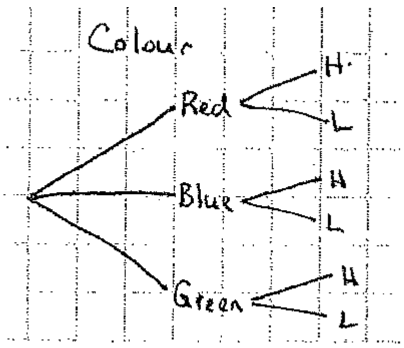
Stat 254 - Chapter 3 Practice Problems

1. 

$S = \{RH, RL, BH, BL, GH, GL\}$

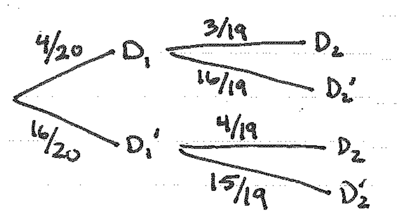
2. (a) $\{b, d, f, h\}$ (b) $\{c\}$ (c) $\{a, b, c, d, e, g\}$ (d) $\emptyset$ (e) $\{a, b, c, e, f, g, h\}$

3. (a) A' = does not prefer video game themes
   (b) $A \cup C$ = prefers video game themes or buys a most two songs
   (c) $A \cap B$ = prefers video game themes and also prefers jazz and buys at least 3 songs
   (d) $C \cap D$ = prefers acapella and buys 1 or 2 songs

4. (a) $P(A') = 1 - 0.26 = 0.74$
   (b) $P(A \cap B) = P(A) + P(B) - P(A \cup B) = 0.26 + 0.68 - 0.80 = 0.14$
   (c) $P([A \cap B]') = 1 - P(A \cap B) = 1 - 0.14 = 0.86$
   (d) $P([A \cup B]') = 1 - P(A \cup B) = 1 - 0.8 = 0.2$
   (e) $P(A|B) = \dfrac{P(A \cap B)}{P(B)} = \dfrac{0.14}{0.68} = 0.2058$
   (f) $P(B|A) = \dfrac{P(A \cap B)}{P(A)} = \dfrac{0.14}{0.26} = 0.5385$

5. (a) $2/10 = 0.2$ (b) $(1+3)/10 = 0.4$ (c) $1 - 4/10 = 0.6$

Let D_1 = defect in tire 1
D_2 = defect in tire 2

6. 

$$\begin{aligned} P(\text{Exactly one defect}) &= P((D_1 \cap D_2') \cup (D_1' \cap D_2)) \\ &= (4/20 \times 16/19) + (16/20 \times 4/19) \\ &= 0.3368 \end{aligned}$$

7. (a) $5 \times 8 \times 4 = 160$ (b) $\binom{7}{3} = 35$ (c) ${}_{30}P_4 = 657720$

8. Let E = eye test is positive, B = blood test is positive

(a) $P(E \cap B) = 0$ so $P(E \cup B) = P(E) + P(B) - P(E \cap B) = 0.28 + 0.67 - 0 = 0.95$

(b) $P(E \cap B) = P(E) \times P(B) = 0.28 \times 0.67 = 0.1876$ so $P(E \cup B) = P(E) + P(B) - P(E \cap B) = 0.28 + 0.67 - 0.1876 = 0.7624$

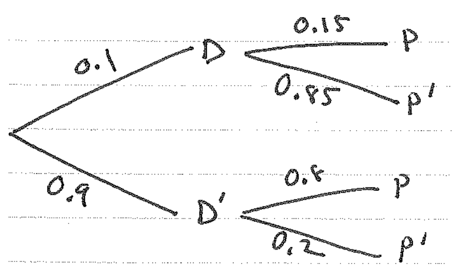
(c) $P(E \cap B) = 0.14$ so $P(E \cup B) = P(E) + P(B) - P(E \cap B) = 0.28 + 0.67 - 0.14 = 0.81$

9. (a)

(i) $225/386 = 0.5829$	(ii) $68/386 = 0.1762$	(iii) $1 - 124/386 = 0.6788$
(iv) $68/225 = 0.3022$	(v) $(124 + 11)/386 = 0.3497$	(vi) $(225 - 68)/386 = 0.4067$

(b) $P(\text{Female}|\text{Accounting}) = 68/124 = 0.5484$, $P(\text{Female}) = 0.5829$ Since $P(\text{Female}|\text{Accounting}) \neq P(\text{Female})$ the events are *dependent*.

Since $P(\text{Female} \cap \text{Accounting}) = 0.1762 \neq 0$, the events are not disjoint.

10. 

(b) $P(D \cap P') = 0.1 \times 0.85 = 0.085$

(c) $P(P) = 0.1 \times 0.15 + 0.9 \times 0.8 = 0.735$

(d) $P(D'|P) = \dfrac{P(D' \cap P)}{P(P)} = \dfrac{0.9 \times 0.8}{0.735} = 0.9796$