A+ will be down for a version upgrade on Tuesday 03.01.2023 at 9-12.

This course has already ended.

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CS-C3140 (/os/2022/) / 1. Introduction (/os/2022/materials_m01/) / 1.1 Introduction exercises

Introduction exercises

Exercise 1

⚠ The deadline for the assignment has passed (Friday, 23 September 2022, 22:00).

Computer architecture questionnaire

Question 1 **1 / 1**

A processor core

- ○ Orchestrates the use of memory
- ○ Manages the buses
- ○ Accesses the hard drives
- ◉ **Executes intructions**

✔ Correct!

Question 2 **1 / 1**

An instruction set architecture (ISA) defines

- ◉ **How data can be interpreted**
- ○ Processor clock frequency
- ○ Number of processor cores
- ○ Available shell commands

✔ Correct!

Question 3 **1 / 1**

Which of the following can be considered primary memory?

- ○ USB stick
- ◉ **Processor cache**
- ○ SSD
- ○ Network drive

✔ Correct!

Question 4 **1 / 1**

Thinking of processor, what is cache memory?

- ○ Typically a read-only memory
- ◉ **Typically a fast memory close to processor core**
- ○ Typically a large external memory
- ○ Typically a write-only memory

✔ Correct!

Question 5 **1 / 1**

Unless instructed otherwise processor always increments the _____ after each instruction fetch so that it will fetch the next instruction in sequence.

- ○ Frame pointer
- ◉ **Program Counter**
- ○ Memory Address Register
- ○ Program Status Word

✔ Correct!

Question 6 **1 / 1**

A system program that sets up an executable program in main memory ready for execution is

- ○ Assembler
- ○ Linker
- ◉ **Loader**
- ○ Compiler

✔ Correct!

Question 7 **1 / 1**

The Program Counter (PC) register:

- (●) **Contains the address of the next instruction to execute**
- ( ) Contains the most recently fetched instruction.
- ( ) Holds condition codes, status information, interrupt

✔ Correct!

Question 8 **1 / 1**

Principle of locality means that:

- ( ) Data is local
- (●) **The memory references of a program tend to cluster**
- ( ) Addresses are local

✔ Correct!

Submit

Exercise 2

⚠ The deadline for the assignment has passed (Friday, 23 September 2022, 22:00).

Unit conversions

Please make sure that you only enter valid (as in the examples), non-empty inputs for the following exercises. Contact TAs in case of any problems.

* **Enter three consecutive digits from your student number** **0 points**

This number is used in the exercises below. (No cheating here, as you could risk wasting a submission. Note, that '000' and '099' are always prohibited. In the case either one is included in your student number, please choose another sequence.)

1. Basic conversions

a) **3 points**

Considering the three-digit number you just entered, convert its opposite into a 16-bit two's complement binary representation. Answer as a 16-bit binary number, e.g.,

```
0010 0100 0010 1000
```

b) **3 points**

Considering the three-digit number you just entered, subtract 99 from the number and take its absolute value. Convert the result into hexadecimal representation of a half-precision floating-point format (16-bit). Answer as a hexadecimal number, e.g.,

```
0x45EF
```

c) **3 points**

Convert the numbers -99 and -124 into their 8-bit twos complement forms (check https://en.wikipedia.org/wiki/Two%27s_complement (https://en.wikipedia.org/wiki/Two%27s_complement)). Answer is 2 hexadecimal numbers, separated by a space, e.g.

```
0xA1 0xFB
```

d) **3 points**

(Using the results from c), now add the two numbers you just entered together. Answer is a 16 bit hexadecimal number (mind the sign!) e.g.

```
0xBEEF
```

2. Binary to UTF-8

4 points

Consider this sequence of bytes

```
01101101 01100001 01100011 01001111 01010011
```

What is the resulting sequence of symbols if the bytes are interpreted as hex-encoded UTF-8 symbols? Answer as a string, e.g.,

```
AbCd
```

3. RGB vectorization

4 points

Insert the colors green (0x00FF00), regal blue (0x123456) and perano (0xABABEF) in a 128-bit vector starting from the most significant bit (big-endian). Each color should be left-padded with zeros to 4 bytes. The padded colors should be inserted successively in the given order.

Show the bits of the vector grouped into bytes. Answer as a 128-bit binary number, e.g.,

```
00000001 01000000 00000000 00000000
00000000 00000000 10000000 00000000
00000001 00000000 00000000 00001000
00010010 00000000 10000000 00000001
```

Submit

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