Computer Organization

Instruction Set Characteristics, Instruction Formats, Addressing Modes, RTL & Micro-Operations, CISC, RISC.

Chapters (10 + 11 + Mano Ch.4 + 13)

Infix & Postfix Representations

- Infix notation
  - c = a + b
  - c = a - b
- Postfix notation
  - a b +
  - a b -

$a + (b \times c)$ becomes a b c $\times$+

$(a + b) \times c$ becomes a b + c$\times$

Number of Addresses

- Write programs to compute:

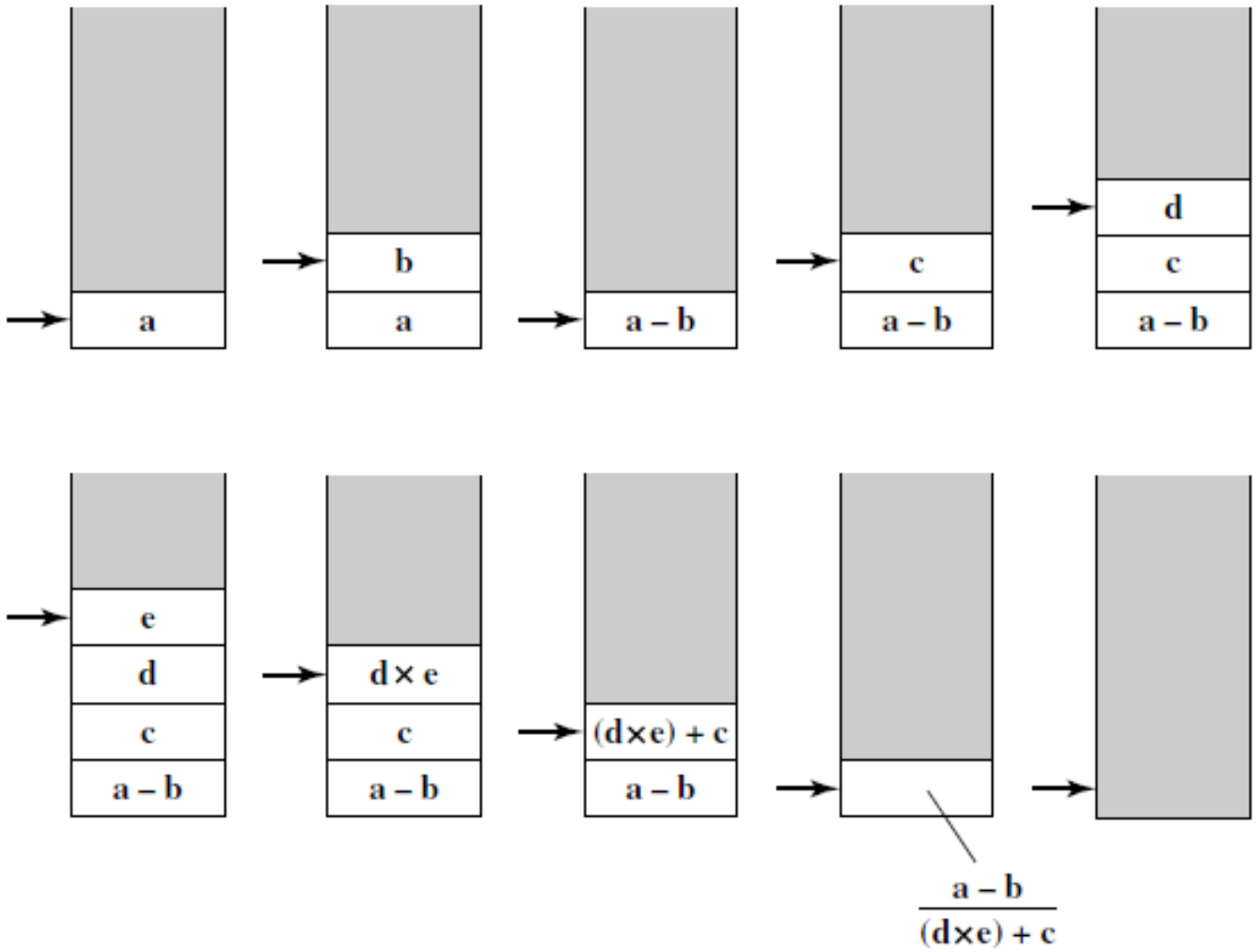
$$f = \frac{a - b}{c + (d \times e)}$$

- For 0, 1, and 2 addresses

	Stack	General Registers	Single Register
	Push a Push b Subtract Push c Push d Push e Multiply Add Divide Pop f	Load R1, a Subtract R1, b Load R2, d Multiply R2, e Add R2, c Divide R1, R2 Store R1, f	Load d Multiply e Add c Store f Load a Subtract b Divide f Store f
Number of instructions	10	7	8
Memory access	10 op + 6 d	7 op + 6 d	8 op + 8 d

Computations on the Stack

$$f = \frac{a - b}{c + (d \times e)}$$



Number of Addresses

- Write programs to compute:

  X = (A + B * C)/(D - E * F)

For the following cases:

0 Address	1 Address	2 Address	3 Address
PUSH M	LOAD M	MOVE (X ← Y)	MOVE (X ← Y)
POP M	STORE M	ADD (X ← X + Y)	ADD (X ← Y + Z)
ADD	ADD M	SUB (X ← X – Y)	SUB (X ← Y – Z)
SUB	SUB M	MUL (X ← X × Y)	MUL (X ← Y × Z)
MUL	MUL M	DIV (X ← X/Y)	DIV (X ← Y/Z)
DIV	DIV M		

Stack Implementation