1.

- Suppose a new simpler CPU has
  - 85% of capacitive load of old CPU
  - 15% voltage and 15% frequency reduction

- Q. What is the impact on power?

$$\frac{P_{new}}{P_{old}} =$$

2.

- 10 nsec clock cycle => 100 MHz clock rate
- 5 nsec clock cycle => $\square$ MHz clock rate
- 2 nsec clock cycle => 500 MHz clock rate
- 1 nsec (10^{-9}) clock cycle => 1 GHz (10^{9}) clock rate
- $\square$ psec clock cycle => 2 GHz clock rate
- 250 psec clock cycle => $\square$ GHz clock rate
- 200 psec clock cycle => 5 GHz clock rate

3.

Exercise

- **Computer A**: 2GHz clock, 10s CPU time
- Designing **Computer B**
  - Aim for 6s CPU time
  - Can do faster clock, but causes 1.2x more clock cycles
- Q. How fast must Computer B clock rate be?

4.

CPI Example

- For a given program, compiler 1 produced instruction sequence 1, while compiler 2 produced instruction sequence 2. Both sequences consist of instructions from classes A, B, and C (IC = Instruction Count). Calculate the average CPI for each sequence.

Instruction Class	A	B	C
CPI for class	1	2	3
IC in sequence 1	2	1	2
IC in sequence 2	4	1	1

5.

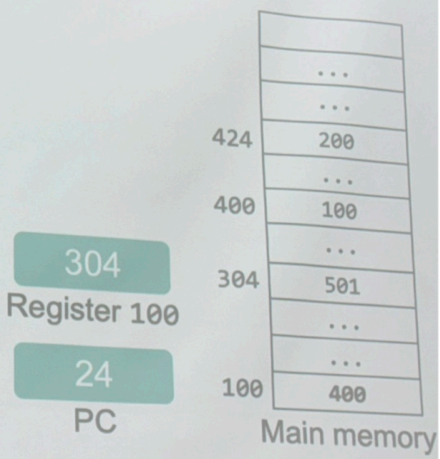
Addressing Mode Exercise

Assume that we have this instruction:

`LoadAC 100`

Fill the table!

Addressing mode	Effective address	Content of AC
Register		
Register indirect		
Direct		
Indirect		
PC-relative		



6. Represent -13 in (8비트만)

① signed magnitude :

② one's compliment :

③ two's compliment :

7. **Q. What is the range of memory addresses a 32-bit machine (e.g., MIPS) can access?**

: ______ bytes = ____ GB

8.

Exercise: Deciding Target Address

- PC = `0xa7f8001c`

	6 bits	26 bits
J	`0000 10`	`01 1111 1110 0000 0000 0000 0100`

9.

Exercise: Loading 32-bits Constants

- What is MIPS assembly code for 32-bit constant `0x003D 0900` into `$s0`?

10.

Exercise

80

- 1110 x 1110 =14 x 14 = 196

Fill in the table

Iteration–Operation	Product – *before* operation	Product – *after* operation
1st – shift	0000 1110	0000 0111
...	...	...

11.

Exercise #1

81

- Represent -3.90625$_{ten}$ in IEEE single precision format

12.

Exercise #2

82

- Convert the following single-precision float to the decimal number (normalized scientific notation)

  11000000010100000000000000000000

13.

Exercise

$$1.0110_2 \times 2^3 + 1.1000_2 \times 2^2$$

14. $1.000_2 \times 2^{-1} + -1.110_2 \times 2^{-2}$ $(0.5 + -0.4375)$

15. $1.000_2 \times 2^{-1} \times -1.110_2 \times 2^{-2}$ (0.5×-0.4375)

16. $A[300] = h + A[300]$

4-byte array A[ ]
h in $s2
base address of A in $t1

$\Rightarrow$

17.

- **C code:**

```
while (save[i] == k) i += 1;
```

- i in $s3
- k in $s5
- Address of save[ ] in $s6
- 4-byte array save[ ]

18.

```
int purple(int g, h) {
    int f;
    f = g + h;
    return f;
}

int blue(int a) {
    int b = 3;
    int c = purple(4, 3)
    return a + b + c;
}

int red(int a) {
    return blue(5);
}
```

- purple

- blue