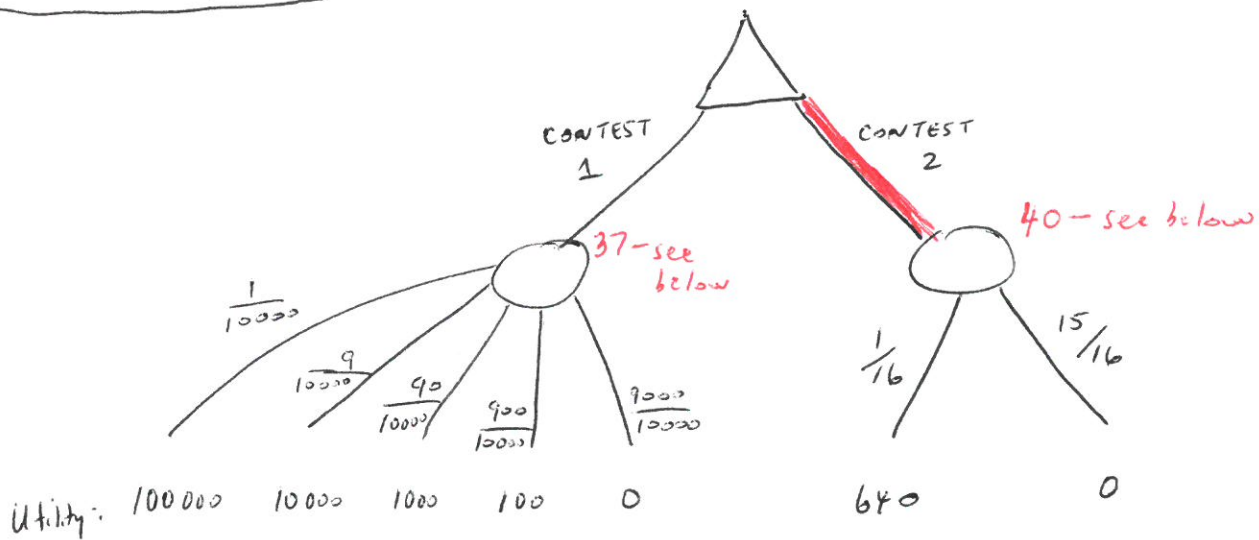


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QUESTION 4(a)



$$\begin{aligned} \text{Expected Utility (Contest 1)} &= \frac{1}{10000} (100000) + \frac{9}{10000} (10000) + \frac{90}{10000} (1000) \\ &\quad + \frac{900}{10000} (100) + \frac{9000}{10000} (0) \\ &= \boxed{37} \end{aligned}$$

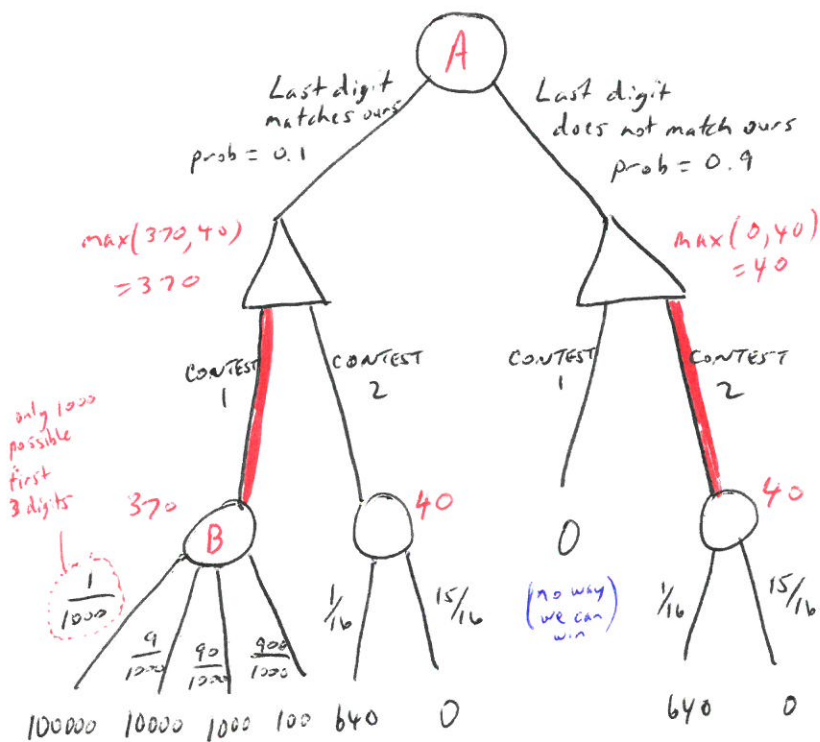
$$\begin{aligned} \text{Expected Utility (Contest 2)} &= \frac{1}{16} (640) + \frac{15}{16} (0) \\ &= \boxed{40} \end{aligned}$$

