1. a. [illegible]

$P(A)\ \frac{52}{52}\cdot\frac{48}{51}\cdot\frac{44}{50}\cdot\frac{40}{49}\cdot\frac{36}{48} = \underline{0.507}$ unique face value

b. 2 cards the same face value and only 2

$P(B) = 13\cdot\frac{4}{52}\cdot\frac{3}{51}\cdot\frac{48}{50}\cdot\frac{47}{49}\cdot\frac{46}{48} = \underline{0.0519}$ -pair

c.

$P(L) = \frac{52}{52}\cdot\frac{12}{51}\cdot\frac{11}{50}\cdot\frac{10}{49}\cdot\frac{9}{48} = \underline{0.00194}$

2. a. $E(A) = 0.1\cdot 0.06 + 0.14\cdot 0.03 + 0.50\cdot 0.02 + 0.26\cdot 0.04 = \underline{0.0306}$

b. $P(\text{Accident} \cap \text{Age } 16\text{-}20) = 0.10\cdot 0.06 = \frac{3}{500} = \underline{0.006}$

3. 15% – $A'\cap B'$ 50% – A 50% – B A' – 50% B' – 50% $A\cup B = 85\%$

$A'\cup B' = 50+50-15 = 85\%$ $A\cap B = 50\% + 50\% - 85\% = 15\%$

a. $Y=0 : P(A'\cap B') = \underline{15\%}$

$Y=1 : P(A'\cup B') - P(A'\cap B') = 85 - 15 = \underline{70\%}$

$Y=2 ; P(A\cap B) = P(A) + P(B) - P(A'\cap B')' = 50+50-85 = \underline{15\%}$

b. $P(Y=2) = \frac{15\%}{100\%} = \underline{15\%}$

4.

x	0	1	2	3
f(x)	0.1	0.2	0.3	0.4

$Var(X) = E((E(X)-X)^2)$

a. $E(X) = 0\cdot 0.1 + 1\cdot 0.2 + 2\cdot 0.3 + 3\cdot 0.4 = \underline{2}$

$E(2X+1) = 0 + (2\cdot 1+1)\cdot 0.2 + (2\cdot 2+1)\cdot 0.3 + (2\cdot 3+1)\cdot 0.4 = \underline{4.9}$

b. $Var(X) = 0 + (1-2)^2\cdot 0.2 + (2-2)^2\cdot 0.3 + (2-3)^2\cdot 0.4 = \underline{0.6}$

$Var(2X+1) = 0 + (3-4.9)^2\cdot 0.2 + (5-4.9)^2\cdot 0.3 + (7-4.9)^2\cdot 0.4 = \underline{2.489}$

5. ~~$P(H) = 0.6$ $P(T) = 0.3$~~

~~a. 4 tosses # heads ≥2~~ on back

5. $P(H) = 0.\overline{6}$ $\quad P(T) = 0.\overline{3}$

a. 9 tosses, let X be # heads

$$\binom{9}{\#h}(0.\overline{6})^{\#h}(0.\overline{3})^{9-\#h}$$

$$P(X>2) = \frac{\sum_{k=3}^{9}\binom{9}{k}(0.\overline{6})^{k}(0.\overline{3})^{9-k}}{\sum_{k=0}^{9}\binom{9}{k}(0.\overline{6})^{k}(0.\overline{3})^{9-k}} \approx \frac{0.9917}{1} \approx 0.992$$

b. $(0.\overline{6})^4 0.\overline{3} \approx 0.0658$

c. $\binom{4}{3}(0.\overline{6})^3 0.\overline{3}) 4 \cdot 0.\overline{3} \approx 0.132$

Extra Credit: $\quad P(X=2) = 3 \times P(X=4) \qquad P(x,\lambda) = \frac{\lambda^x e^{-\lambda}}{x!}$

$$3 = \frac{P(X=2)}{P(X=4)}$$

$$3 = \frac{\frac{\lambda^2 e^{-2}}{2!}}{\frac{\lambda^4 e^{-4}}{4!}} = \frac{\frac{\lambda^2}{2e^2}}{\frac{\lambda^4}{24e^4}} = \frac{12e^2}{\lambda^2}$$

$$\frac{e^2}{4} = \frac{1}{\lambda^2} \Rightarrow \lambda = \sqrt{\frac{4}{e^2}} \approx 0.736$$