Key to 3.3 - 3.4

12 a) E_1, E_2, E_3, E_4, E_5 $P(S) = 1$ b/c each event has prob of $1/5$

b) E_1, E_2 $P(A) = 2/5$

c) $E_1 E_2, E_4, E_5$ $P(B) = 4/5$

d) E_3, E_4 $P(C) = 2/5$

e) E_2, E_4, E_5 $P(\bar{A}) = 3/5$

f) E_3 $P(\bar{B}) = 1/5$

g) E_1 $P(A \cap B) = 1/5$

h) E_3 $P(A \cap C) = 1/5$

i) E_1 $P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{1/5}{4/5} = 1/4$ notice once we know B has occured we are down to 4 choices

j) E_1, E_2, E_3, E_4, E_5 $P(A \cup B) = 1$

k) E_1, E_3, E_4 $P(A \cup C) = 3/5$

l) E_3 $P(A|C) = \frac{P(A \cap C)}{P(C)} = \frac{1/5}{2/5} = 1/2$

13 A and B are not mutually exclusive b/c they share E_1

independence $P(A|B) = 1/4$ from 12 i which is $\neq P(A)$ → so B does give information about A and they are not independent

14 a) $P(A) = \overset{.1}{P(E_1)} + \overset{.05}{P(E_4)} + \overset{.2}{P(E_6)} = .35$

b) $P(B) = \overset{.05}{P(E_3)} + \overset{.05}{P(E_4)} + \overset{.3}{P(E_5)} + \overset{.2}{P(E_6)} + \overset{.1}{P(E_7)} = .7$

c) $P(A \cap B) = \overset{.05}{P(E_4)} + \overset{.2}{P(E_6)} = .25$

d) $P(A \cup B) = 1 - \overset{.05}{P(E_2)} - \overset{.15}{P(E_8)} = .8$

e) no $P(AB) \neq 0$ in part c they share events

f) $P(A|B) = \frac{P(A \cap B)}{P(B)}$ $\frac{.25}{.7} = .3571$

g) $P(B|A) = \frac{P(A \cap B)}{P(A)}$ $\frac{.25}{.35} = .714$

h) no $P(A|B) \neq P(A)$ so not independent

16 a) $P(\text{order} > 2000) = .25 + .2 + .1 = .55$

b) $P(\text{order} \le 2000 \mid \text{order} > 1000) = \dfrac{P(\text{order} \le 2000 \wedge \text{order} < 1000)}{P(\text{order} > 1000)} = \dfrac{.35}{.35 + .25 + .20 + .1}$

$= .39$

c) $P(\text{order} > 3000 \mid \text{order} > 2000) = \dfrac{P(\text{order} > 3000 \wedge \text{order} > 2000)}{P(\text{order} > 2000)} = \dfrac{.2 + .1}{.25 + .2 + .1}$

$= .545$

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define events A: adult belives ad B: adult is college grad

17 C: adult has some college D: adult has not gone to college

given

a) $P(B) = .24$

find $P(\bar{A} \cap B) = P(\bar{A} \mid B)\, P(B) = (1 - .18)(.24) = \underline{.1968}$

b) $P(\bar{A} \mid C) = 1 - \overset{.25}{P(A \mid C)} = \underline{.75}$

c) $P(D) = .4$ given

$P(A \cap D) = P(A \mid D)\, P(D) = (.27)(.4) = \underline{.108}$

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define events L - maintain parental leave S - comp pays salary

18 H - comp pays health care

a) $P(L \cap S) = P(S \mid L)\, P(L) = (1/3).27 = .09$

b) $P(L \cap \bar{H}) = P(\bar{H} \mid L)\, P(L) = (1/4).27 = .0675$

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22 a) $P(\text{exellent}) = 2/35 = .057$

b) $P(\text{at least good}) = \dfrac{2}{35} + \dfrac{21}{35} + \dfrac{11}{35} = \dfrac{34}{35}$

c) $P(\text{select brand not rated E or V}) = \dfrac{11}{35} + \dfrac{1}{35} = \dfrac{12}{35}$

d) event A - 1st is very good
even B - 2nd is very good

$P(A \cap B) = P(B \mid A)\, P(A) = \left(\dfrac{20}{34}\right)\left(\dfrac{21}{35}\right) = .3529$

23 define events A: first is activated B: second is activated

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$ not A and B are independent so $P(A \cap B) = P(A)\,P(B)$

$= .91 + .95 - (.91)(.95)$

$= .9955$

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46 event F - patient fails to pay bill - assume they are independ events

a) $P(\text{all 4 fail to pay bill}) = p(F)p(F)p(F)p(F) = \underline{.0081}$ b/c independent

b) $P(\text{one will be forgiven})$ - there are 4 diffent ways this can happen

$F\bar{F}\bar{F}\bar{F}$, $\bar{F}F\bar{F}\bar{F}$, $\bar{F}\bar{F}F\bar{F}$, $\bar{F}\bar{F}\bar{F}F$ where $\bar{F} = .7$

each $= .3(.7)(.7)(.7) = .1029$ add them together to get $\underline{.4116}$

c) $P(\text{all 4 pay}) = \underset{.7}{p(\bar{F})}\underset{.7}{p(\bar{F})}\underset{.7}{p(\bar{F})}\underset{.7}{p(\bar{F})} = \underline{.2401}$

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49 a) 1, 2, 3, 4, 5, 6 $P(S) = 1$ b) 1, 2, 3 $P(A) = 3/6 = 1/2$

c) 1, 2 $P(B) = 2/6 = 1/3$ d) 4, 5, 6 $= 3/6 = 1/2$ e) 1, 2 $P(A \cap B) = 2/6 = 1/3$

f) $\emptyset$ $P(A \cap C) = 0$ g) $\emptyset$ $P(B \cap C) = 0$ h) 1, 2, 3 $P(A \cup B) = 3/6 = 1/2$

i) 1, 2, 3, 4, 5, 6 $P(A \cup C) = 1$ j) 1, 2, 4, 5, 6 $P(B \cup C) = 5/6$

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50 a) $P(A \cap C) = P(B \cap C) = 0$ so they are mutually exclusive $P(A \cap B) \neq 0$ so not mutually exclusive

b) 1/2

c) $P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{1/3}{1/3} = 1$ $P(A|C) = \frac{P(A \cap C)}{P(C)} = \frac{0}{1/2} = 0$

d) $P(A|B) \neq P(A)$ and $P(A|C) \neq P(A)$ so neither are independent