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CS154 Homework 1

**1.3**

First, a C program is fed into a compiler. Here, the high level C code is restructured into assembly language. The assembly language program is then fed to an assembler which translates assembly language into binary. This binary representation is what is executed by a computer processor.

**1.4**

a. = 1,310,720 bytes

b.

1,310,720 \* = 0.105 seconds

**1.5**

|  |  |  |  |
| --- | --- | --- | --- |
| **Processor** | **Clock Rate (GHz)** | **CPI** | **Instructions per Sec** |
| P1 | 3 | 1.5 | 2 \* 10­9 |
| P2 | 2.5 | 1 | 2.5 \* 109 |
| P3 | 4 | 2.2 | 1.82 \* 109 |

1. Processor two has the best rate of instructions per second
2. For 10 seconds:

|  |  |  |
| --- | --- | --- |
| **Processor** | **Cycles** | **Instructions** |
| P1 | 3 \* 1010 | 2 \* 1010 |
| P2 | 2.5 \* 1010 | 2.5 \* 1010 |
| P3 | 4 \* 1010 | 1.82 \* 1010 |

c. Desired runtime

|  |  |  |
| --- | --- | --- |
| **Processor** | **New CPI** | **Desired Clock Rate** |
| P1 | 1.8 | 5.14 |
| P2 | 1.2 | 4.286 |
| P3 | 2.64 | 6.86 |

**1.6**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Processor** | **Clock Rate (GHz)** | **Class A** | **Class B** | **Class C** | **Class D** |
| P1 | 2.5 | 1 | 2 | 3 | 3 |
| P2 | 3 | 2 | 2 | 2 | 2 |

Divisions of 1.0 E 6 instructions

|  |  |  |  |
| --- | --- | --- | --- |
| **Class A** | **Class B** | **Class C** | **Class D** |
| 1 \* 105 | 2 \* 105 | 5 \* 105 | 2 \* 105 |

P2 is faster.

1. P1 = 2.6, P2 = 2
2. P1 = 2.6 \* 106 clock cycles, P2 = 2 \* 106 clock cycles

**1.7**

a. Compiler A = 1.1

Compiler B 1.25

b. 1.0E9 – 1.2E9 / 1.2E9 = A is 16.7% slower than B

c. New compiler runtime = 6 E 8 instructions \* .66sec

Compared to compiler A 1.1/.66 = 167% speedup

Compared to compiler B 1.5/.66 = 227% speedup