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CSCI 564 - Homework 3
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1. a) Using the branch prediction with 100% prediction accuracy: T T T T T T
Combining this branch with the following branch will result in negative interference (accuracy reduces to 50%): NT NT NT NT NT NT

b) Using the branch prediction: T T T T NT NT (with prediction accuracy of 33.33%).
Combining this branch with the following branch will result in positive interference (accuracy increases to 66.67%): T T T T NT NT (with the pattern: read the first branch, then second, then back to the first, and second, etc.).

c) Aliasing usually results in negative interference because two branches need to be correlated (or branches that are close in proximity to each other) in order to for the branch prediction rate to increase with aliasing (i.e. positive interference). If the branches are not considered "correlated" (which is a lot more likely than correlated branches), the branch predictor may get confused, resulting in negative interference.

2. a) It would take 1.12n cycles to execute n instructions. This is because CPI is 1.12.
CPI = 1 + misprediction penalty
Misprediction penalty = (.2*.2*3) = .12
CPI = 1 +.12 = 1.12

b) For the same performance of the MIPS machine, the branch prediction rate of Pentium 4 should be 96.84%.
1.12 = 1 + (.2*(1-x)*19)
0.12 = 3.8(1-x)
1-x = 0.032
x = 0.9684