Unit 4A Exam Review Answers

1. 5 – 10%; 2 – 20%; 2 – 30%; 1 – 50%

X	10%	20%	30%	50%
P(X = x)	5/10	2/10	2/10	1/10

   a. P(>20%) = P(30%) + P(50%) = 2/10 + 1/10 = 0.30

   b. P(<20%) = P(10%) = 5/10 = 0.50

   c. $P(50\% \cap 50\%) = \left(\frac{1}{10}\right)^2 = 0.01$

   d. $P(50\%^C \cap 50\%^C \cap 50\%^C) = \left(\frac{9}{10}\right)^3 = 0.729$

      OR: binomial B(3, 0.1) P(X = 0) = 0.729

   e. $P(30\%^C \cap 30\%^C \cap 30\%^C \cap 30\%^C \cap 30\%^C \cap 30\%) = \left(\frac{8}{10}\right)^5 \bullet \frac{2}{10} = 0.0655$

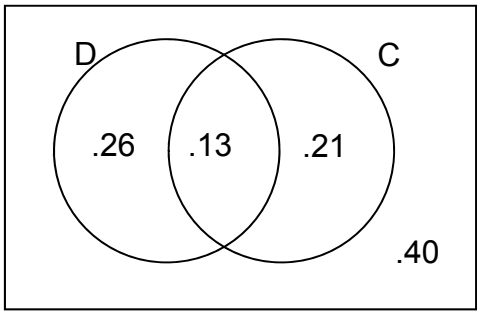
   f. $1 - P(50\%^C \cap 50\%^C \cap 50\%^C \cap 50\%^C \cap 50\%^C) = 1 - \left(\frac{9}{10}\right)^5 = 0.4095$

      OR: binomial B(5, 0.1) $P(X \geq 1) = 1 - P(X \leq 0) = 0.4095$

   g. Both are incorrect. Each roll of the rubber cube is independent of any other roll. So the probability of getting a 50% discount is the same no matter what the previous values were.

---

2. Dogs and cats
   a. D = Family owns at least one dog
      C = Family owns at least one cat



(.39 + .34) - .60 = .13

   b. $P(C^C \cap D^C) = 0.40$

   c. $P(C \cap D) = 0.13$

   d. $P(C|D) = \frac{P(C \cap D)}{P(D)} = \frac{0.13}{0.39} = 0.33$

   e. No. $P(C \cap D) = 0.13 \neq 0$. A household can own a cat and a dog at the same time.

   f. Yes. Knowing that a family has a dog doesn't change the probability that they own a cat. P(C) = 0.34; P(C|D) = 0.33

3. a. P(X = 3) = 0.28

   b. P(X ≤ 3) = 0.16 + 0.22 + 0.28 = 0.66

c. $P(1<X\leq 4) = 0.22 + 0.28 + 0.20 = 0.70$

d. $E(X) = 1(0.16) + 2(0.22) + 3(0.28) + 4(0.20) + 5(0.14) = 2.94$
$Var(X) = (1 - 2.94)^2(0.16) + (2 - 2.94)^2(0.22) + (3 - 2.94)^2(0.28) + (4 - 2.94)^2(0.20) + (5 - 2.94)^2(0.14)$
$Var(X) = 1.6164$
$SD(X) = 1.2714$

---

4. (a) $P(A \cup B) = 0.65 + 0.23 - 0.15 = 0.73$

(b) $P(B|A) = \frac{0.15}{0.65} = 0.2307$

(c) No. $P(A \cap B)$ is not 0

(d) Possibly. $P(B|A)$ is very close to $P(B)$. Justify whatever answer you give!!

