P1:

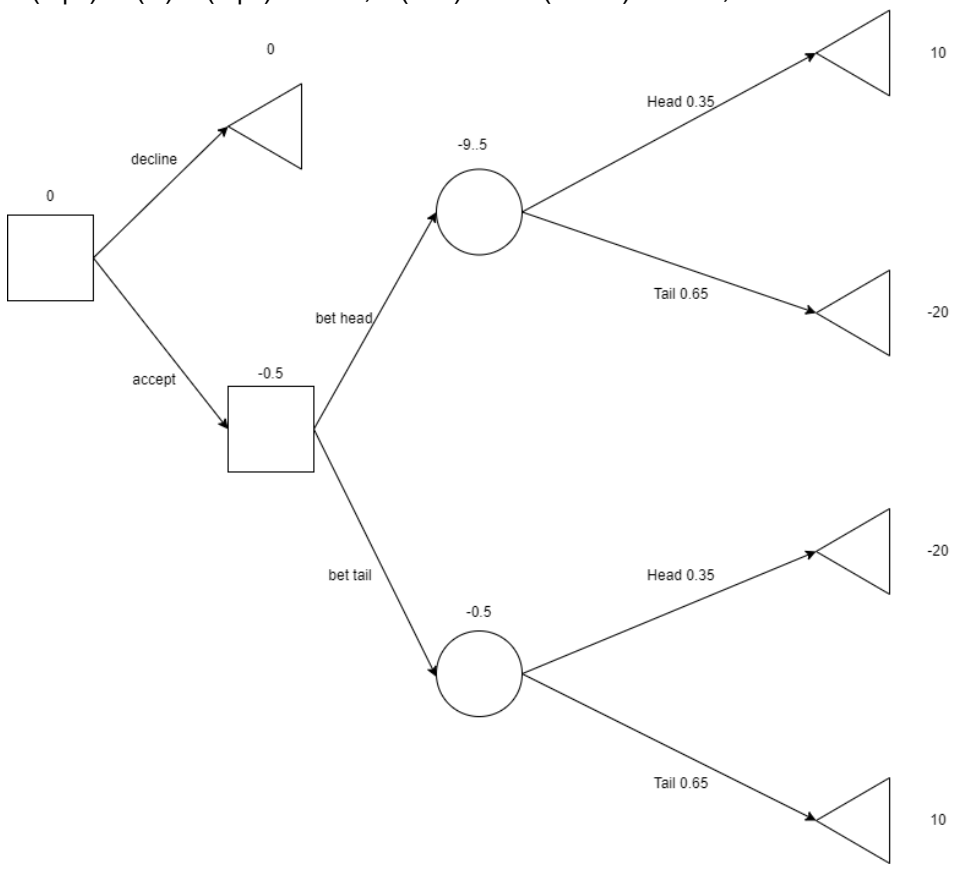
A. a. P(X=2) = P(X=2, Y=1) + P(X=2, Y=2) + P(X=2, Y=3) = 0.38
   b. P(Y=2) = P(X=0, Y=2) + P(X=1, Y=2) + P(X=2, Y=2) = 0.54
   c. P(X=Y) = P(X=1, Y=1) + P(X=2, Y=2) = 0.3
   d. P(Y=2|X=2) = P(X=2, Y=2) / P(X=2) = 0.526
   e. P(X=1 | X+Y=3) = P(X=1, X+Y=3) / P(X+Y=3) = 0.667
   f. Exp(X) = 0*P(X=0) + 1*P(X=1) + 2*P(X=2) = 1.18
   g. Exp(Y) = 1*P(Y=1) + 2*P(Y=2) + 3*P(Y=3) = 1.98
   h. Exp(2X+Y) = 2Exp(X) + Exp(Y) = 4.34

