# ABC Machine Program Try-It

Part 1: Fill in the Description Column in the table below for each of the Instructions / Data shown below a few are filled in for you

|  |  |  |  |
| --- | --- | --- | --- |
| 0 | 0 | 0 | 0 |

|  |  |  |
| --- | --- | --- |
| Address | Type (Instruction or Data) | Description |
|  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | | Holds Load Instruction:  Loads the value at Memory Address 1111 into the source 1 register (register 000) |
| |  |  |  |  | | --- | --- | --- | --- | | 0 | 0 | 0 | 1 | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | | Loads the value at memory address 1110 into reg 000. |
| |  |  |  |  | | --- | --- | --- | --- | | 0 | 0 | 1 | 0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | |  | Branch to memory address 0110 but we **won’t** because NPZ is zero. |
| |  |  |  |  | | --- | --- | --- | --- | | 0 | 0 | 1 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | |  | Loads the value at memory address 1101 into reg 001 |
| |  |  |  |  | | --- | --- | --- | --- | | 0 | 1 | 0 | 0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | |  | Subtract reg 001 from reg 000 and put the sum in reg 101 |
| |  |  |  |  | | --- | --- | --- | --- | | 0 | 1 | 0 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | |  | Store the value of reg 000 into memory address 1111 |
| |  |  |  |  | | --- | --- | --- | --- | | 0 | 1 | 1 | 0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | |  | Jump to memory address 1001 |
| |  |  |  |  | | --- | --- | --- | --- | | 0 | 1 | 1 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | |  | Branch to memory adress 0110 but we **won’t** because the previous thing jumps over this. |
| |  |  |  |  | | --- | --- | --- | --- | | 1 | 0 | 0 | 0 | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | No instructions |
| |  |  |  |  | | --- | --- | --- | --- | | 1 | 0 | 0 | 1 | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | No instructions |
| |  |  |  |  | | --- | --- | --- | --- | | 1 | 0 | 1 | 0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |  | No instructions |
| |  |  |  |  | | --- | --- | --- | --- | | 1 | 0 | 1 | 1 | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | No instructions |
| |  |  |  |  | | --- | --- | --- | --- | | 1 | 1 | 0 | 0 | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | No instructions |
| |  |  |  |  | | --- | --- | --- | --- | | 1 | 1 | 0 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | |  | No instructions  Just holds dec 7 |
| |  |  |  |  | | --- | --- | --- | --- | | 1 | 1 | 1 | 0 | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | | No instructions  Just holds dec 1 |
| |  |  |  |  | | --- | --- | --- | --- | | 1 | 1 | 1 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | |  | No instructions  Just holds dec 2 |

Part 2: Execute each of the instructions above and show the final state of the registers and memory below:

|  |  |
| --- | --- |
| Register | Contents |
| 0 (000) | Decimal 1 – 0000...0001 |
| 1 (001) | Decimal 7 – 0000...0111 |
| 2 (010) |  |
| 3 (011) |  |
| 4 (100) |  |
| 5 (101) | Decimal -6 – 1111...1001 (-0000...0110) |
| 6 (110) |  |
| 7 (111) |  |

|  |  |
| --- | --- |
| Memory Address | Memory Contents (only fill in the changes) |
| 0 (0000) |  |
| 1 (0001) |  |
| 2 (0010) |  |
| 3 (0011) |  |
| 4 (0100) |  |
| 5 (0101) |  |
| 6 (0110) |  |
| 7 (0111) |  |
| 8 (1000) |  |
| 9 (1001) |  |
| A (1010) |  |
| B (1011) |  |
| C (1100) |  |
| D (1101) |  |
| E (1110) |  |
| F (1111) | Starts at decimal 2 (0...010), ends at decimal 1 (0...001) |