



# Practice problems

For Exam 1: HW

# Short answer practice problems:

The icon consists of the lowercase letters 'ex' in a bold, sans-serif font, colored orange. It is centered within a rounded square that has a light orange fill and a darker orange border.

1. How does a D-latch differ in behavior from a D-flip-flop?
2. How are instructions stored in the HW ISA? How does the HW ISA processor know what instruction to execute next?
3. How many bits are needed to represent which register if the register file has 32 entries?
4. What does it mean for a gate to be universal?

# Bit manipulation practice problem

ex

```
/*
 * absVal - Return the absolute value of x
 * Examples: absVal(-1) = 1
 *           absVal(240) = 240
 * You may assume  $-TMax \leq x \leq TMax$ 
 * Legal ops: ! ~ & ^ | + << >>
 */
int absVal(int x) {
```

```
}
```

# Bit addition practice problem

ex

What is the result of the following computation on 8-bit two's complement numbers?

$$0b110100101 + 0b011001111$$

Does it overflow? Justify your answer without converting to binary numbers.

Consider the same computation on unsigned numbers. What is the result? Does it overflow?

# Building block choice practice problem

ex

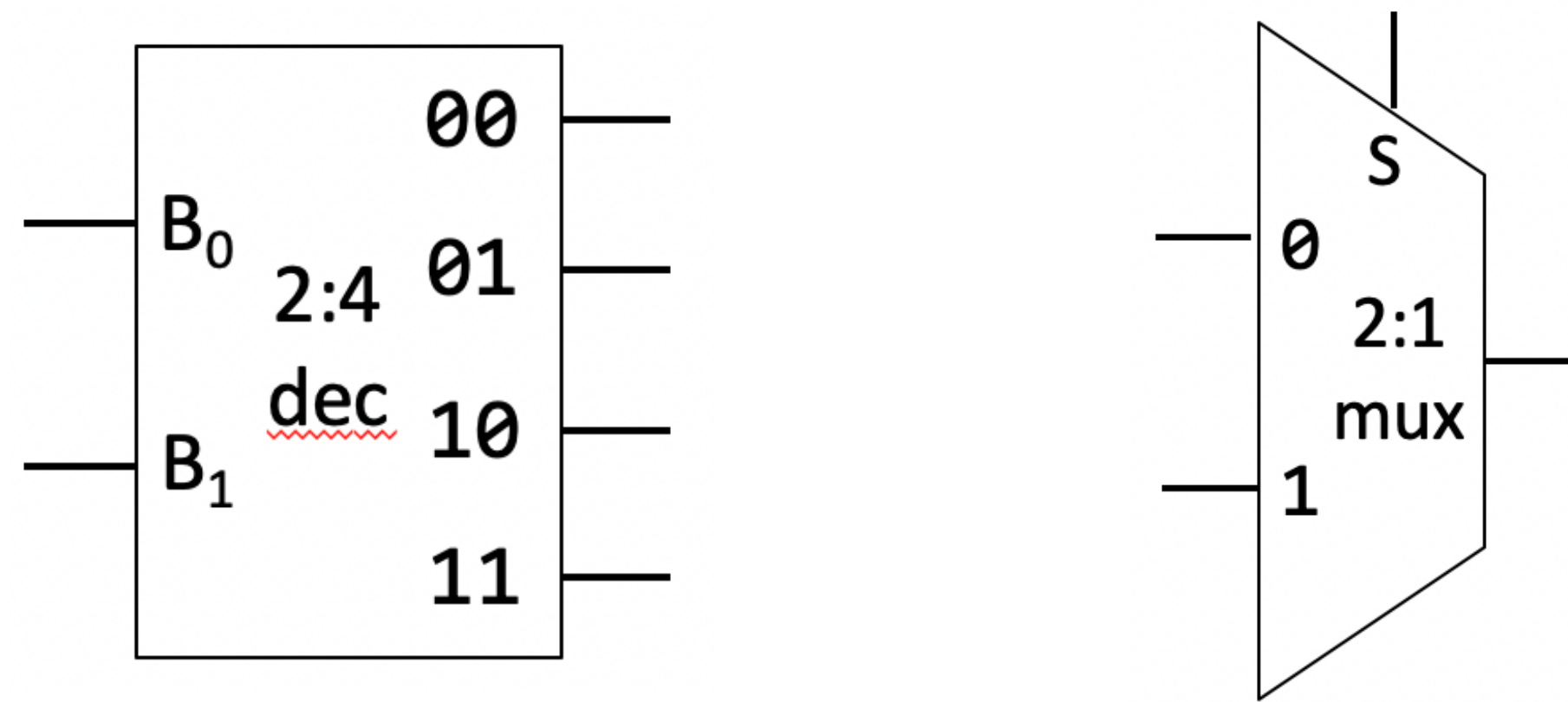
Draw a circuit to implement a switching network. If  $S=1$ , the network is in pass-through mode:  $C=A$  and  $D=B$ . If  $S=0$ , the network is in crossing mode:  $C=B$ , and  $D=A$ .

