

Review Quiz - Addressing Modes of the AVR Architecture

Due No due date **Points** 12 **Questions** 12 **Time Limit** None
Allowed Attempts Unlimited

Take the Quiz Again

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	77 minutes	8 out of 12

Submitted Dec 7 at 20:41

Question 1

1 / 1 pts

Deduce Data Value

Consider the following data definition in an AVR assembly program:

```
data: .byte 1, 2, 0x??, 4
```

Assume that register `Y` has the address of label `data`. The following instructions are executed:

```
LD R12, Y
LDD R13, Y + 2
ADD R12, R13
ADD R12, R12
```

The final value of `R12` is 12. What was the definition of the third byte in the data area?

Correct!☒ 5☐ 6☐ 11☐ It cannot be determined with the given information.

Yes .. BECAUSE: LD R12, Y -> R12 = 1
LDD R13, Y -> R13 = X
ADD R12, R13 -> R12 = 1 + X
ADD R12, R12 -> R12 = 2 + 2x = 12 => x = 5

Question 2**1 / 1 pts**Effect of Addressing Mode

Consider the following data definition in an AVR assembly program:

```
data: .byte 1, 2, 3, 4, 5, 6
```

Suppose that register x has been pre-loaded with the address of the label `data` and the following instructions are executed:

```
LD R12, X+
```

```
LD R13, X+
```

```
LD R14, -X
```

```
LD R15, -X
```

What are the values stored in R12 to R15 respectively?

☐ 1, 2, 3, 2☒ 1, 2, 2, 1**Correct!**

☐ 1, 2, 1, 1

☐ 1, 1, 1, 1

Yes, BECAUSE: The first two instructions access 1, 2, and the third 2 again, and then 1.

Question 3

0 / 1 pts

Effect of Addressing Mode

Consider the following data definition in an AVR assembly program:

```
data: .byte 1, 2, 3, 4
```

```
copy: .space 4, 0
```

Suppose that register `z` and `y` have been pre-loaded with the address of the labels `data` and `copy` respectively. The following instructions are executed:

```
LDD R12, z + 2
```

```
STD y + 1, R12
```

```
LDD R12, z + 3
```

```
STD y + 3, R12
```

```
LDD R12, z + 1
```

```
STD y + 2, R12
```

```
LD R12, z
```

```
ST y, R12
```

What values end up stored in the positions in address `copy`?

☒ 3, 4, 2, 1

☐ 1, 3, 4, 2

You Answered

Incorrect Answer

☐ 1, 3, 2, 4☐ None of the above**Question 4****0 / 1 pts****Effect of Addressing Mode**

Consider the following data definition in an AVR assembly program:

```
data: .space 4, 0
```

Suppose that register `x` has been pre-loaded with the address of the label `data` and registers `R12` through `R15` have values 1, 2, 3, and 4 respectively. The following instructions are executed:

```
STD Y + 2, R12
```

```
STD Y + 1, R13
```

```
ST Y+, R14
```

```
ST Y+, R15
```

What values end up stored in the positions in address `data`?

Incorrect Answer

☐ 3, 4, 1, 0☐ 2, 1, 0, 0☐ 0, 0, 3, 4

You Answered

☒ The instructions are incorrect**Question 5****0 / 1 pts**

Equivalent Operand Access

Consider the following data definition in an AVR assembly program:

```
data: .byte 1, 2, 3, 4
```

```
data2: .byte 5
```

Assume that registers `y` and `x` have the address of labels `data` and `data2` respectively. What would be an equivalent instruction to

```
LDD R12, Y + 4
```

Correct Answer

☐ LDS R12, data2

☐ LDS R12, data + 4

You Answered

☒ LDD R12, X

☐ LDS R12, data

Question 6

1 / 1 pts

Value of Address Register

Assume that register `y` has initially the address `0x0020`. The following instructions are executed:

```
LDD R12, Y + 3
```

```
LDD R13, Y + 2
```

```
ADD R12, R13
```

```
LD R13, Y+
```

```
ADD R12, R13
```

What is the value of register `y` after the execution?

