

## Instruction Formats Problems

### Problem 1

Suppose a datapath has three operand busses (two source, one destination), 45 instruction types, and 32 registers where each register is 16 bits wide. Immediate operands can be in the range of  $\pm 128K$ .

Design an instruction format for instructions that have one operation, one destination register and two source registers. Label the fields and minimum number of bits need for each field.

Opcode: ? bits	Destination Register: ? bits	Source 1 Register: ? bits	Source 2 Register: ? bits
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### Problem 2

Suppose we are designing an instruction set architecture with 32-bit instructions and 26 different opcodes. The register file contains 128 registers. One of the instruction types we would like to support specifies an opcode, a destination register, and two immediate source values. What is the minimum number of bits that are needed to specify each field?

Opcode: ? bits	Destination Register: ? bits	Immediate Value: ? bits	Immediate Value: ? bits
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### Problem 3

Suppose we are designing an instruction set architecture with 28-bit instructions and 44 different opcodes. Immediate operands can be in the range of  $\pm 512$ . How many registers can this datapath have?

Opcode	Destination Register	Source Register	Immediate
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