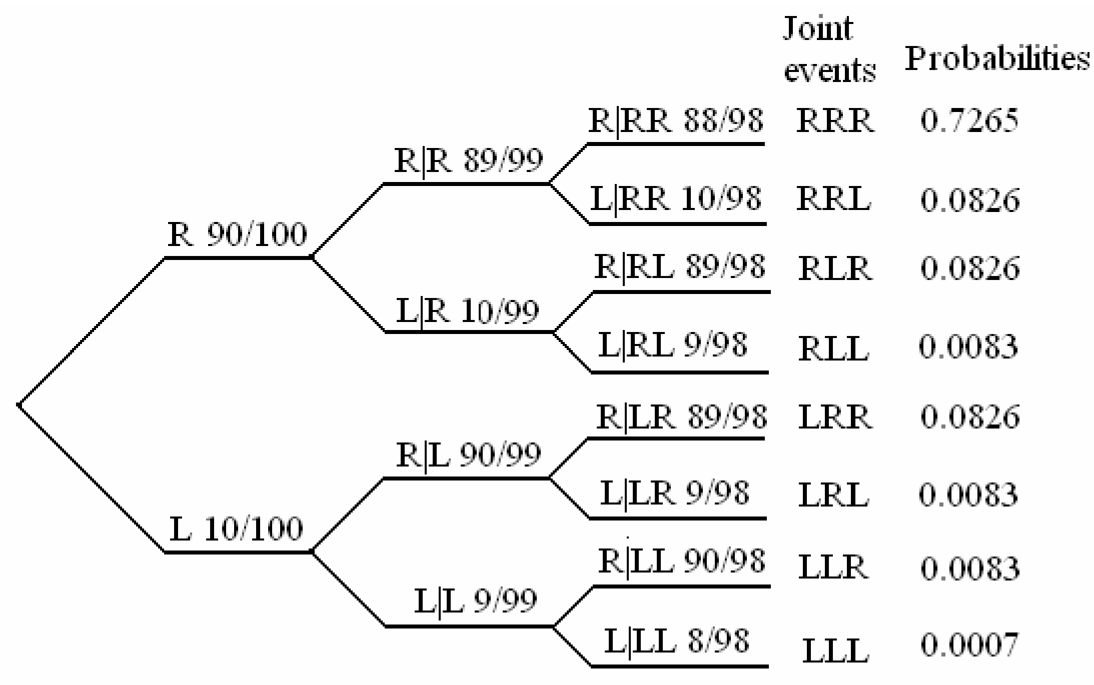
b P(RR) = .8091

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



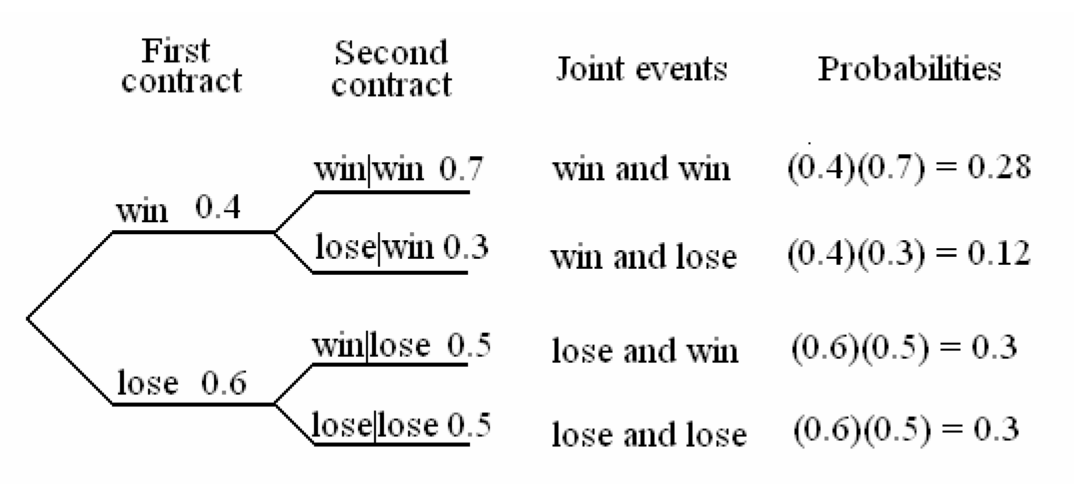
P(0 right-handers) = (10/100)(9/99)(8/98) = .0007