Correct!☐ 0x0020☒ 0x0021☐ 0x0025☐ 0x0026

Yes.. BECAUSE: The only instruction modifying the register is the next to last that increases its value by 1.

Question 7**1 / 1 pts**

Which addressing mode

What addressing mode is used to obtain the second operand of the following instructions?

```
LDI R16, lo8(label)
```

```
LDI R17, hi8(label)
```

☐ Register Direct☒ Immediate☐ Register Indirect☐ None of the above**Correct!**

Yes ... BECAUSE: the second operands are constants (extracted from the program).

Question 8**1 / 1 pts****Address Manipulation**

Consider the following data definition in an AVR assembly program:

```
data: .space 2, 0
```

Assume that the address of label `data` is `0xABCD`. What is the content of the previous space after executing the following instructions:

```
LDI R26, lo8(data)
LDI R27, hi8(data)
ST X+, R26
ST X, R27
```

☐ `0xAB, 0xCD`☒ `0xCD, 0xAB`☐ The sequence of instructions is incorrect.☐ Impossible to tell with the given information.**Correct!**

Yes. BECAUSE: Register X has `0xABCD`, but we store first the least significant part `0xCD` and then the most significant `0xAB`.

Question 9**1 / 1 pts****Data Manipulation**

Consider the following data definition in an AVR assembly program:

```
data: .byte 1, 2, 3, 4, 5
```

Assume that the address of label data is loaded in register Z. What are the values in the previous locations after executing the following instructions:

```
LDD R12, Z + 1
```

```
STD Z + 2, R12
```

```
LDD R12, Z + 3
```

```
STD Z + 1, R12
```

```
LDD R12, Z + 2
```

```
STD Z + 3, R12
```

☐ 1, 2, 3, 4, 5

☐ 1, 4, 2, 4, 5

☐ 1, 2, 2, 2, 5

☒ 1, 4, 2, 2, 5

Correct!

Yes.

BECAUSE: $Z + 2 \leftarrow Z + 1$ (2)

$Z + 1 \leftarrow Z + 3$ (4)

$Z + 3 \leftarrow Z + 2$ (2)

Question 10

1 / 1 pts

Handling Addresses

Assume that register Y has initially the address 0x03FE. What is the final value of R28 after executing the following instructions?

```
LDD R12, Y + 2
```



```
LDD R13, Y + 3
```

```
LD R14, Y+
```

```
LD R15, Y+
```

Correct!☒ 0x00☐ 0x0400☐ 0x05☐ 0x0405

Yes. BECAUSE: Only two last instructions modify Y and increase by 2. Question asks about R26 only, not the whole register

Question 11

0 / 1 pts

Handling Addresses

Assume that register x has initially the address 0x0020 to access some data structure. You now want to access a data structure with fields at displacement 2, 56 and 60 from address 0x0020. What would you do?

You Answered☒

Access the data with the instruction LDD and displacements 2, 56 and 60.

Correct Answer☐

Move the address to register y or z and use displacements with the new register.

☐ Add the numbers 2, 56 and 60 to register R26

- ☐ Add the numbers 2, 56 and 60 to register R27

Question 12

1 / 1 pts

Register Changes

Consider the following data definition:

```
data .byte 0, 1, 0, 3
```

Assume that register Y has initially the address of label data (which it is 0x003F). The rest of the registers in the register file ****have value zero****.

How many registers in the register file ****have changed their value**** after executing the following instructions?

```
LDD R12, Y + 2
```

```
LDD R13, Y + 3
```

```
LD R14, Y+
```

```
LD R15, Y+
```

☐ Two

☒ Three

☐ Four

☐ Five

Correct!

Yes. BECAUSE: Only second, third and fourth instr change registers: R12, R14 and Y.