Use the most reasonable combinational building blocks or gates.



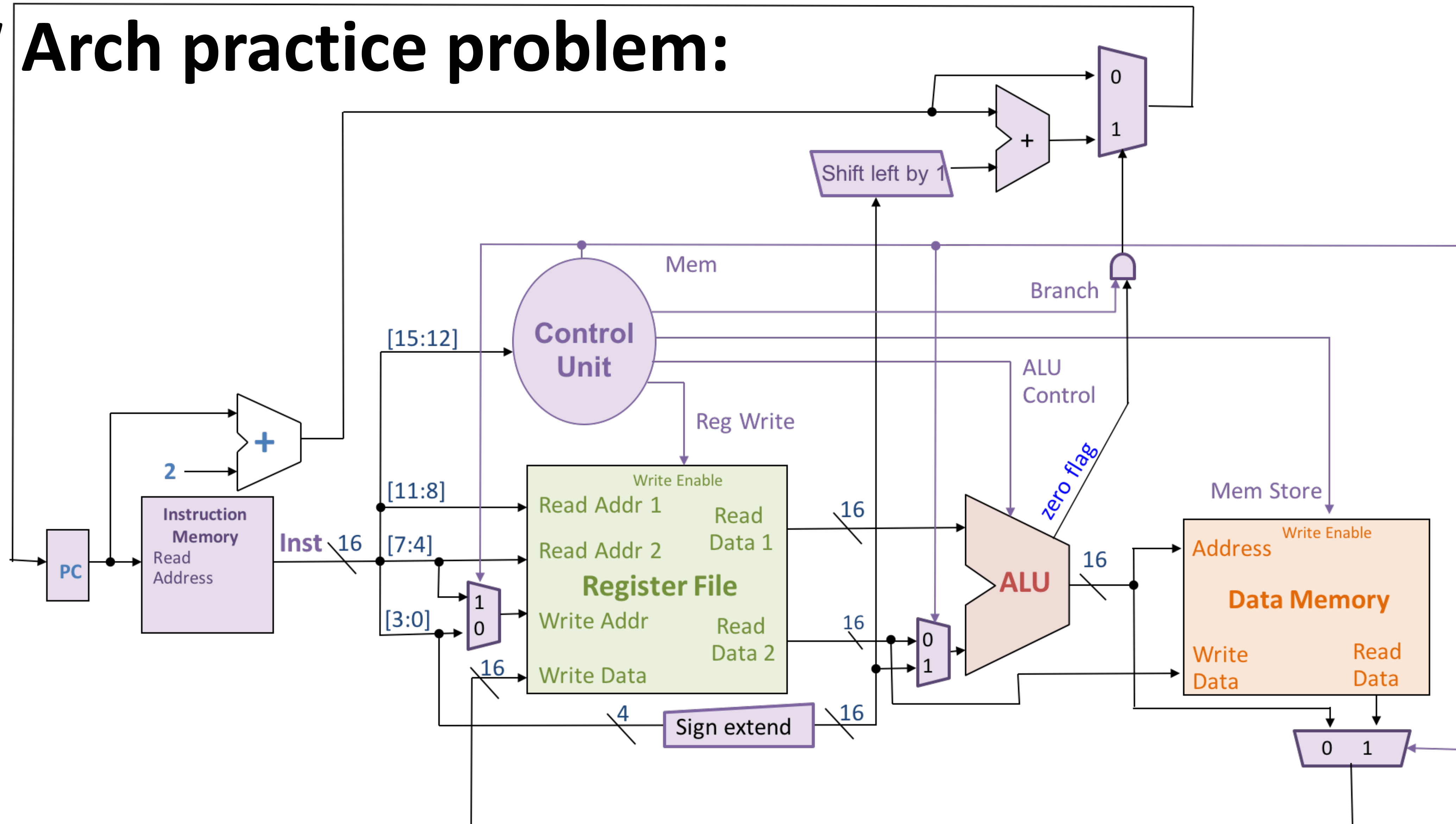
# Decoder + mux practice problem

ex



Use **one** 2:4 decoder and **one** 2:1 mux to implement  $A \text{ XOR } B$

# HW Arch practice problem:



1. What is the purpose of each of the 4 mux components in the HW architecture above?