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

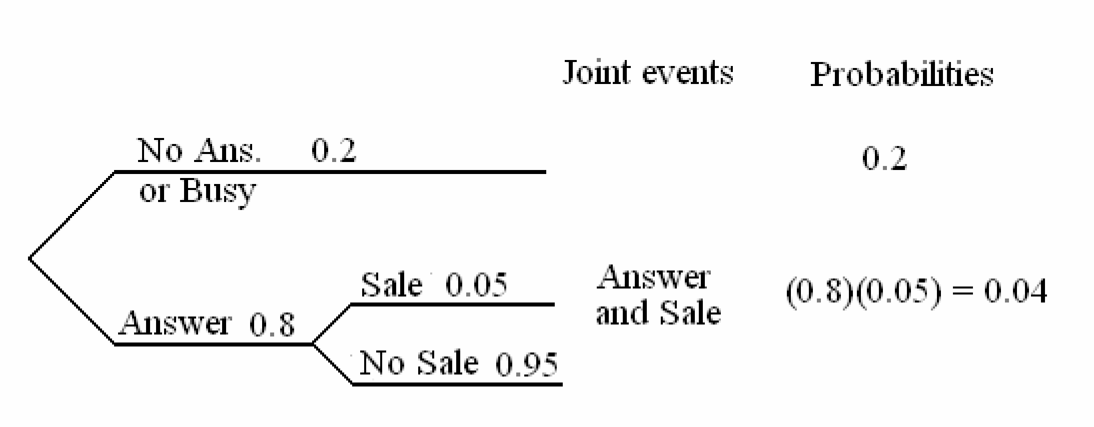


a P(win both) = .28

b P(lose both) = .30

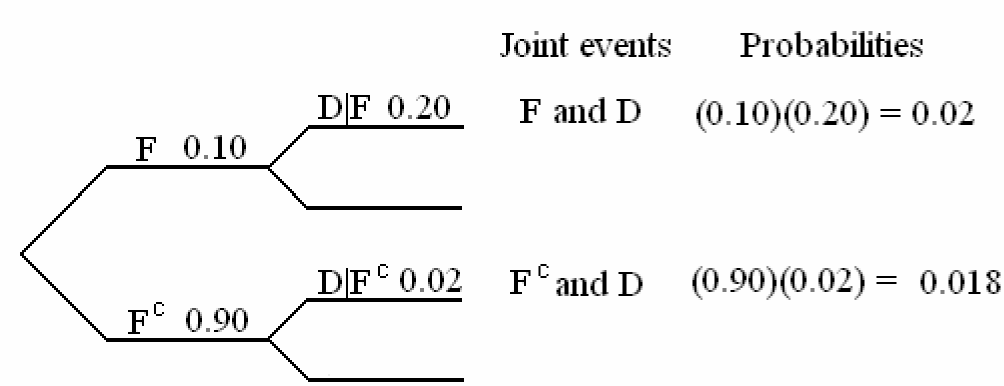
c P(win only one) = .12 + .30 = .42

6.57



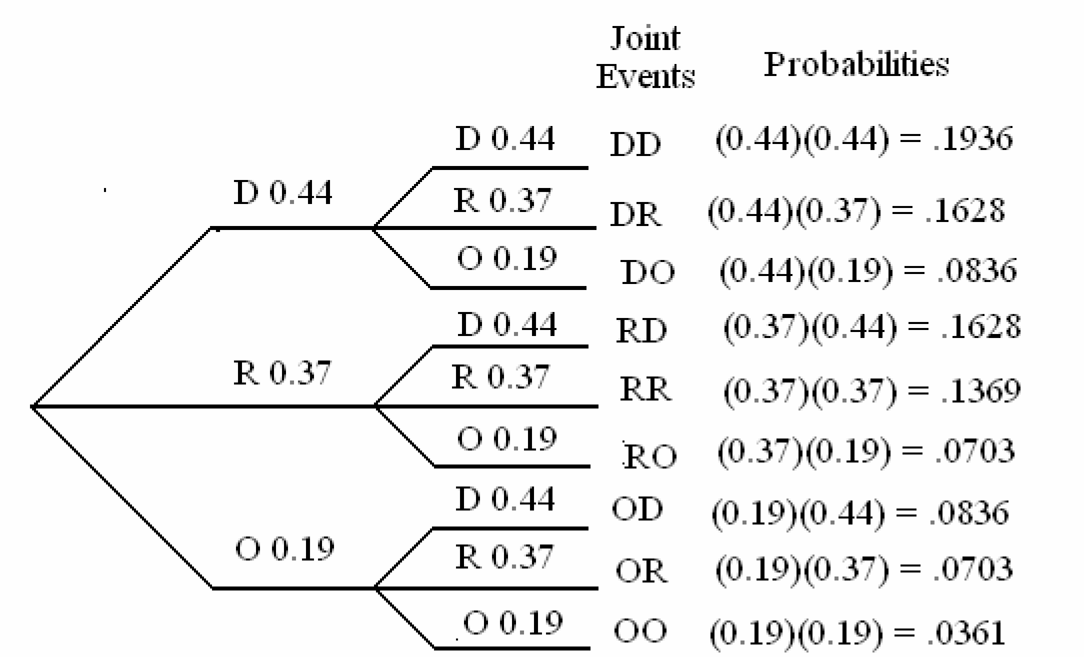
P(sale) = .04

6.58



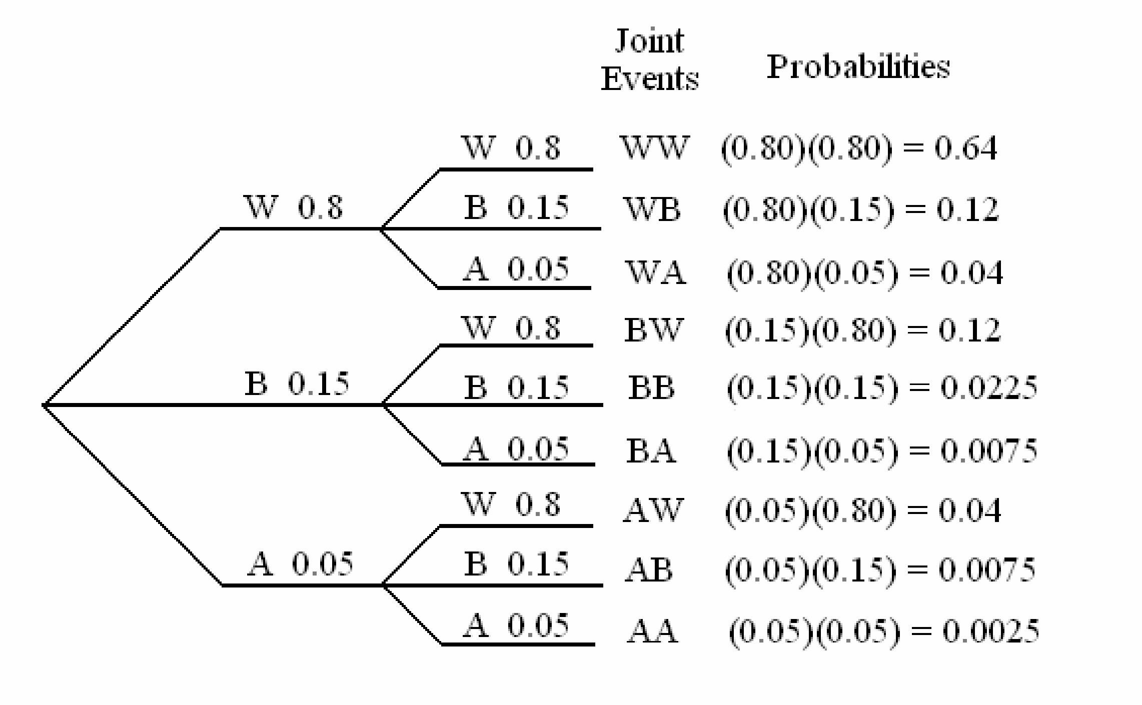
P(D) = .02 + .018 = .038

6.59



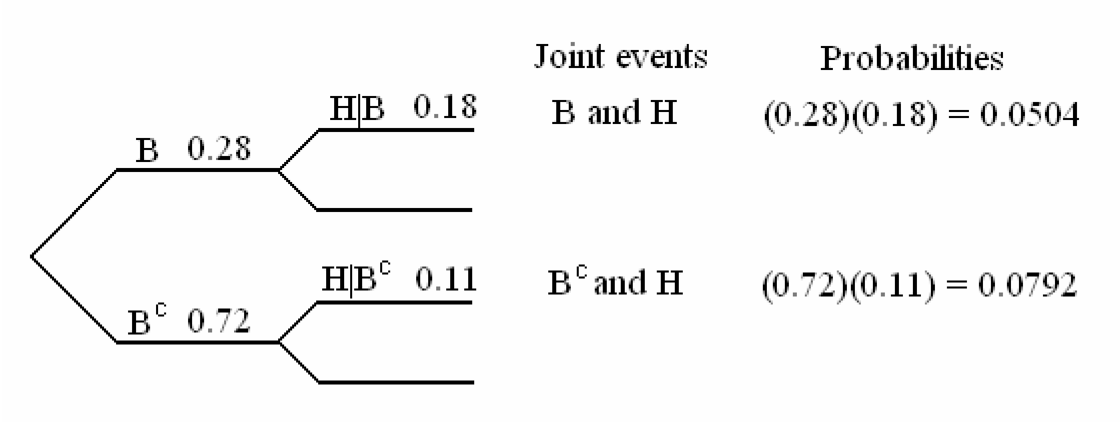
P(Same party affiliation) = P(DD) + P(RR) + P(OO) = .1936 + .1369 + .0361.3666

