

```

int getExp(int a, int b)
{
    if(b == 0) return 1;
    if(b % 2 == 0)
    {
        auto t = getExp(a, b/2);
        return (t * t);
    }
    return a * getExp(a, b-1);
}

```

even = জোড়  
odd = বিজোড়

$5^3$   
 $a^b$

$${}^{212}C_{73} = \frac{212!}{73!(139!)} \quad {}^nC_r = \frac{n!}{r!(n-r)!}$$

$$= \frac{212!}{73! 139!} \text{ MOD } M$$

$$= [(212!) \% M] \times [(73! 139!)^{-1} \% M]$$

$$= [616613957] \times [(157550195)^{-1}]$$

$$= 616613957 \times (157550195)^{M-2}$$

$$= (616613957 \times 419647481)$$

$$f(5) = 5 \times f(4) = 24 = 120$$

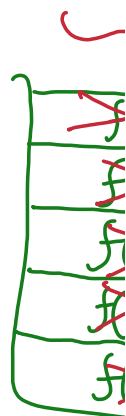
$$\hookrightarrow 4 \times f(3) = 6 = 24$$

$$\hookrightarrow 3 \times f(2) = 2 = 6$$

$$\hookrightarrow 2 \times f(1)$$

$$1 \times f(0) = 1$$

1  
 2  
 6  
 24  
 120



~~Alg  $\rightarrow$  EQSV~~  
~~Ex  $\rightarrow$  Alg~~  
 HP  $\rightarrow$  Examples

$N$

$$2^{10 \times \log_2 N}$$

$$2^{345} \% M \rightarrow \boxed{2}^b \% \boxed{M}$$

$$\hookrightarrow 2$$

$$10^{49} \% 11 = 105 \% 11$$

$[0, M-1]$

$$\phi(11) = 10$$

$$\boxed{105} \% 11 = 2^5$$

$$2^b \% M \rightarrow 2^{b \% \phi(M)} \% M$$

$$\begin{array}{ccccccc}
 & \boxed{\begin{smallmatrix} 6 \\ 5 \end{smallmatrix}} & & & & & \\
 & \begin{smallmatrix} 3 \\ a \end{smallmatrix} & & & & & \\
 2 & \xrightarrow{\quad} & 2 & \xrightarrow{\quad} & 2 & \xrightarrow{\quad} & 2 \xrightarrow{\quad} \\
 & & \begin{smallmatrix} k_1 \\ 4 \\ 3 \end{smallmatrix} & & \begin{smallmatrix} k_2 \\ 3 \end{smallmatrix} & & \begin{smallmatrix} k_3 \end{smallmatrix} \\
 & & & & \phi(M) + b \% \phi(M) & & \\
 & & & & \% M & & \\
 a^b \% M = a
 \end{array}$$

$$\begin{array}{l}
 \begin{array}{ccc}
 \boxed{\begin{smallmatrix} 5 \\ 4 \end{smallmatrix}} & & \boxed{\begin{smallmatrix} 1024 \\ 3 \end{smallmatrix}} \% 196 \\
 2^3 \% 197 = 2 & & \% 197 = 2^{25} \%
 \end{array} \\
 \begin{array}{l}
 \text{1024} \\
 \text{6} \\
 \text{2} \% 197
 \end{array} \\
 \boxed{\begin{array}{l} 1024 \\ 3 \% 196 \end{array}}
 \end{array}$$