

2.1.a Inst. Length= percentage of instx16 + percentage of instx24
+percentage of instx32
= .35x.17x16 + .35x.4x24 + .35x.43x32
+ .17x.93x24 + .17x.07x32
+.48x16 =21 bits

b- fixed length = .48x24 + .35x.57x24 + .35x.43x48
+ .17x.93x24 + .17x.07x48
=27 bits

2.3

ACC	INST MEM(BITS)	DATA MEM(BITS)
LDA B	8+16	32
ADDA C	8+16	32
STA A	8+16	32
LDA C	8+16	32
ADDA A	8+16	32
STA B	8+16	32
LDA A	8+16	32
SUBA B	8+16	32
STA D	8+16	32

TOTAL=	9X24	9X32 = 505 BITS

BW =504/9 CYCLES

MEMORY-MEMORY

FORMAT OPCODE| M1| M2| M3= 8+16+16+16 BITS

INST	NST MEM(BITS)	DATA MEM(BITS)
ADD A,B,C	8+16+16+16	32+32+32
ADD B,A,C	8+16+16+16	32+32+32
SUB D,A,B	8+16+16+16	32+32+32

TOTAL	3X56	3X3X32
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BW= 456/3 BITS PER CYCLES

STACK

FORMAT	OPCODE ADDRESS	= 8 16
OPCODE		=8

INST	INST MEM (BITS)	DATA MEM (BITS)
PUSH B	8+16	32
PUSH C	8+16	32
ADD	8	0
POP A	8+16	32

TOTAL	9X24 +3X8	9X32
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BW = 528/12 BITS/CYCLES

REG LD/ST

INST FORMAT OPCODE|R | MEM =8|4|16

OPCODE | R | R | R = 8 | 4 | 4 | 4

INST	INST MEM (BITS)	DATA MEM (BIT)
LD R1,B	8+4+16	32
LD R2,C	8+4+16	32
ADD R3.R1,R2	8+4+4+4	0
ST R3, A	8+4+16	32

TOTAL= 5X28 +3X20 5X32
 ONLY MULTIPLE BYTES = 5X32+3X24 + 5X32=392 BITS

BW=392/8 CYCLES

2.11

OPERATION=

	LD/ST	BRANCH		JUMPS
		16%		
		not taken	taken	
FREQ	35%	40%	60%	1%
COST	1.4	1.5	2	1.2

ALU FREQ= 1 -.35-.6X.16 -.4X.16 -.01 = .48 OR 48%

FROM GCC, ESPRESSO

LD/ST FREQ=31.6%, JUMPS=2.7%, BRANCHES=13%

CPI=1X.52 + 1.4X.316 + 2X.6X.13 + 1.5X.4X.13 + 1.2X.027= 1.23

2.12 B

REDUCTION = 10/100 X.35XN =.035 N

WHERE N = NO CHANGE

NEW INST NUMBER = (1-.035)XN

TIME= .965X1.05 = 1.013 SLOWER

OR SPEEDUP = 1/1.013= .987