

### TASK 3:

#### Instruction Types

**R-type:** Register type

**I-type:** Immediate type

**S-type:** Store type

**B-type:** Branch type

**U-type:** Upper immediate type

**J-type:** Jump type

```
0000000000010184 <main>:
10184:    ff010113      addi    sp,sp,-16
10188:    00113423      sd      ra,8(sp)
1018c:    00f00613      li      a2,15
10190:    00500593      li      a1,5
10194:    00021537      lui     a0,0x21
10198:    18050513      addi    a0,a0,384 # 21180 <__clzdi2+0x48>
1019c:    26c000ef      jal     ra,10408 <printf>
101a0:    00000513      li      a0,0
101a4:    00813083      ld      ra,8(sp)
101a8:    01010113      addi    sp,sp,16
101ac:    00008067      ret
```

**addl sp,sp,-16**

Hex: ff010113

Binary: 1111\_1111\_0000\_0001\_0000\_0001\_0001\_0011

Source Register (rs1): sp (x2) - 00010

Destination Register (rd): sp (x2) - 00010

Immediate: -16 (111111110000)

func3: 000

Opcode: 0010011 (addl)

**sd ra,8(sp) (Address: 10188)**

Hex: 00113423

Binary: 0000\_0000\_0001\_0001\_0011\_0100\_0010\_0011

Source Register 1 (rs1): sp (x2) - 00010

Source Register 2 (rs2): ra (x1) - 00001

Immediate: 8 (000000001000)

func3: 011

Opcode: 0100011 (sd)

**ll a2,15 (Address: 1018c)**

Hex: 00f06613

Binary: 0000\_0000\_1111\_0000\_0110\_0110\_0001\_0011

Source Register (rs1): x0 - 00000

Destination Register (rd): a2 (x12) - 01100

Immediate: 15 (000000001111)

func3: 011

Opcode: 0000011 (ll)

**ll a1,5 (Address: 10190)**

Hex: 00506593

Binary: 0000\_0000\_0101\_0000\_0110\_0101\_1001\_0011

Source Register (rs1): x0 - 00000

Destination Register (rd): a1 (x11) - 01011

Immediate: 5 (000000000101)

func3: 011

Opcode: 0000011 (ll)

**lui a0,0x21 (Address: 10194)**

Hex: 00021537

Binary: 0000\_0000\_0000\_0010\_0001\_0101\_0011\_0111

Destination Register (rd): a0 (x10) - 01010

Immediate: 0x21 (000000100001)

func3: N/A

Opcode: 0110111 (lui)

**addl a0,a0,384 (Address: 10198)**

Hex: 18050513

Binary: 0001\_1000\_0000\_0101\_0000\_0101\_0001\_0011

Source Register (rs1): a0 (x10) - 01010

Destination Register (rd): a0 (x10) - 01010

Immediate: 384 (011000000000)

func3: 000

Opcode: 0010011 (addl)

**jal ra,10408 (Address: 1019c)**

Hex: 26c000ef  
Binary: 0010\_0110\_1100\_0000\_0000\_0000\_1110\_1111  
Destination Register (rd): ra (x1) - 00001  
Immediate: 10408 (offset)  
func3: N/A  
Opcode: 1101111 (jal)

**ll a0,0 (Address: 101a0)**

Hex: 00005513  
Binary: 0000\_0000\_0000\_0000\_0101\_0101\_0001\_0011  
Source Register (rs1): x0 - 00000  
Destination Register (rd): a0 (x10) - 01010  
Immediate: 0 (000000000000)  
func3: 011  
Opcode: 0000011 (lli)

**ld ra,8(sp) (Address: 101a4)**

Hex: 00813083  
Binary: 0000\_0000\_1000\_0001\_0011\_0000\_1000\_0011  
Source Register (rs1): sp (x2) - 00010  
Destination Register (rd): ra (x1) - 00001  
Immediate: 8 (000000001000)  
func3: 011  
Opcode: 0000011 (ld)

**addl sp,sp,16 (Address: 101a8)**

Hex: 01010113  
Binary: 0000\_0001\_0000\_0001\_0000\_0001\_0001\_0011  
Source Register (rs1): sp (x2) - 00010  
Destination Register (rd): sp (x2) - 00010  
Immediate: 16 (000000010000)  
func3: 000  
Opcode: 0010011 (addl)

**ret (Address: 101ac)**

Hex: 00008067  
Binary: 0000\_0000\_0000\_0000\_1000\_0000\_0110\_0111  
Source Register (rs1): ra (x1) - 00001

func3: 000

Opcode: 1100111 (jalr)

101b0:	00050593	mv	a1,a0
101b4:	00000693	li	a3,0
101b8:	00000613	li	a2,0
101bc:	00000513	li	a0,0

**mv a1, a0(Address:101b0)**

Binary: 00000000000000101000010110010011

Source Register (rs1): ra (x1) - 01010

Destination Register (rd): sp (x2) - 01011

Immediate: 16 (0000000000000)

func3: 000

Opcode: 0010011

**li a3, 0(address:101b4)**

Binary: 0000000000000000000000011010010011

Source Register (rs1): ra (x1) - 00000

Destination Register (rd): sp (x2) - 01101

Immediate: 16 (0000000000000)

func3: 000

Opcode: 0010011

**li a2, 0(address:101b8)**

Binary: 0000000000000000000000011000010011

Source Register (rs1): ra (x1) - 00000

Destination Register (rd): sp (x2) - 01100

Immediate: 16 (0000000000000)

func3: 000

Opcode: 0010011

**li a0, 0(address:101bc)**

Binary: 0000000000000000000000010100010011

Source Register (rs1): ra (x1) - 00000

Destination Register (rd): sp (x2) - 01010

Immediate: 16 (0000000000000)

func3: 000

Opcode: 0010011