Exercícios 1

❖ Tente resolver os exercícios abaixo:

```
1  if ( a == b )
2      c = a + b;
3      a = b - c;
4  else
5      b = a + c;
6      c = b - c;
```

```
1  if ( a != b )
2      c = a - b;
3      a = b + c;
4  else
5      b = a - c;
6      c = b + c;
```

```
1  if ( a > b )
2      c = a - b;
3      a = b + c;
4  else
5      b = a - c;
6      c = b + c;
```

```
1  if ( a < b )
2      c = a + b;
3      a = b - c;
4  else
5      b = a + c;
6      c = b - c;
```

Exercício 1a:

```
1  if ( a == b )
2      c = a + b;
3      a = b - c;
4  else
5      b = a + c;
6      c = b - c;
```

1. **Linguagem de máquina**
2. **Linguagem de Montagem**
3. **Representação de linguagem de máquina**
4. **Código de máquina**

```
1: BNE $s0, $s1, ELSE
   ADD $s2, $s0, $s1
   SUB $s0, $s1, $s2
   J EXIT
   ELSE: ADD $s1, $s0, $s2
   ELSE: SUB $s2, $s1, $s2
   EXIT

2: BNE $16, $17, ELSE
   ADD $18, $16, $17
   SUB $16, $17, $18
   J EXIT
   ELSE: ADD $17, $16, $18
   ELSE: SUB $18, $17, $18
   EXIT
```

3:

Endereço	OpCode	Rs	Rt	Rd	Shamt	Funct
10000	4	16	17	10020		
10004	0	16	17	18	0	32
10008	0	17	18	16	0	34
10012	2	10028				
10020	0	16	18	17	0	32
10024	0	17	18	18	0	34
10028	EXIT					

4:
000100.10000.10001.00100.11100.100100
000000.10000.10001.10010.00000.100000
000000.10001.10010.10000.00000.100010
000010.00000.00000.00100.11100.101100
000000.10000.10010.10001.00000.100000
000000.10001.10010.10010.00000.100010

Exercício 1b:

```
1  if ( a != b )
2      c = a - b;
3      a = b + c;
4  else
5      b = a - c;
6      c = b + c;
```

1: BEQ $s0, $s1, ELSE
   SUB $s2, $s0, $s1
   ADD $s0, $s1, $s2
   J EXIT
   ELSE: SUB $s1, $s0, $s2
   ELSE: ADD $s2, $s1, $s2
   EXIT

2: BEQ $16, $17, ELSE
   SUB $18, $16, $17
   ADD $16, $17, $18
   J EXIT
   ELSE: SUB $17, $16, $18
   ELSE: ADD $18, $17, $18
   EXIT

Endereço	OpCode	Rs	Rt	Rd	Shamt	Funct
10000	4	16	17	10020		
10004	0	16	17	18	0	32
10008	0	17	18	16	0	34
10012	2	10028				
10020	0	16	18	17	0	32
10024	0	17	18	18	0	34
10028	EXIT					

4:
000100.10000.10001.00100.11100.100100
000000.10000.10001.10010.00000.100000
000000.10001.10010.10000.00000.100010
000010.00000.00000.00100.11100.101100
000000.10000.10010.10001.00000.100000
000000.10001.10010.10010.00000.100010

Exercício 1c e Exercício 2a:

```
1  if ( a > b )
2      c = a - b;
3      a = b + c;
4  else
5      b = a - c;
6      c = b + c;
```

1: SLT $t0, $s1, $s0
   BNE $t0, $zero, ELSE
   SUB $s2, $s0, $s1
   ADD $s0, $s1, $s2
   J EXIT
   ELSE: SUB $s1, $s0, $s2
   ELSE: ADD $s2, $s1, $s2
   EXIT

2: SLT $8, $17, $16
   BNE $8, $zero, ELSE
   SUB $18, $16, $17
   ADD $16, $17, $18
   J EXIT
   ELSE: SUB $17, $16, $18
   ELSE: ADD $18, $17, $18
   EXIT

3:

Endereço	OpCode	Rs	Rt	Rd	Shamt	Funct
10000	0	17	16	8	0	42
10004	4	8	zero	10024		
10008	0	16	17	18	0	32
10012	0	17	18	16	0	34
10020	2	10032				
10024	0	16	18	17	0	32
10028	0	17	18	18	0	34
10032	EXIT					

4:
000000.10001.10000.01000.00000.101010
000100.01000.00000.00100.11100.101000
000000.10000.10001.10010.00000.100000
000000.10001.10010.10000.00000.100010
000010.00000.00000.00100.11100.101100
000000.10000.10010.10001.00000.100000
000000.10001.10010.10010.00000.100010

Exercício 1d e Exercício 2b:

```
1  if ( a < b )
2      c = a + b;
3      a = b - c;
4  else
5      b = a + c;
6      c = b - c;
```

1: SLT $t0, $s0, $s1
   BNE $t0, $zero, ELSE
   ADD $s2, $s0, $s1
   SUB $s0, $s1, $s2
   J EXIT
   ELSE: ADD $s1, $s0, $s2
   ELSE: SUB $s2, $s1, $s2
   EXIT

2: SLT $8, $17, $16
   BNE $8, $zero, ELSE
   ADD $18, $16, $17
   SUB $16, $17, $18
   J EXIT
   ELSE: ADD $17, $16, $18
   ELSE: SUB $18, $17, $18
   EXIT

3:

Endereço	OpCode	Rs	Rt	Rd	Shamt	Funct
10000	0	16	17	8	0	42
10004	4	8	zero	10024		
10008	0	16	17	18	0	32
10012	0	17	18	16	0	34
10020	2	10032				
10024	0	16	18	17	0	32
10028	0	17	18	18	0	34
10032	EXIT					

4:
000000.10000.10001.01000.00000.101010
000100.01000.00000.00100.11100.101000
000000.10000.10001.10010.00000.100000
000000.10001.10010.10000.00000.100010
000010.00000.00000.00100.11100.101100
000000.10000.10010.10001.00000.100000
000000.10001.10010.10010.00000.100010