6.60



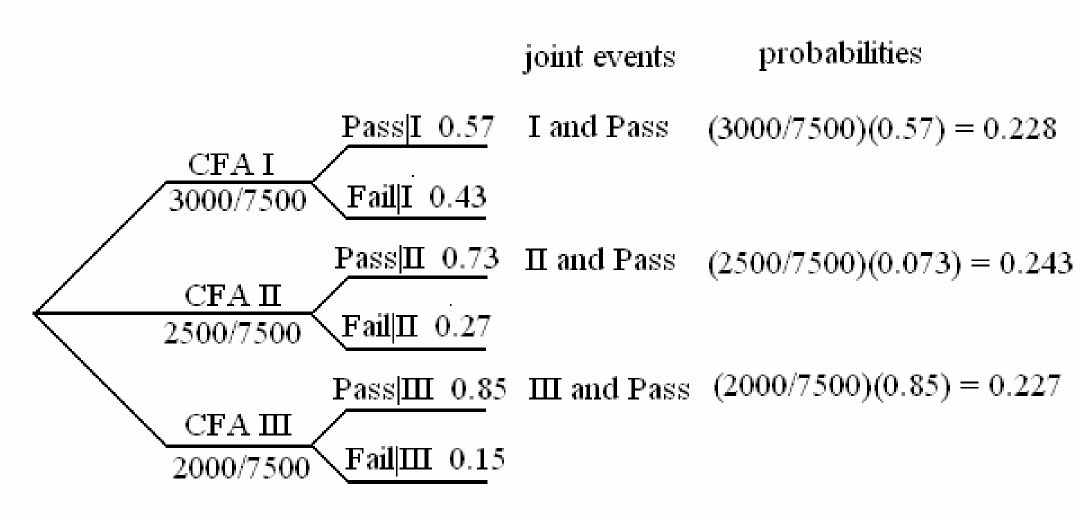
Diversity index = .12 + .04 + .12 + .0075 + .04 + .0075 = .335

6.61



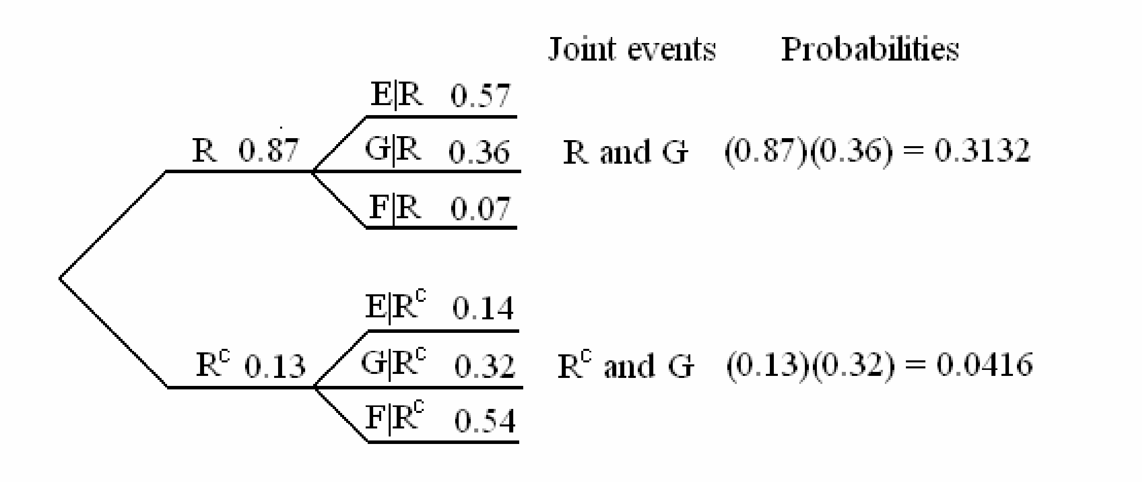
P(heart attack) = .0504 + .0792 = .1296

6.62



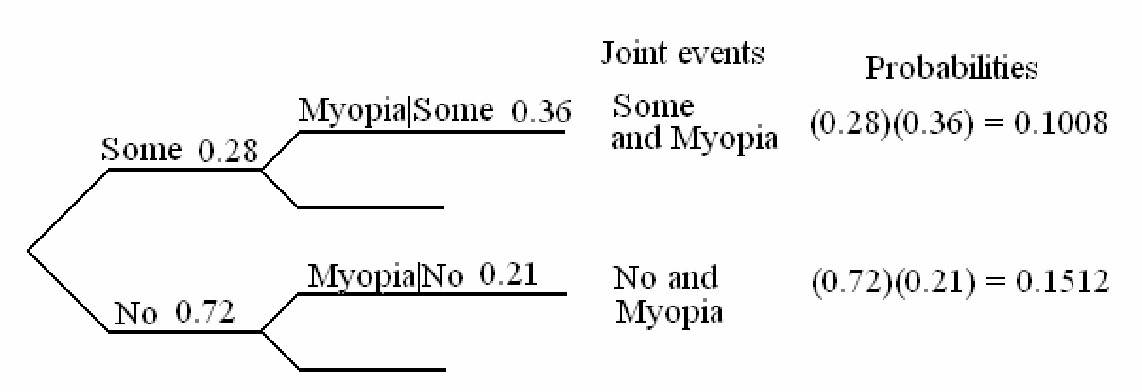
P(pass) = .228 + .243 + .227 = .698

6.63



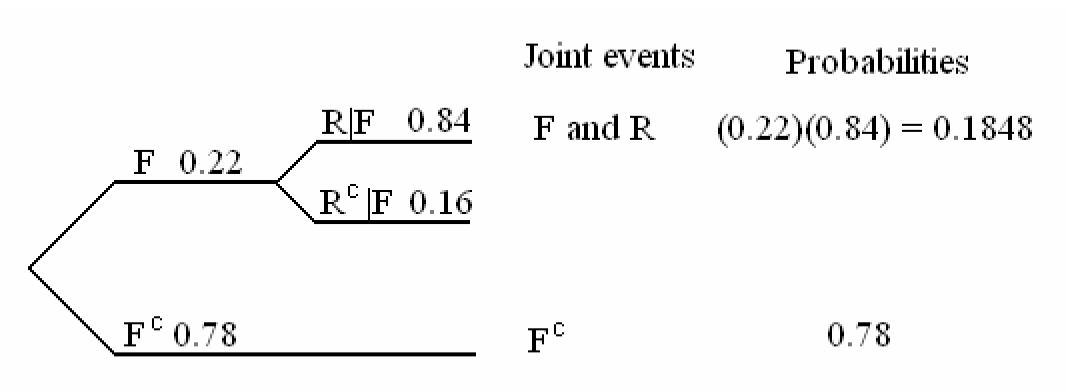
P(good) = .3132 + .0416 = .3548

6.64



P(myopic) = .1008 + .1512 = .2520

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 Let A = DJIA increase and B = NASDAQ increase

P(A) = .60 and P(B | A) = .77

P(A and B) = P(A)P(B | A) = (.60)(.77) = .462

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 and B_1 and B_2) = [P(M)][P(B_1)][P(B_2)]

