**Manually written instructions into the instruction memory**

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**Instructions Breakdown:**

1. **Arithmetic/Logical Instructions:**
   * ADD $t1, $t2, $t3 (R-type)
   * SUB $t1, $t2, $t3 (R-type)
   * AND $t1, $t2, $t3 (R-type)
   * OR $t1, $t2, $t3 (R-type)
2. **Branching Instructions:**
   * BEQ $t1, $t2, offset (I-type)
3. **Load/Store Instructions:**
   * LW $t1, 4($t2) (I-type)
   * SW $t1, 4($t2) (I-type)

**Explanation:**

* **ADD $t1, $t2, $t3** (R-type instruction):
  + Opcode: 000000
  + rs = $t2 → 01010
  + rt = $t3 → 01011
  + rd = $t1 → 01001
  + funct = 100000 (ADD)
* **SUB $t1, $t2, $t3** (R-type instruction):
  + Opcode: 000000
  + rs = $t2 → 01010
  + rt = $t3 → 01011
  + rd = $t1 → 01001
  + funct = 100010 (SUB)
* **AND $t1, $t2, $t3** (R-type instruction):
  + Opcode: 000000
  + rs = $t2 → 01010
  + rt = $t3 → 01011
  + rd = $t1 → 01001
  + funct = 100100 (AND)
* **OR $t1, $t2, $t3** (R-type instruction):
  + Opcode: 000000
  + rs = $t2 → 01010
  + rt = $t3 → 01011
  + rd = $t1 → 01001
  + funct = 100101 (OR)
* **BEQ $t1, $t2, offset** (I-type instruction):
  + Opcode: 000100 (BEQ)
  + rs = $t1 → 01001
  + rt = $t2 → 01010
  + offset = 3 (encoded as 00000 00000 00011)
* **LW $t1, 4($t2)** (I-type instruction):
  + Opcode: 100011 (LW)
  + rs = $t2 → 01010
  + rt = $t1 → 01001
  + offset = 4 (encoded as 00000 00000 000100)
* **SW $t1, 4($t2)** (I-type instruction):
  + Opcode: 101011 (SW)
  + rs = $t2 → 01010
  + rt = $t1 → 01001
  + offset = 4 (encoded as 00000 00000 000100)