Cryptocurrency and Blockchain sheet-1

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Assignment 1. Bitcoin Various Topics

1. Yes, the ISP broadcasts the transaction to all nodes, and after it got the block, let's say block-123, which contains the first transaction. Then it broadcasts the second transaction again and mines a longer chain from block-122 to roll-back the format block, in this way both transaction are validated, but only second transaction recorded in the block. In order to accomplish that, it has to mine two blocks more then the format blockchain while other miners are working with extending the chain at the same time. And normally it has to calculate 6 blocks = 6 * 5.28 ZH = 31.68 ZH

2. (a) Stand on the timestamp that they just finished solving the hash-puzzle, and then they broadcast them, let's say A and B. When other nodes receives the first node A (or B), they will begin to do the validation, after that a new node C might produced from them. Then the new chain would be former chain + A + C (or former chain + B + C), because it depends on whoever produce the longer chain with A (or B). Afterwards, the transactions in B (or A) would be put back in pool.

   (d) No. we don't know if at the end (after six blocks) the block of Mynies would be the main chain, maybe other nodes produced l longer chain with Minnies' block. Then his block would be the main chain instead of Mynie's.

3. $P(N(t) = n) = \frac{(\lambda t)^n e^{-\lambda t}}{n!} \implies P(N(10) = 1) = \frac{(0.1*10)^1 e^{-0.1*10}}{1!} \approx 36.8\%$

4. The probability that 6 blocks be found within x minutes bigger than 99 % equals 1 minus the total probability that 5 to 0 blocks be found within x minutes. so,

   $P(N(x) \geq 6) = 1 - P(N(x) \leq 5) \implies$
   $P(N(x) = 5) + P(N(x) = 4) + P(N(x) = 3) + P(N(x) = 2) + P(N(x) = 1) + P(N(x) = 0) \leq 1\% \implies$
   $\frac{(0.1*x)^5 e^{-0.1*x}}{5!} + \frac{(0.1*x)^4 e^{-0.1*x}}{4!} + \frac{(0.1*x)^3 e^{-0.1*x}}{3!} + \frac{(0.1*x)^2 e^{-0.1*x}}{2!} + \frac{(0.1*x)^1 e^{-0.1*x}}{1!} + \frac{(0.1*x)^0 e^{-0.1*x}}{0!} \leq 1\%$

Assignment 2. see TxHandler.java