CIS501 HW1a

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The following answers are all about the trace sjeng-10M.tar.gz.

Question 1 - Micro-ops per Macro-op

a. The average number of micro-ops per macro-op is 1.32.

b.

Micro-ops per Macro-op	Percentage
1	75.16
2	19.75
3	3.45
4	1.09
5	0.55

So the average number of micro-ops per macro-op is $1 \times 0.7516 + 2 \times 0.1975 + 3 \times 0.0345 + 4 \times 0.0109 + 5 \times 0.0055 = 1.32$

Question 2 - Size of Instructions in Bytes

a. Average bytes per Macro-op is 4.04.

b.

Bytes per Macro	Percentage
1	1.99717
2	25.82105
3	25.63944
4	15.15138
5	4.96922
6	8.84013
7	8.09828
8	8.11079
9	0.75554
10	0.20650
11	0.29168
12	0.08512
13	0.00083
14	0.03266
15	0.00021

So average bytes per Macro-op is 4.04

Question 3 - Distribution of Branch Distances

a.

Cumulative number of bits per Macro	Percentage
1	0
2	0
3	0
4	3.17
5	15.29
6	38.38
7	46.80
8	61.56
9	72.73
10	81.01
11	85.26
12	91.52
13	93.07
14	93.70
15	96.56
16	99.52
17	100.00

b. 61.56 percent of branches can be encoded with 8 bits. 99.52 percent of branches can be encoded with 16 bits

Question 4 - Instruction Mix

Type of instructions	Percentage
Loads	20.13
Stores	6.91
Unconditional branches	3.53
Conditional branches	13.82
Other	55.62

Question 5 - Performance Calculation

The increase of total micro-ops for larger branches is 6.67%

Question 6 - Operation Fusion

1328289 pairs (26.57%) of all micro-ops are eligible for such fusion. It will be 15.32 % faster.