No.
Date

Homework 2

1. (a) Global CPI for P1: $1\times10\% + 2\times20\% + 3\times50\% + 3\times20\% = \boxed{2.6}$

Global CPI for P2: $2\times10\% + 2\times20\% + 2\times50\% + 2\times20\% = \boxed{2}$

(b) Class A: $1.0\times10^6 \times 10\% = 1\times10^5$ instructions

Class B, C, D have 2×10^5, 5×10^5, 2×10^5 instructions

Clock Cycles for P1: $1\times10^5\times1 + 2\times10^5\times2 + 5\times10^5\times3 + 2\times10^5\times3 = \boxed{2.6\times10^6}$

Clock Cycles for P2: $1\times10^6\times2 = \boxed{2\times10^6}$

(c) Time cost of P1: $\frac{2.6\times10^6}{2.5\times10^9} = 1.04\times10^{-3}$ s

Time cost of P2: $\frac{2\times10^6}{3\times10^9} \approx 6.67\times10^{-4}$ s

Hence $\boxed{\text{P2}}$ is faster.

2. (a) x30 is $\boxed{\text{0x50000000.}}$

It is $\boxed{\text{overflow}}$, because MSB of x5 and x6 are both 1, but MSB of x30 is 0, it must overflow.

(b) x30 is $\boxed{\text{0xB0000000.}}$

It is $\boxed{\text{NOT overflow}}$, because MSB of x5 and x6 are the same.

3. 23 in signed 8-bit: ~~0000~~ 00010111_2

112 in signed 8-bit: 01110000_2

(a) $00010111_2 + 01110000_2 = 10000111_2$, MSB of 23 and 112 are both 0, but MSB of result is 1, overflow. Saturating arithmetic result in $\boxed{127}$ in decimal.

(b) $00010111_2 - 01110000_2 = 00010111_2 + 10010000_2 = 10100111_2$, MSB of 23 and 112 are both 0, no overflow. Saturating arithmetic result is $\boxed{-89}$ in decimal.

No.
Date

4.

iter	multiplicand	product	operation
0	00010000	00000000 01100100	
1		00000000 00110010	shift right
2		00000000 00011001	shift right
3		00010100 00011001 00001010 00001100	add multiplicand to left shift right
4		00000101 00000110	shift right
5		00000010 10000011 00010111 10000011	shift right add multiplicand to left
6		00001011 01000001	shift right
7		00011111 01000001 00001111 10100000	add multiplicand to left shift right
8		00000111 11010000	shift right

Hence, 0x62 × 0x14 = 0x07D0 (100 × 20 = 2000 in decimal).

~~5. iter Q Divisor R operation~~

~~0 000000 011110000000~~

5.

iter	Q	Divisor	R	operation
0	000000	010101000000	00000011111110	
1	000000	001010100000	10101111111110 00000011111110	R = R − Div R<0, R = R+Div, shift 0 into Q Shift Div right
2	000000	000101010000	00000011111110	R = R − Div R<0, R = R+Div, shift 0 into Q Shift Div right
3	000000	000010101000	00000011111110	R = R − Div R<0, R = R+Div, shift 0 into Q Shift Div right
4	000000	000001010100	00000011111110	Same as 1
5	000000	000000101010	00000011111110 00000000010100	Same as 1 R = R − Div R≥0, shift 1 into Q Shift Div right
6	000001	000000010101		
7	000010 (11, 2)	000000001010	00000000010100 (11, 20)	Same as 1

Result: 62 ÷ 21 = 2 ····· 20

NO.
Date . .

6. (a) $S = 0$, $exp = 00011000_2$, $frac = 0$, $bias = 127_{10}$

$num = (-1)^S \times (1 + frac) \times 2^{(exp - bias)} = (-1)^0 \times (1+0) \times 2^{-103} = \boxed{2^{-103} \approx 9.86 \times 10^{-32}}$

(b) $63.25_{10} = 111111.01_2 = 1.111101 \times 2^5$

$S = 0$, $exp = 5 - bias = 132 = 10000100_2$, $frac = 11111010000000000000000_2$

IEEE754 representation is ~~0x3D7D0000~~ $\boxed{0x427D0000}$