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

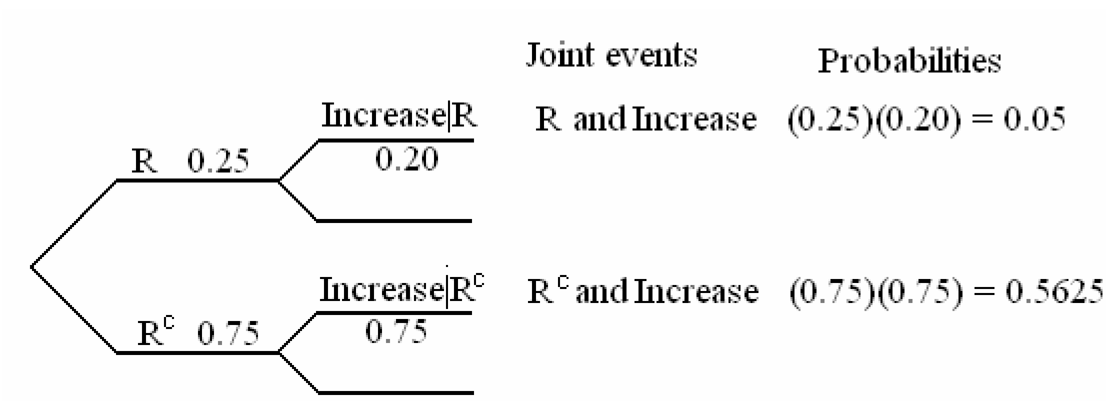
= .00000001

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

6.69 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

6.70



P(Increase) = .05 + .5625 = .6125

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

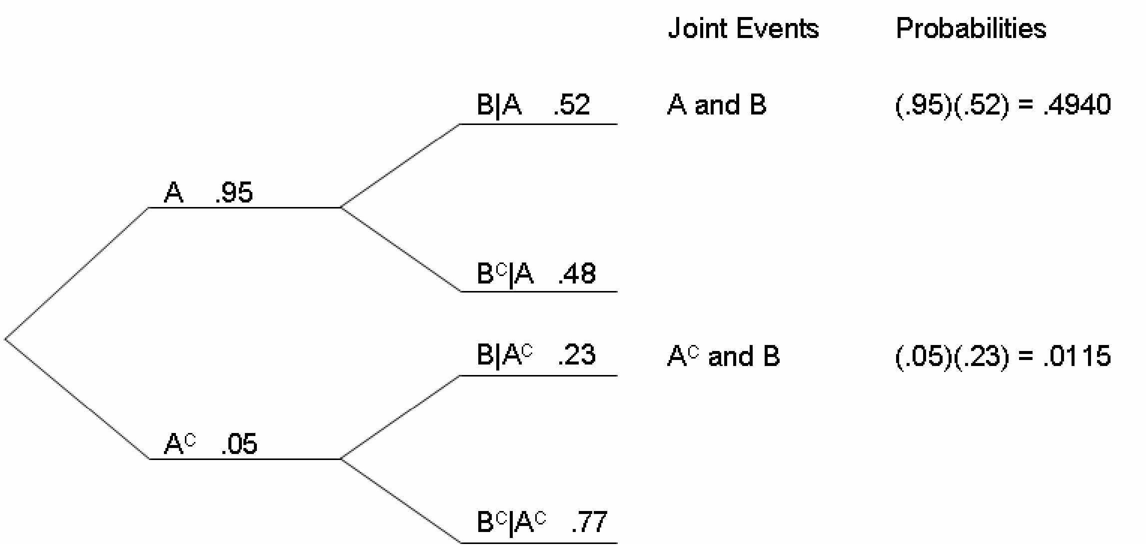
a $P(A \mid B) = \dfrac{P(A \text{ and } B)}{P(B)} = \dfrac{.32}{.46} = .696$

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

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

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

6.73



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

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

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

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

$P(A) = .01$, $P(B \mid A) = .084$, $P(B) = .12$

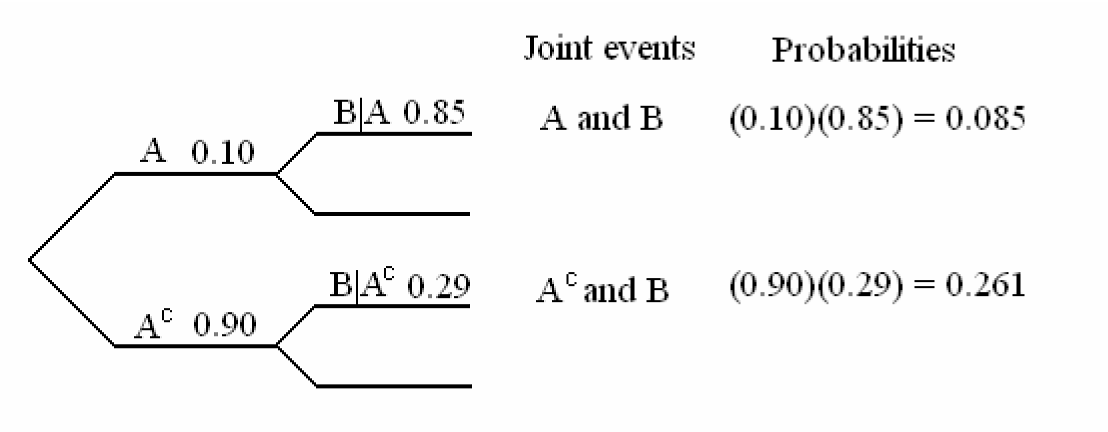
$P(A \text{ and } B) = (.01)(.084) = .00084$

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

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

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

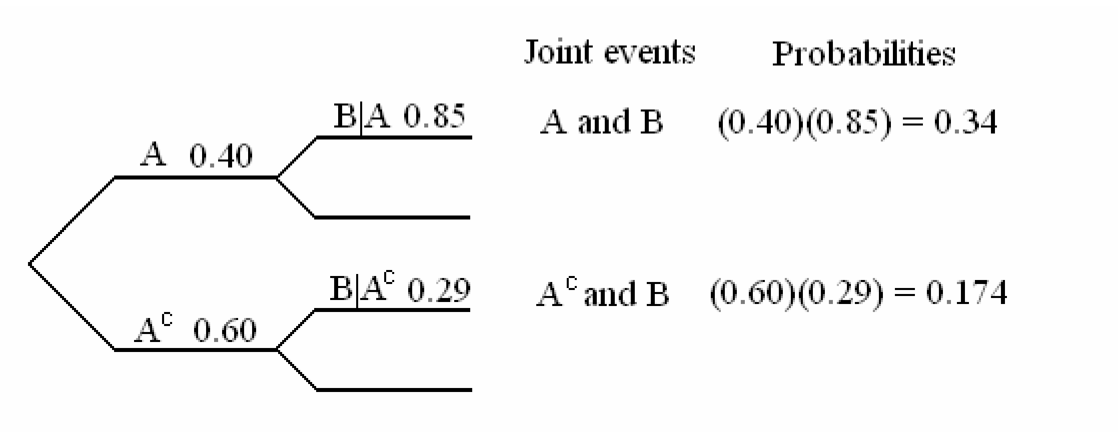
$P(A) = .10$, $P(B \mid A) = .85$, $P(B \mid A^C) = .29$



