CS161 W19
Assignment-1 Solution

1-

a. ISA A: 10 instructions per cycle $*$ 500, 000,000 cycle per second = 5000 MIPS
b. ISA B: 2 instructions per cycle $*$ 600, 000,000 cycle per second = 1200 MIPS
c. Don't know, The best compiled code for each processor may have a different number of instructions

2-

a.

i. P1 = 2.0* 10^9
ii. P2 = 2.5* 10^9
iii. P3 = 1.818* 10^9

b.

i. P1 = 30* 10^9 cycles
ii. P2 = 25* 10^9 cycles
iii. P3 = 40* 10^9 cycles

i. P1 = 20* 10^9 instructions
ii. P2 = 25* 10^9 instructions
iii. P3 = 18.18* 10^9 instructions

c.P1= 5.143 GHz

3-

a. i. CPIP1 = 2.6 cycles/instruction
ii. CPIP2 = 2.0 cycles/instruction

b. i. clock cycles P1 = 2.6*10^6 cycles
ii. clock cycles P2 = 2*10^6 cycles

4-

a. i. CPIA = 1.1
ii. CPIB = 1.25

b. A= 1.0*10^9*1.1=1.1*10^9

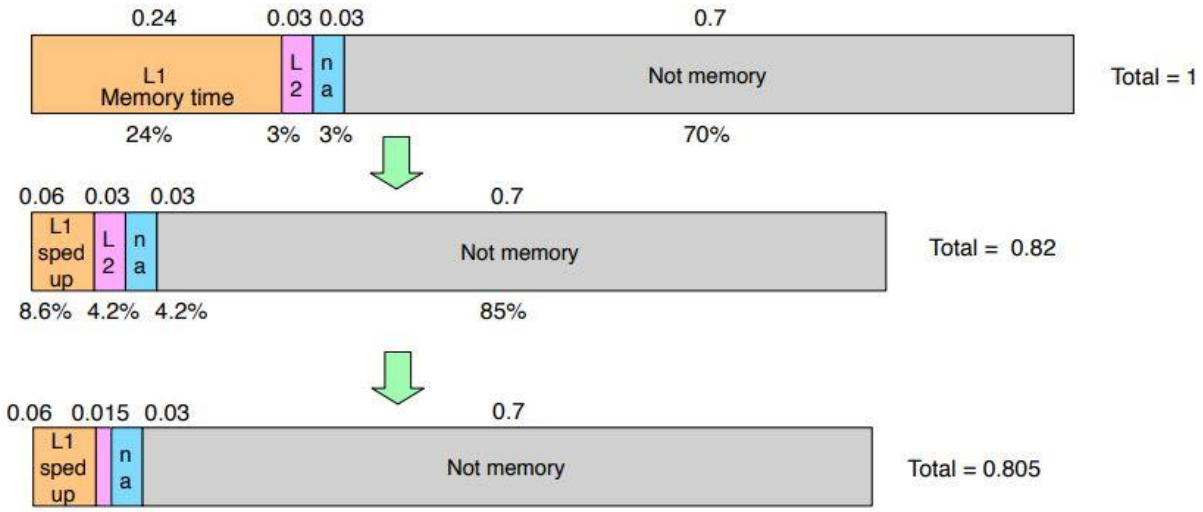
B= 1.2*10^9*1.25= 1.5*10^9

1.5*10^9/1.1*10^9= 1.36

c.

i.
fC/fA= 1.667x faster than fA (or fA/fC= 0.60)
ii.
fC/fB= 2.273x faster than fB (or fB/fC= 0.44)

5-



Speed up = 1.242

6-

$t0 = f*4;
$t0 = &A[f];
$t1 = g*4;

$t1 = &B[g];
f = A[f];
$t2 = &A[f+1];
$t0 = A[f+1];
$t0 = A[f+1] + A[f];
B[g] = A[f+1] + A[f];

7-

```
sll $t0, $s3, 2 # $t0 = i * 4
add $t0, $s6, $t0 # $t0 = &A[i]
lw $t0, 0($t0) # $t0 = A[i]
sll $t1, $s4, 2 # $t1 = j * 4
add $t1, $s6, $t1 # $t1 = &A[j]
lw $t1, 0($t1) # $t1 = A[j]
add $t0, $t0, $t1 # $t0 = A[i] + A[j]
sw $t0, 32($s7) # B[8] = A[i] + A[j]
```

8-

f = 2 * (&A);
or
f = &A[0] + &A[0];

9-
$t2 = 3