**Analysis:**

* **2-Operands:**

**NB:** All 2 operand instructions are the same except for cmp which has less by one mem access and two clk cycles.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Instruction | Src | Dest | Mem Accesses | Clk Cycles |
| ADD | R0 | R0 | 1 | 12 |
| ADD | R0 | @R0 | 3 | 14 |
| ADD | R0 | (R0)+ | 3 | 15 |
| ADD | R0 | @(R0)+ | 4 | 16 |
| ADD | R0 | -(R0) | 3 | 15 |
| ADD | R0 | @-(R0) | 4 | 16 |
| ADD | R0 | X(R0) | 4 | 17 |
| ADD | R0 | @X(R0) | 5 | 18 |
| ADD | @R0 | R0 | 2 | 13 |
| ADD | @R0 | @R0 | 4 | 15 |
| ADD | @R0 | (R0)+ | 4 | 16 |
| ADD | @R0 | @(R0)+ | 5 | 17 |
| ADD | @R0 | -(R0) | 4 | 16 |
| ADD | @R0 | @-(R0) | 5 | 17 |
| ADD | @R0 | X(R0) | 5 | 18 |
| ADD | @R0 | @X(R0) | 6 | 19 |
| ADD | (R0)+ | R0 | 2 | 14 |
| ADD | (R0)+ | @R0 | 4 | 16 |
| ADD | (R0)+ | (R0)+ | 4 | 17 |
| ADD | (R0)+ | @(R0)+ | 5 | 18 |
| ADD | (R0)+ | -(R0) | 4 | 17 |
| ADD | (R0)+ | @-(R0) | 5 | 18 |
| ADD | (R0)+ | X(R0) | 5 | 19 |
| ADD | (R0)+ | @X(R0) | 6 | 20 |
| ADD | @(R0)+ | R0 | 3 | 15 |
| ADD | @(R0)+ | @R0 | 5 | 17 |
| ADD | @(R0)+ | (R0)+ | 5 | 18 |
| ADD | @(R0)+ | @(R0)+ | 6 | 19 |
| ADD | @(R0)+ | -(R0) | 5 | 18 |
| ADD | @(R0)+ | @-(R0) | 6 | 19 |
| ADD | @(R0)+ | X(R0) | 6 | 20 |
| ADD | @(R0)+ | @X(R0) | 7 | 21 |
| ADD | -(R0) | R0 | 2 | 14 |
| ADD | -(R0) | @R0 | 4 | 16 |
| ADD | -(R0) | (R0)+ | 4 | 17 |
| ADD | -(R0) | @(R0)+ | 5 | 18 |
| ADD | -(R0) | -(R0) | 4 | 17 |
| ADD | -(R0) | @-(R0) | 5 | 18 |
| ADD | -(R0) | X(R0) | 5 | 19 |
| ADD | -(R0) | @X(R0) | 6 | 20 |
| ADD | @-(R0) | R0 | 3 | 15 |
| ADD | @-(R0) | @R0 | 5 | 17 |
| ADD | @-(R0) | (R0)+ | 5 | 18 |
| ADD | @-(R0) | @(R0)+ | 6 | 19 |
| ADD | @-(R0) | -(R0) | 5 | 18 |
| ADD | @-(R0) | @-(R0) | 6 | 19 |
| ADD | @-(R0) | X(R0) | 6 | 20 |
| ADD | @-(R0) | @X(R0) | 7 | 21 |
| ADD | X(R0) | R0 | 3 | 16 |
| ADD | X(R0) | @R0 | 5 | 18 |
| ADD | X(R0) | (R0)+ | 5 | 19 |
| ADD | X(R0) | @(R0)+ | 6 | 20 |
| ADD | X(R0) | -(R0) | 5 | 19 |
| ADD | X(R0) | @-(R0) | 6 | 20 |
| ADD | X(R0) | X(R0) | 6 | 21 |
| ADD | X(R0) | @X(R0) | 7 | 22 |
| ADD | @X(R0) | R0 | 4 | 17 |
| ADD | @X(R0) | @R0 | 6 | 19 |
| ADD | @X(R0) | (R0)+ | 6 | 20 |
| ADD | @X(R0) | @(R0)+ | 7 | 21 |
| ADD | @X(R0) | -(R0) | 6 | 20 |
| ADD | @X(R0) | @-(R0) | 7 | 21 |
| ADD | @X(R0) | X(R0) | 7 | 22 |
| ADD | @X(R0) | @X(R0) | 8 | 23 |
|  |  |  | SUM | 1144 |

* **1-Operand:**

**NB:** All 1 operand instructions are the same except for branch

|  |  |  |  |
| --- | --- | --- | --- |
| Inst | Operand | Memory Access | ClK Cycles |
| INC | R0 | 1 | 9 |
| INC | @R0 | 3 | 11 |
| INC | (R0)+ | 3 | 12 |
| INC | @(R0)+ | 4 | 13 |
| INC | -(R0) | 3 | 12 |
| INC | @-(R0) | 4 | 13 |
| INC | X(R0) | 4 | 14 |
| INC | @X(R0) | 5 | 15 |
|  |  | SUM | 99 |

* **Branch:**

**NB:** All Branch instructions are the same

|  |  |  |  |
| --- | --- | --- | --- |
| Inst | Operand | Memory Access | ClK Cycles |
| BR | Offset | 1 | 7 |

* **No Operand:**

|  |  |  |
| --- | --- | --- |
| Inst | Memory Access | ClK Cycles |
| HLT | 1 | 5 |
| NOP | 1 | 5 |
| RESET | 1 | 5 |

* **CPI Analysis:**