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

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

6.78 $P(A) = .40$, $P(B \mid A) = .85$, $P(B \mid A^C) = .29$



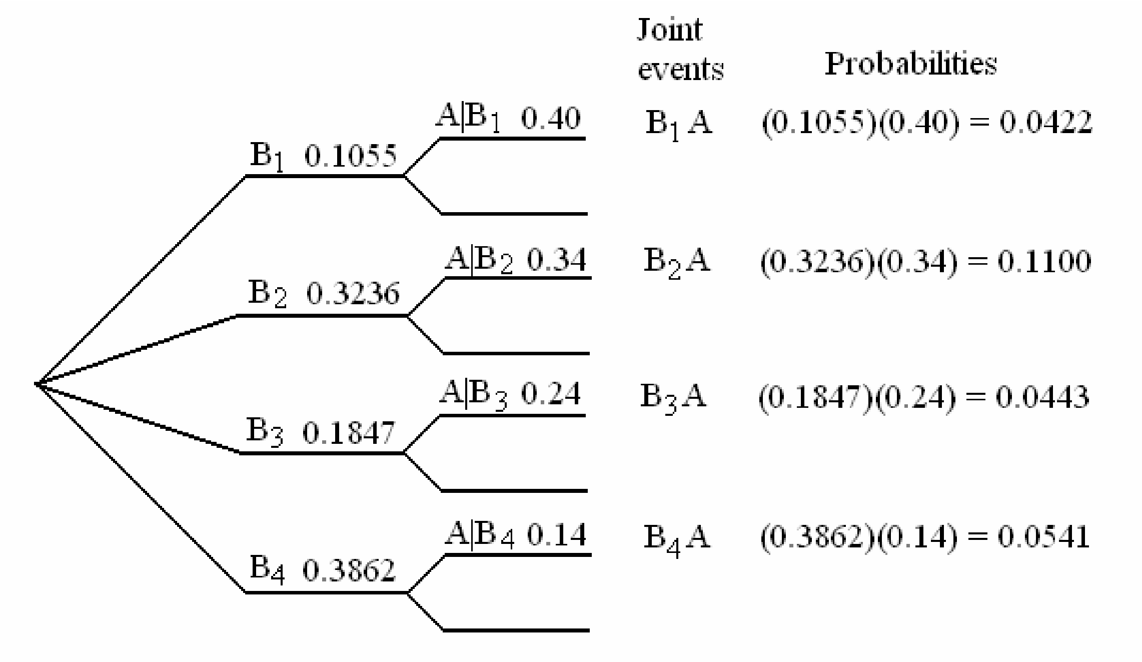
$P(B) = .34 + .174 = .514$

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

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

$P(A \mid B_1) = .40$, $P(A \mid B_2) = .34$, $P(A \mid B_3) = .24$, $P(A \mid B_4) = .14$