---

5. $P(D \cup C) = P(D) + P(C) = 0.78$

---

6. $P(K \cap R) = P(K)*P(R) = 0.1633$

---

7. (a) $P(F \cap H) = P(H|F) * P(F) = 0.0429$

(b) $P(F \cup H) = P(F) + P(H) - P(F \cap H) = 0.5671$

---

8. $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
$0.78 = 0.25 + P(B) - 0.12$
$P(B) = 0.65$

---

9. $P(R) = 0.37$ $\quad P(U|R) = \frac{0.15}{0.37} = 0.405$
$P(R \cap U) = 0.15$

---

10. $P(M) = 0.5$ $\quad P(J|M) = \frac{0.20}{0.50} = 0.40$
$P(M \cap J) = 0.20$

		Breakfast		
		Yes	No	
Sex	Male	66	66	132
	Female	125	74	199
		191	140	331

11.

a. P(F) = 199/331 = 0.6012

b. P(B) = 191/331 = 0.5770

c. P(F ∩ B) = 125/331 = 0.3776

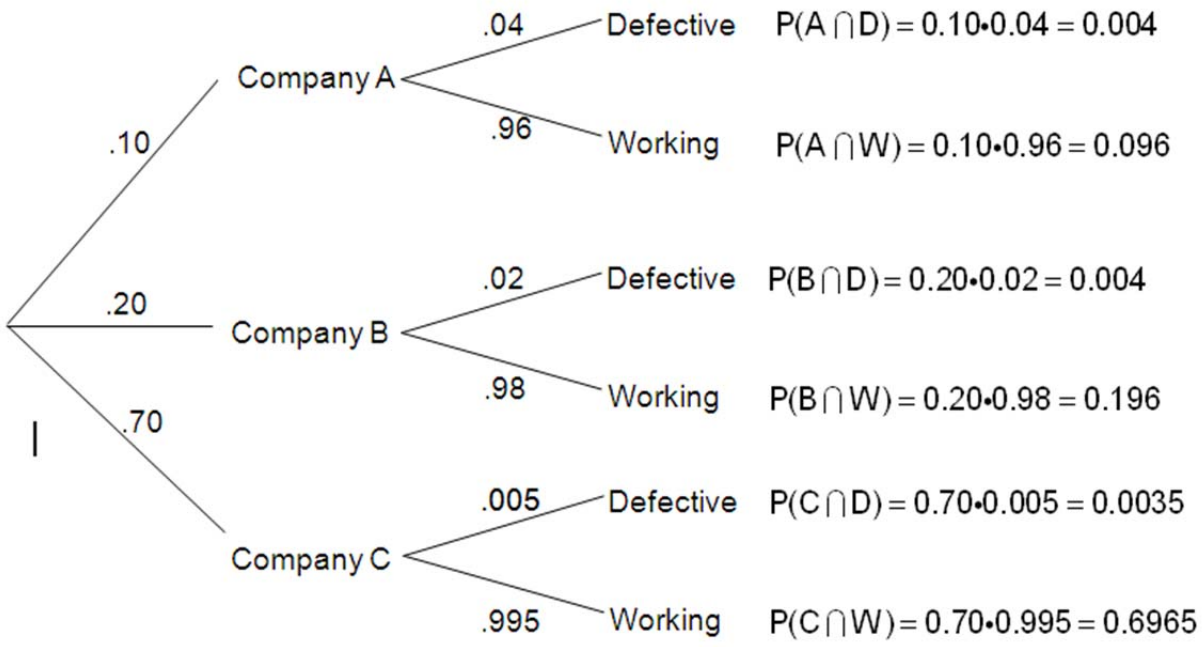
d. P(B|F) = 125/199 = 0.6281

e. P(F|B) = 125/191 = 0.6545

f. No it doesn't appear that they are independent. Knowing that a student is female changes the probability that they ate breakfast. P(B|F) = 0.6281 ≠ P(B) = 0.5770

---

12. Tree Diagram



$$P(B \mid D) = \frac{P(B \cap D)}{P(A \cap D) + P(B \cap D) + P(C \cap D)} = \frac{0.004}{0.004 + 0.004 + 0.0035} = 0.348$$