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QUESTION 4(b)

Modified tree if we learn the last digit of the winning ticket for Contest 1:



Expected utility (node B)

$$= \frac{1}{1000}(100000) + \frac{9}{1000}(10000) + \frac{90}{1000}(1000) + \frac{900}{1000}(100)$$

$$= 370$$

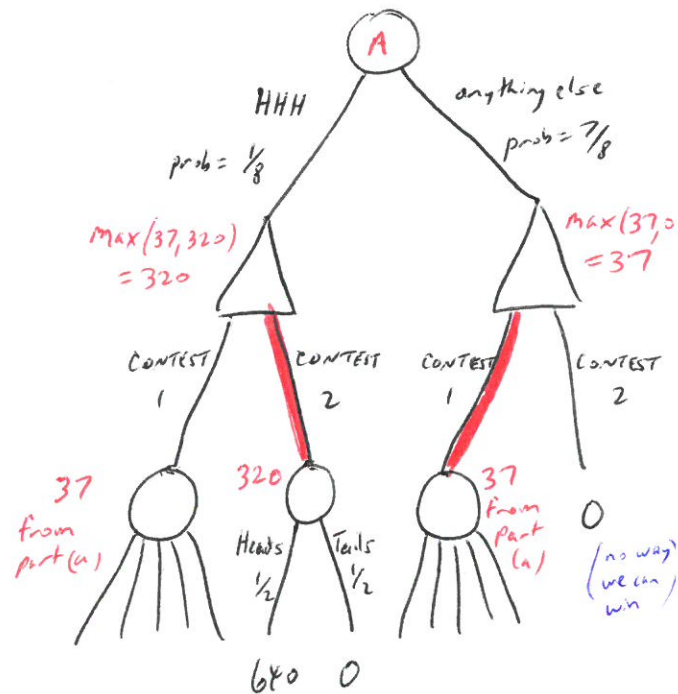
$$\text{Expected utility (node A)} = 0.1(370) + 0.9(40)$$

$$= \boxed{73}$$

$$\text{Value of information} = 73 - 40$$

$$= \underline{\underline{33}} \leftarrow \text{Choose this.}$$

Modified tree if we learn the outcomes of the first three coin flips for Contest 2:



Expected utility (node A)

$$= \frac{1}{8}(320) + \frac{7}{8}(37)$$

$$= \boxed{72.375}$$

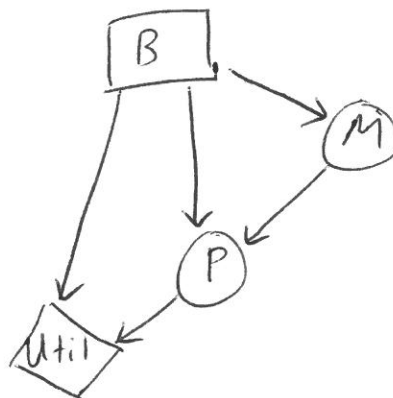
$$\text{Value of information} = 72.375 - 40 = \underline{\underline{32.375}}$$

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QUESTION 5

(a)



(b) Buying the book: 
$$P(p|b) = P(m|b)P(p|b,m) + P(\neg m|b)P(p|b,\neg m)$$
$$= 0.9 \times 0.9 + 0.1 \times 0.5$$
$$= 0.86$$

$$P(\neg p|b) = 1 - 0.86 = 0.14$$

$$\begin{aligned}\text{Expected utility} &= P(p|b)U(p,b) + P(\neg p|b)U(\neg p,b) \\ &= 0.86 \times 0.95 + 0.14 \times 0.00 \\ &= \underline{\underline{0.817}}\end{aligned}$$

Not buying the book: 
$$P(p|\neg b) = P(m|\neg b)P(p|\neg b,m) + P(\neg m|\neg b)P(p|\neg b,\neg m)$$
$$= 0.7 \times 0.8 + 0.3 \times 0.3$$
$$= 0.65$$

$$P(\neg p|\neg b) = 1 - 0.65 = 0.35$$

$$\begin{aligned}\text{Expected utility} &= P(p|\neg b)U(p,\neg b) + P(\neg p|\neg b)U(\neg p,\neg b) \\ &= 0.65 \times 1.00 + 0.35 \times 0.05 \\ &= \underline{\underline{0.6675}}\end{aligned}$$

(c) Sam should buy the book because the expected utility is higher.