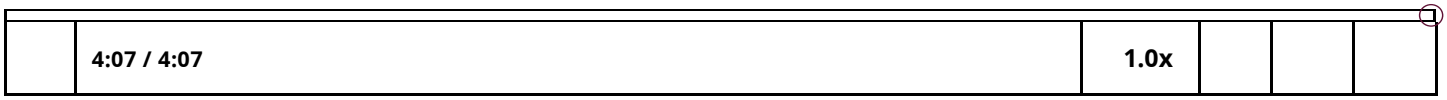
ASSEMBLER



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Starting at 1:54, Professor Albonesi states that the first five instructions have no labels. In fact, the LD instruction has a label, which requires the use of the Symbol Table.

Starting at 3:05, Professor Albonesi states that the offset is 16, but it is actually 8.

ASSEMBLY EXAMPLE

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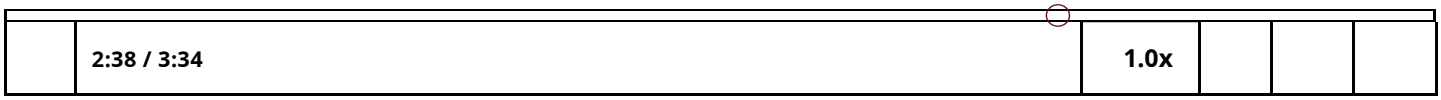

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1. CHECK YOUR UNDERSTANDING

The following questions relate to the assembly of the character count program.

1 A. CHECK YOUR UNDERSTANDING (1/1 point)

Why does the assembler make two passes through the program?

- (•) To determine the addresses of labels in order to calculate the correct offset for PC relative memory and branch instructions. ✔
- ( ) To calculate immediate values for operate instructions.
- ( ) To determine register values for LDR and STR instructions.
- ( ) To create constant values for .FILL assembler directives.

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EXPLANATION

The assembler needs to calculate offsets for PC relative memory instructions and branch instructions. In order to do so, we need to know the addresses of the labels that are associated with those instructions. Those are determined in the first pass, and in the second pass they are used to calculate the offsets.

The other three operations can be done in one pass since the required information is in the instruction or assembler directive.

Final Check | **Save** | **Hide Answer** | *You have used 1 of 2 submissions*

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1 B. CHECK YOUR UNDERSTANDING (1/1 point)

After the second pass, what machine code instruction would the assembler create for BRnzp TEST?

- (•) 0000111111110111 ✔
- ( ) 0000111000010111
- ( ) 0000111111111000
- ( ) 0000111000011000

EXPLANATION

The leftmost four bits are 0000, the opcode for BR. The next three bits are 111 since the N, Z, and P bits are all checked. The offset is -9. Since the PC was incremented during the fetch of the BR instruction, it is currently x300E, which is nine locations below x3005, the location of the label TEST.

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1 C. CHECK YOUR UNDERSTANDING (1/1 point)

After the second pass, what machine code instruction would the assembler create for LD R0, ASCII?

0010011000000100

0010000000000011 ✔

0010000000000100

0010010000000111

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EXPLANATION

The opcode for LD is 0010. The next three bits are 000, corresponding to R0. The offset is 3. Since the PC was incremented during the fetch of the LD instruction, it is currently x300F, which is three locations above x3012, the location of the label ASCII.

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