B. X+Y:

1	2	3	4	5
0.06	0.20	0.36	0.28	0.10

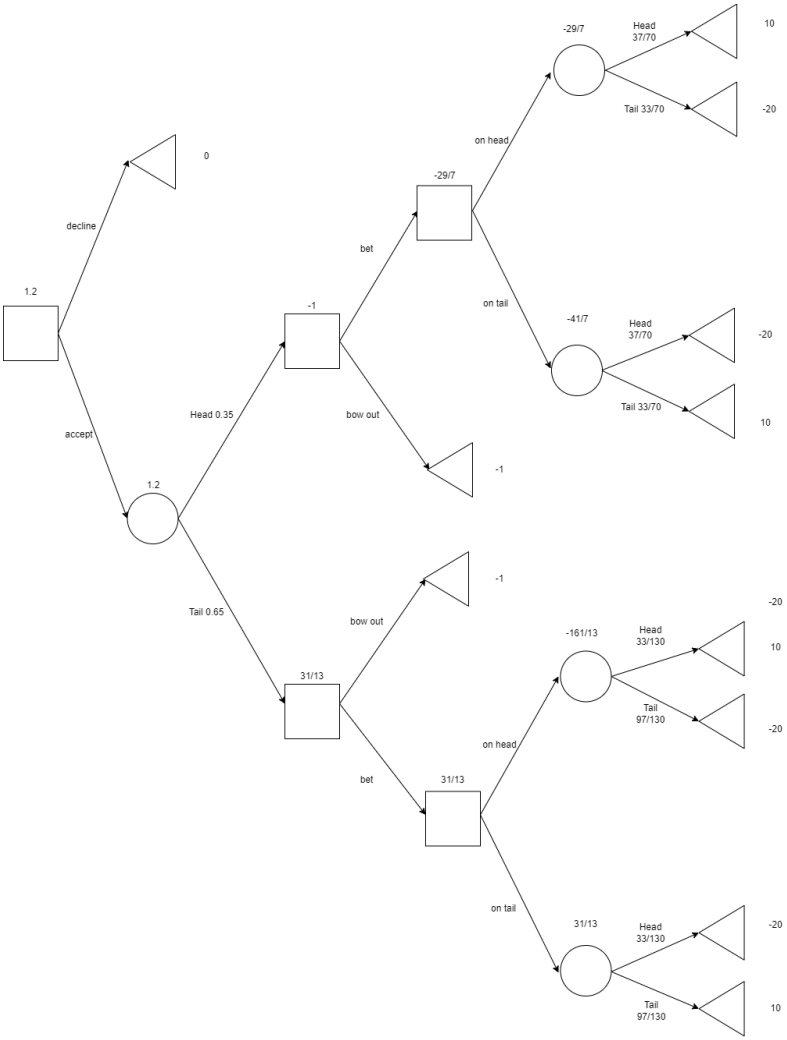
Exp(X+Y) = Exp(X) + Exp(Y) = 3.16

P2. A. Denote coin with 0.1 as head as coin A, and the other one as coin B; P(Head) = P(A)*P(H|A)+P(B)*P(H|B) = 0.35; P(Tail) = 1-P(Head) = 0.65;



The expected loss is -0.5 if we bet, hence we shouldn't take the bet.

B. Denote the event that the coin comes up head in the first flip as H1, head in the second flip as H2, tail in the first flip as T1, and tail in the second flip as T2.
Given that the first flip is a head, the probability that the coin is coin A: P(A|H1) = P(H1|A)*P(A) / P(H1) = 1/7
Given the first flip is a tail, the probability that the coin is coin B: P(B|H1) = 1 − P(A|H1) = 6/7
Therefore, the probability that the coin comes up head in the second flip is: P(H2|H1) = P(H2|A)*P(A|H1) + P(H2|B)*P(B|H1) = 37/70
The probability that the coin comes up tail in the second flip is P(T2|H1) = 1 − P(H2|H1) = 33/70
Given that the first flip is a tail, the probability that the coin is coin A: P(A|T1) = P(T1|A)*P (A) / P(T1) = 9/13
Given the first flip is a tail, the probability that the coin is coin B: P(B|T1) = 1 − P(A|T1)= 4/13
Therefore, the probability that the coin comes up head in the second flip is: P(H2|T1) = P(H2|A)*P(A|T1) + P(H2|B)*P(B|T1) = 33/130
The probability the coin comes up tails in the second flip is P(T2|T1) = 1 − P(H2|T1) = 97/130.



We should bet and if the first coin is head then bow out, but if it's tail then bet on tail. The expected profit is 1.2 following the above strategy.