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

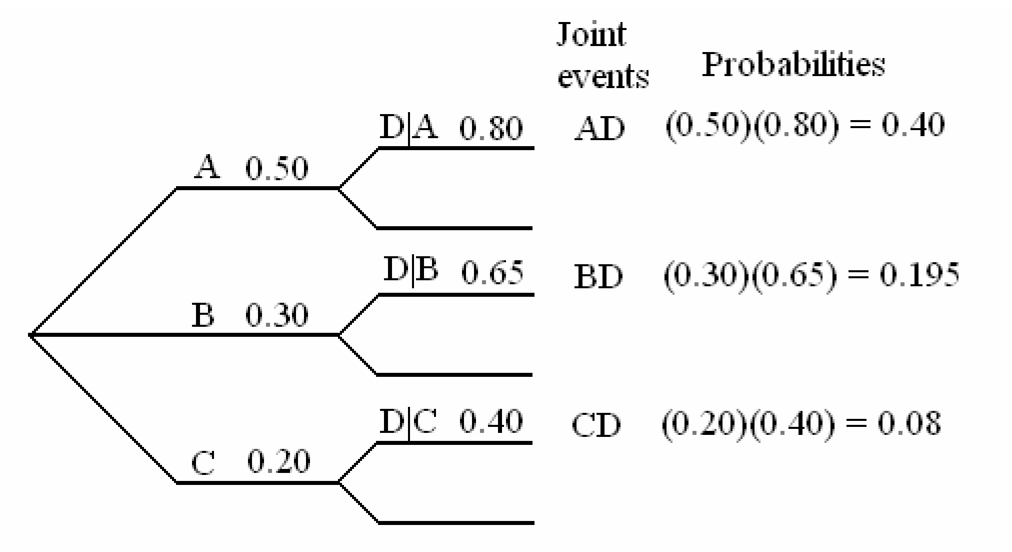


$P(A) = .0422 + .1100 + .0443 + .0541 = .2506$

$P(B_4 \mid A) = .0541/.2506 = .2159$

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

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

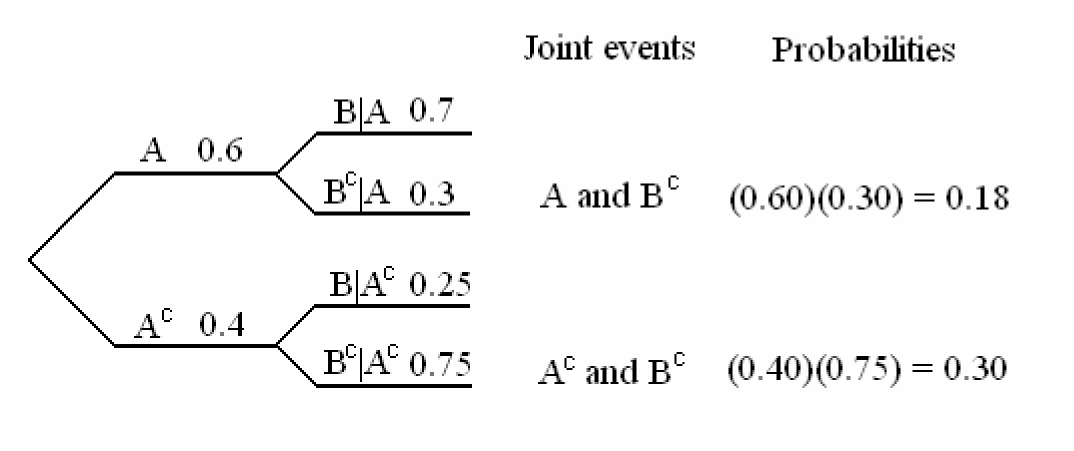


$P(D) = .40 + .195 + .08 = .675$

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

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

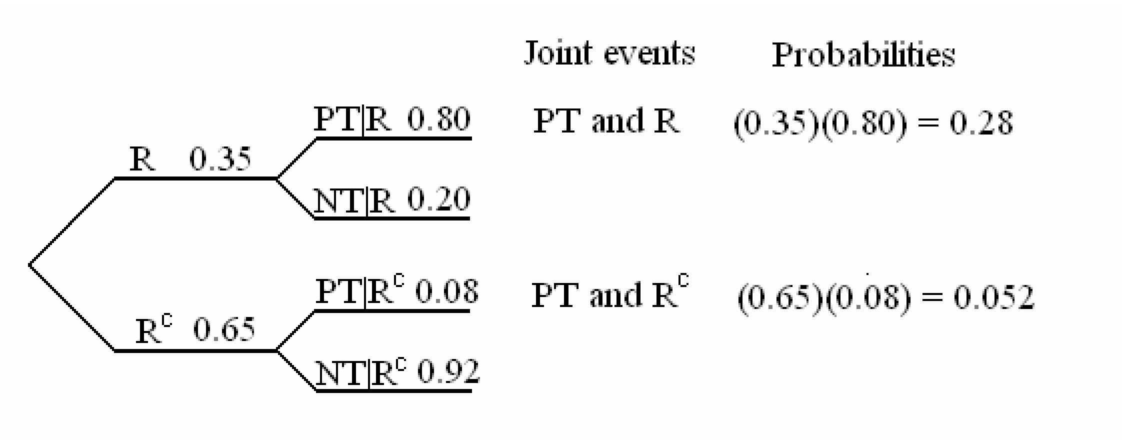
$P(A) = .60$, $P(B \mid A) = .70$, $P(B \mid A^C) = .25$



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

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

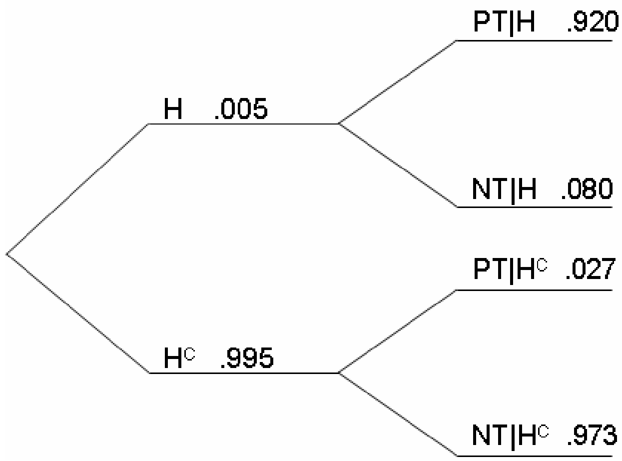
6.82



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

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

6.83



Joint Events	Probabilities
H and PT	(.005)(.920) = .0046
H and NT	(.005)(.080) = .0004
H^C and PT	(.995)(.027) = .0269
H^C and NT	(.995)(.973) = .9681

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

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

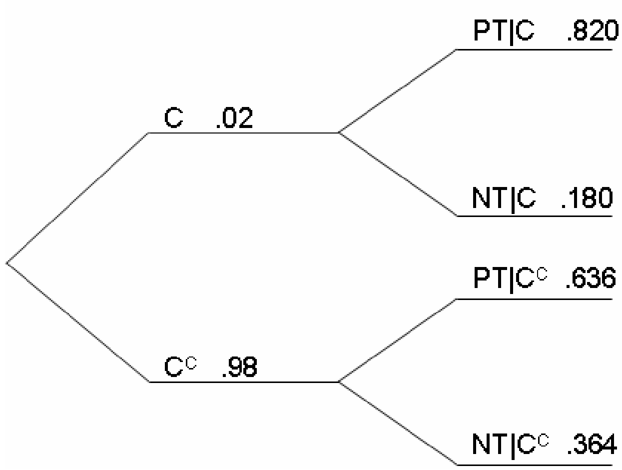
6.84 Sensitivity = P(PT | H) = .920

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

Positive predictive value = P(H | 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



Joint Events	Probabilities
C and PT	(.02)(.820) = .0164
C and NT	(.02)(.180) = .0036
C^C and PT	(.98)(.636) = .6233
C^C and NT	(.98)(.364) = .3567

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

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

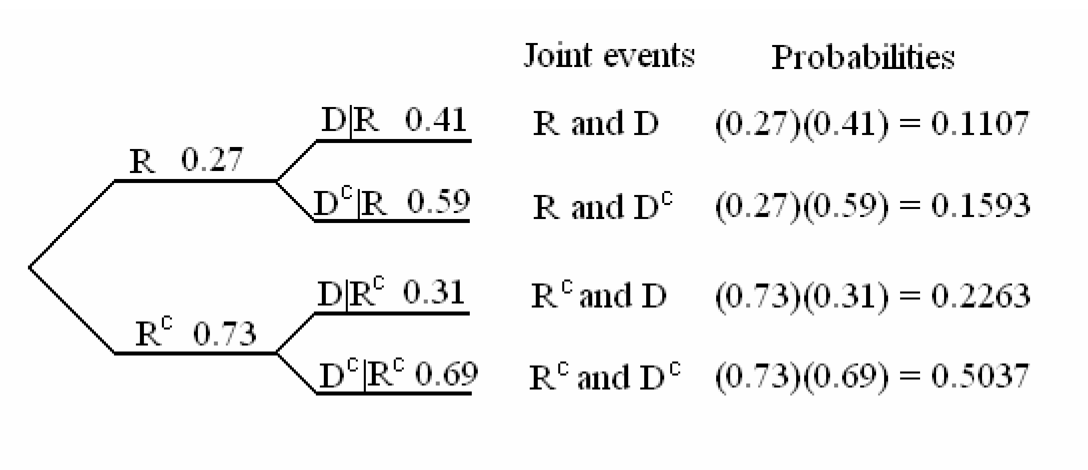
$$P(C \mid PT) = \frac{P(C \text{ and } PT)}{P(PT)} = \frac{.0164}{.6397} = .0256$$

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

6.86 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

6.87



a $P(D) = P(R \text{ and } D) + P(R^C \text{ and } D) = .1107 + .2263 = .3370$

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

b $P(D^C) = P(R \text{ and } D^C) + P(R^C \text{ and } D^C) = .1593 + .5037 = .6630$

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

6.88 P(T) = .5

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

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

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 $P(\text{pass}) \neq P(\text{pass} \mid \text{miss 5 or more classes})$

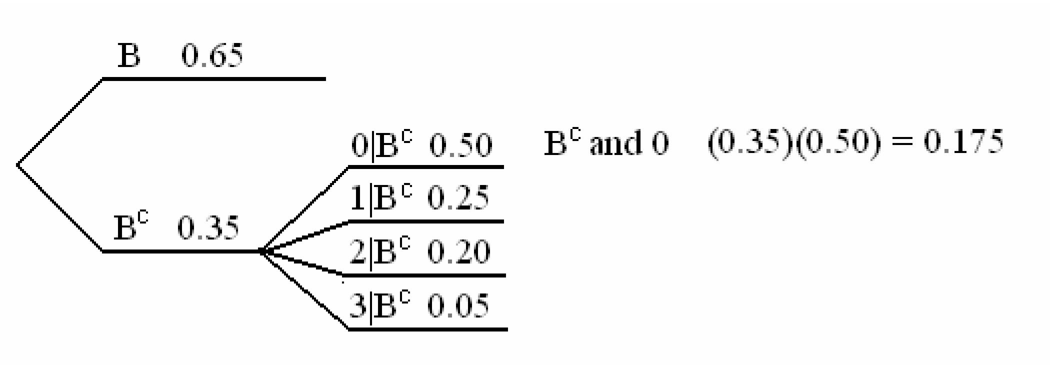
6.90 Define events: A = job security is an important issue, B = pension benefits is an important issue

