edX    **CornellX: ENGRI1210x The Computing Technology Inside Your Smartphone**    👤 KarenWest ▾

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## SECOND PROGRAM



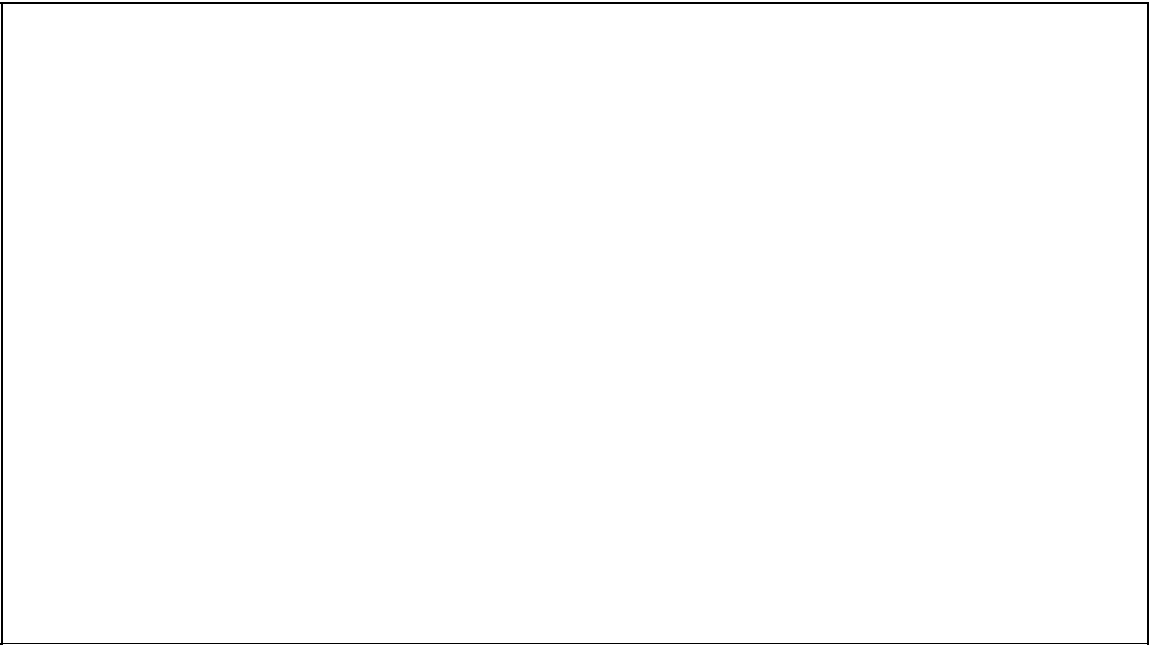2:46 / 2:46                                                                        1.0x

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In the video **Second Program Code**, at 1:50-1:53 Prof. Albonesi meant to say, instruction x300A, NOT x3009.

## SECOND PROGRAM CODE

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3:06 / 3:06                                                                    1.0x

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

Which of the following is a true statement regarding the program?

- ⚪ At x3001, an LEA instruction could have been used instead of the LD.

- ⚪ The instructions at x3006, x3007, x3008, and x3009 will result in a taken branch if the contents of R1 and R0 are the same.

- ⦿ The BR at x300D is always taken.  ✔️

- ⚪ Two back-to-back ADD instructions could have been used at x300E and x300F instead of the LD and the ADD at those locations.

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**EXPLANATION**

An LEA instruction could not have been used since the problem statement says that the address of the beginning of the file is at x3012. Therefore, we need to load that value from memory in order to point to the beginning of the file.

The instructions at x3006, x3007, and x3008 perform the operation R0-R1. The condition 101 in the BR instruction will cause a taken branch if R1 and R0 are different.

Since the condition of the BR at x300D is 111, the BR is always taken.

The reason for the LD and ADD instructions is that the offset of x30 is too large to fit in the 5-bit offset field of an ADD immediate

instruction. Thus, the constant value x30 at x3013 is incorporated into the program, and the LD at x300e loads this value into a register. An alternative uses multiple ADD instructions whose immediate values add up to x30, but two ADD instructions are not enough (three are necessary) given that the 5-bit offset is a two's complement signed number.

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