(1)

	0-1.5	1.5-3	3-4.5	4.5-6	6-7.5	7.5-9
Rel freq.	.108	.2415	.18	.042	.3795	.0495
CDF	.108	.3495	.5295	.5715	.951	1

(a) The sample median is located in the bin 3-4.5

(b) $\bar{x}_n = .108 \cdot .9 + .2415 \cdot 2.1 + .18 \cdot 3.3 + .042 \cdot 5 + .3795 \cdot 6.2 + .0495 \cdot 7.7$

$= 4.1424$

$$S_n^2 = \frac{36}{36-1} \cdot \underbrace{\begin{bmatrix} (.9-4.1424)^2 \cdot .108 \\ + (2.1-4.1424)^2 \cdot .2415 \\ + (3.3-4.1424)^2 \cdot .18 \\ + (5-4.1424)^2 \cdot .042 \\ + (6.2-4.1424)^2 \cdot .3795 \\ + (7.7-4.1424)^2 \cdot .0495 \end{bmatrix}}_{\approx 4.5346} \approx 4.6642$$

(2)

(a) $\binom{6}{3} \cdot (0.6)^3 \cdot (0.4)^3$

(b) The 10th coin toss must be H, so begin with $\binom{9}{7}$ outcomes.
Then the probability of Player 1 winning on the 10th toss is

$$\left[\binom{9}{7} - \binom{8}{1} - 1\right] \cdot (0.6)^8 \cdot (0.4)^2,$$

since the ways to observe 2 T in the first 9 coin tosses where player 1 wins all the money prior to the 10th toss are:

$$\left.\begin{matrix} 1\,0\,0\,0\,0\,0\,0\,0\,1\,0 \\ 0\,1\,0\,0\,0\,0\,0\,0\,1\,0 \\ 0\,0\,1\,0\,0\,0\,0\,0\,1\,0 \\ 0\,0\,0\,1\,0\,0\,0\,0\,1\,0 \\ 0\,0\,0\,0\,1\,0\,0\,0\,1\,0 \\ 0\,0\,0\,0\,0\,1\,0\,0\,1\,0 \\ 0\,0\,0\,0\,0\,0\,1\,0\,1\,0 \\ 0\,0\,0\,0\,0\,0\,0\,1\,1\,0 \end{matrix}\right\} \binom{8}{1}$$

$$\left.0\,0\,0\,0\,0\,0\,1\,1\,0\,0\right\} \quad 1$$

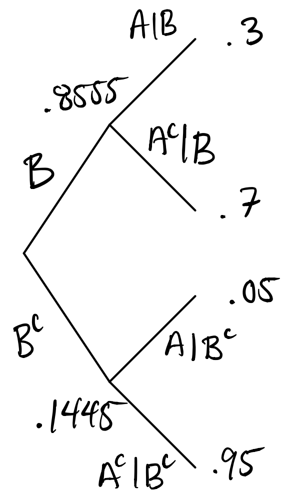
(3)

(a) $\binom{8}{3} + \binom{8}{4} + \binom{8}{5} + \binom{8}{6} + \binom{8}{7} + \binom{8}{8} = 219$

(b) $\left[\binom{8}{3} + \binom{8}{4} + \binom{8}{5} + \binom{8}{6} + \binom{8}{7} + \binom{8}{8}\right] \cdot \left(\frac{1}{2}\right)^8 = .8555$

(c) $A := \{\text{have disease}\}$

$B := \{\text{high risk}\}$



$$P(B|A) = \frac{P(B\cap A)}{P(A)}$$

$$= \frac{P(A|B)\cdot P(B)}{P(A|B)P(B) + P(A|B^c)P(B^c)}$$

$$= \frac{.3 \cdot .8555}{.3 \cdot .8555 + .05 \cdot .1445}$$

$$= .9726$$

(4)

(a) For $i \leq j$, $P(A_j \setminus A_i) = P(A_j \cap A_i^c)$

$$= P(A_j) - P(A_j \cap A_i)$$

$$= P(A_j) - P(A_i)$$

Since $A_i \subseteq A_j$ implies that $A_i \cap A_j = A_i$. #

(b)

$$\left[\bigcup_{i=2}^{k} (A_i \setminus A_{i-1})\right] \cup A_1 = A_1 \cup (A_2 \cap A_1^c) \cup \cdots \cup (A_k \cap A_{k-1}^c)$$

$$= \bigcup_{i=1}^{k} A_i$$

$$= A_k$$

Since $A_1 \subseteq A_2 \subseteq \cdots \subseteq A_k$. Then since A_1 and $\bigcup_{i=2}^{k} (A_i \setminus A_{i-1})$ are disjoint

$$P(A_k) = P\left(\left[\bigcup_{i=2}^{k} (A_i \setminus A_{i-1}) \right] \cup A_1 \right)$$

$$= P\left(\left[\bigcup_{i=2}^{k} (A_i \setminus A_{i-1}) \right] \right) + P(A_1). \qquad \#$$