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

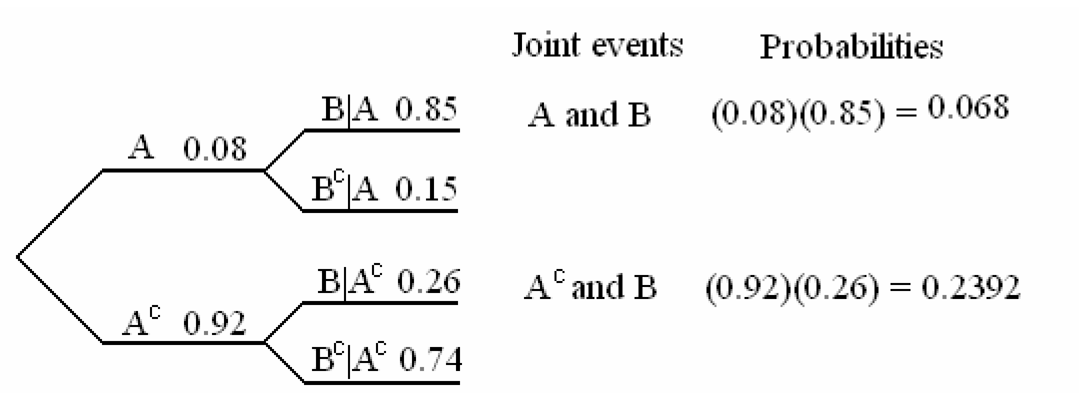
6.91



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

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

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



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

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

6.93 P(Idle roughly)

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

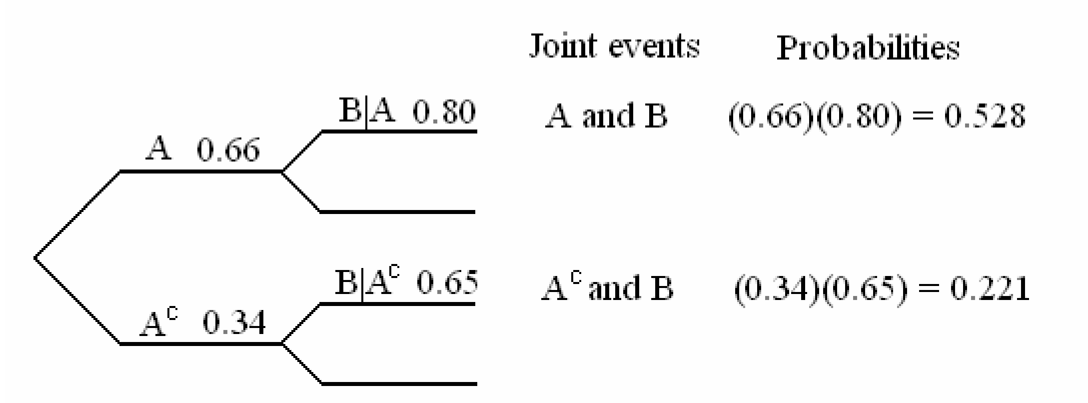
6.94 Define events: A = purchase extended warranty, B = regular price

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

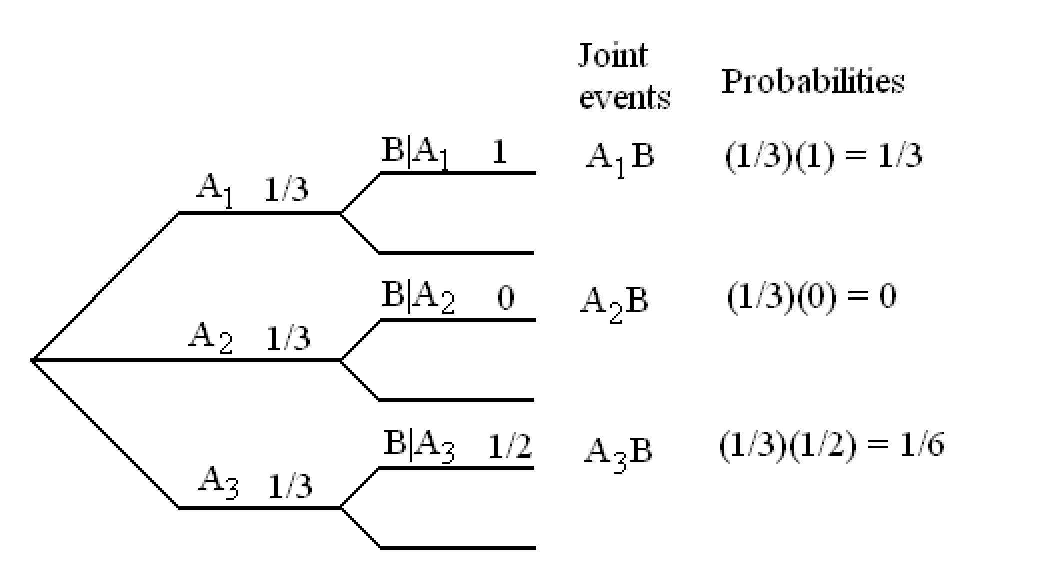
c No, because $P(A) \neq P(A \mid B)$

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



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

6.96 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.

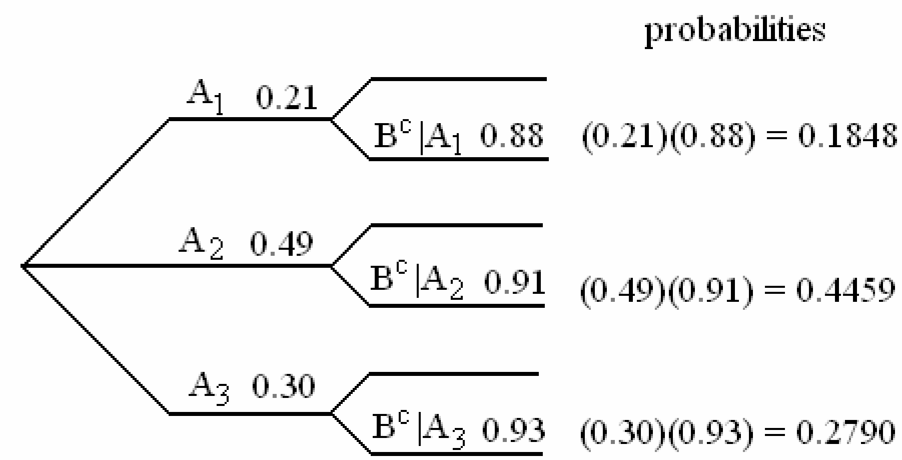


P(B) = 1/3 + 0 + 1/6 = 1/2

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

6.97 $P(A^C \mid B) = \dfrac{P(A^C \text{ and } B)}{P(B)} = \dfrac{.221}{.749} = .295$

