In this tutorial, please complete the following exercises.

**Exercise 1:** Introduce yourself to your class.

**Exercise 2:** Discuss questions given below.

**Tutorial Questions:**

1. Refer to the lecture note wk1-1 P39, explain why general purpose registers gain popularity in the modern computer.

2. Discuss the benefits of using register $\text{zero}$ in the MIPS ISA design.

The following questions are from the P&H textbook (with some modifications).

3. P&H (2.1) For the C statement \( f = g + (h - 5) \), what is the corresponding MIPS assembly code? Assume that variables \( f \), \( g \), and \( h \) are given and could be considered as 32-bit integers as declared in a C program. Use the minimal number of MIPS assembly instructions.

4. P&H (2.3) For the following C statement, what is the corresponding MIPS assembly code? Assume the variables \( i \) and \( j \) are assigned to registers \( \text{s3} \), and \( \text{s4} \), respectively, and that the base address of the arrays \( A \) and \( B \) are in registers \( \text{s6} \), \( \text{s7} \), respectively.

5. (2.18) Assume we would like to expand the MIPS register file to 128 registers and expand the instruction set to contain four times as many instructions. How this would affect the size of each of the bit fields in the R-type instruction?

6. (2.20) Find the shortest sequence of MIPS instructions that extracts bits 16 down to 11 from register \( \text{t0} \) and uses the value of this field to replace bits 31 down to 26 in register \( \text{t1} \) without changing the other 26 bits of register \( \text{t1} \).

7. (2.25) The following instruction is not included in the MIPS instruction set:
\textit{rpt rs, loop}  \# if (R[rs]>0) R[rs]=R[rs]-1, PC=PC+4+BranchAddr

a. If this instruction were to be implemented in the MIPS instruction set, what is the most appropriate instruction format?

b. What is the shortest sequence of MIPS instructions that performs the same operation?