Question & Answer 1

**Topics**

1. Memory Segments
   1. Text Memory Segment
   2. Static Memory Segment
   3. Heap Memory Segment
   4. Stack Memory Segment
2. Load/Store instructions
   1. Loading word, double, and byte data
   2. Storing word, double, and byte data
3. Amdahl’s Law
   1. Overview
   2. Determining maximum improvement

**Examples**

1. Memory Segments  
   1. Identify which memory segment will store the following data:

Static Variables (B)

Local Variables (D)

Global Variables (B)

Machine Instructions (A)

Dyn. Sized Data Structure (C)

String Literals (B)

a. Text

b. Static

c. Heap

d. Stack

* 1. What variable(s) will be stored in the static data segment? Stack?  
       
     
     1. Static 🡪 a
     2. Stack 🡪 No need for b, because it isn’t returned and main is a leaf.
  2. Where will a data structure dynamically allocated with malloc be stored?
     1. Heap, just above the static data segment

1. Amdahl’s Law
   1. Formula
   2. Is it possible to reduce the CPI of the branch instruction in the following program such that execution time **of the first 5 instructions\*** is reduced by 90%?

\*Original question assumed all instructions were executed just once ☹



|  |  |
| --- | --- |
| Branch Instructions | CPI = 6 |
| Arithmetic Instructions | CPI = 1 |

FCLK doesn’t change, so improving CPI is directly proportional to amount of improvement.

90% not possible because the would need to be negative.