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



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

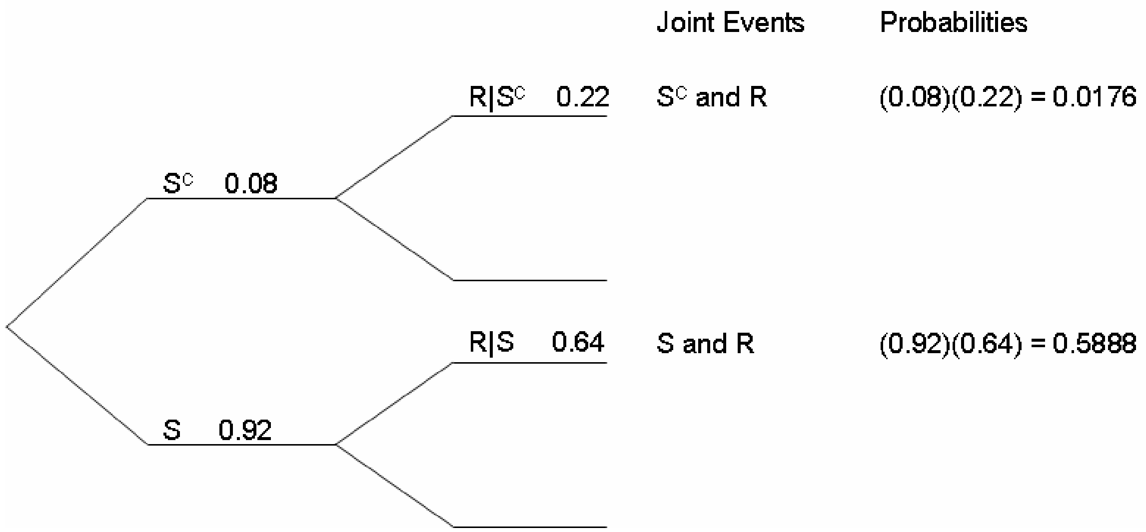
$$P(A_1 \mid B^C) = \frac{P(A_1 \text{ and } B^C)}{P(B^C)} = \frac{.1848}{.9097} = .2031$$

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

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

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

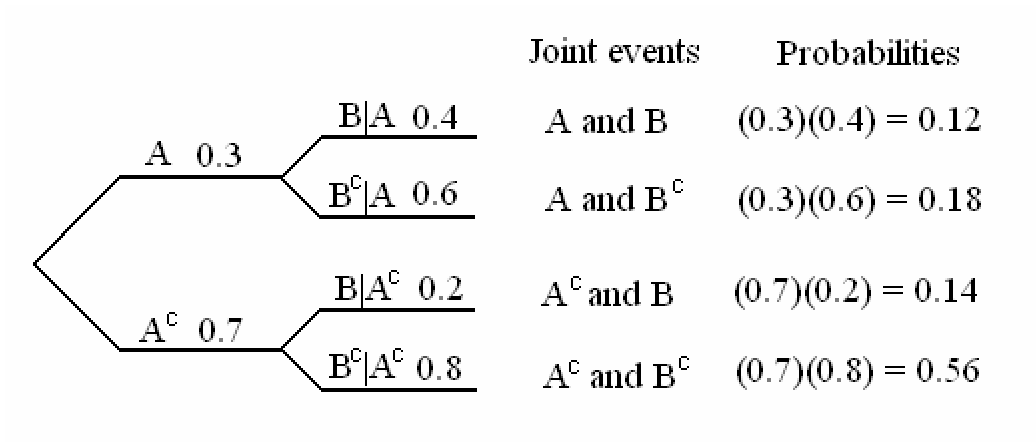
6.100



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

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

6.101 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

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

b $\text{P(excellent | man)} = \dfrac{\text{P(man and excellent)}}{\text{P(man)}} = \dfrac{.22}{.22+.10+.12+.06} = \dfrac{.22}{.50} = .44$

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

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

6.103 a P(Marketing A) = .053 + .237 = .290

b $\text{P(Marketing A | Statistics not A)} = \dfrac{\text{P(Marketing A and Statistics not A)}}{\text{P(Statistics not A)}} = \dfrac{.23}{.237+.580}7 = \dfrac{.237}{.817} = .290$

c Yes, the probabilities in Parts a and b are the same.

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

Switch to Curtain B and double your probability of winning the car.

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.

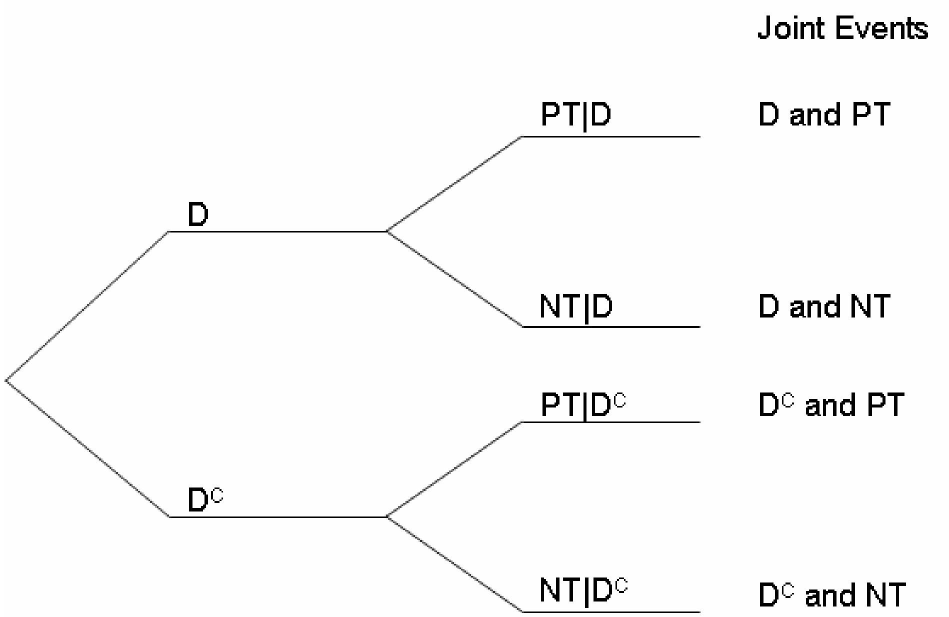
2 outs:

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 | PT) = .00971/.34928 = .02780

P(D | NT) = .00029/.65072 = .00045

Age 45: P(D) = 1/25

P(D and PT) = (1/25)(.971) = .03884

P(D and NT) = (1/25)(.029) = .00116

P(D^C and PT) = (24/25)(.343) = .32928

P(D^C and NT) = (24/25)(.657) = .63072

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

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

P(D | PT) = .03884/.36812 = .10551

P(D | NT) = .00116/.63188 = .00184

Age 49: P(D) = 1/12

P(D and PT) = (1/12)(.971) = .08092

P(D and NT) = (1/12)(.029) = .00242

P(D^C and PT) = (11/12)(.343) = .31442

P(D^C and NT) = (11/12)(.657) = .60255

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

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

P(D | PT) = .08092/.39533 = .20468

P(D | NT) = .00242/.60467 = .00400