

```

public class Main{
    public static void main(String[] args) {
        int n = 5, r = 5;
        int factN = fact(n);
        int factR = fact(r);
        int factNmr = fact(n-r);
        System.out.println(factN/(factR*factNmr));
    }
}

public static int fact(int num){
    int res = 1;
    for(int i = 1; i <= num; i++){
        res = res * i;
    }
    return res;
}

```

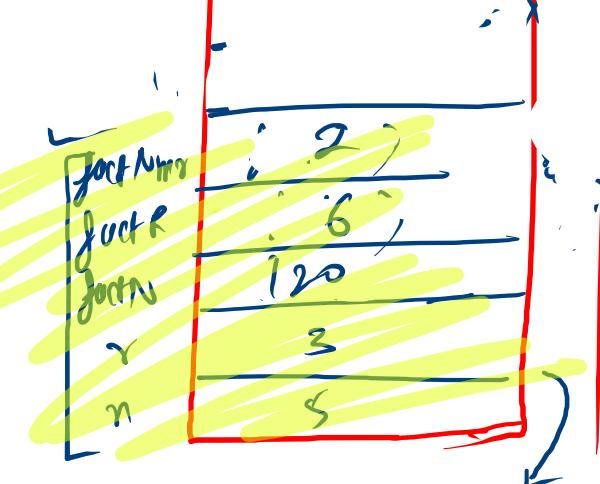
10

(void → special  
returns nothing)

• main()

Program Stack

Heap



num  
 $\underline{(994543234)}$   
 4  
 K → Single digit no.

$\% \rightarrow \text{rem}$   
 $/ \rightarrow \text{reduced num}$

$0 \leq K \leq 9$

$\underline{\text{Count} = \cancel{0} + \cancel{2}}$   
 $\underline{\underline{3}}$

$\underline{\underline{\underline{K=7}}}$

10	994543234	
10	<u>99454323</u>	4
10	<u>9945432</u>	3
10	<u>994543</u>	2
10	<u>99454</u>	3
10	<u>9945</u>	4
10	<u>994</u>	5
10	<u>99</u>	4
10	<u>9</u>	9
	0	9

logic  $\Rightarrow$   $11:03 \rightarrow 11:08$

	<u>1</u> <u>2</u> <u>3</u> <u>2</u> <u>1</u>
10	
	<u>1</u> <u>2</u> <u>3</u> <u>2</u>
10	
	<u>1</u> <u>2</u> <u>3</u>
10	
	<u>1</u> <u>2</u>
10	
	<u>1</u>
10	
	0

$k=2$

Count =  $\frac{1}{2}$

```

while(){
    int rem = n % 10;
    if(rem == k){
        count++;
    }

    n = n / 10;
}

```

## [NUMBER SYSTEM]

→

→ Decimal  $\Rightarrow$  Base 10  $\Rightarrow [0, 1, 2, 3, 4, 5, 6, 7, 8, 9]$

→ Octal  $\Rightarrow$  Base = 8  $\Rightarrow [0, 1, 2, 3, 4, 5, 6, 7]$

→ Binary  $\Rightarrow$  Base = 2  $\Rightarrow [0, 1]$

→ hexadecimal  $\Rightarrow$  Base = 16  $\Rightarrow [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, \text{A}, \text{B}, \text{C}, \text{D}, \text{E}, \text{F}]$

(110)  $\rightarrow$   $\begin{array}{r} 110 \\ 110 \\ \hline 110 \end{array}$

$$(52)_{10} \rightarrow (64)_8$$

$$\begin{array}{r|l} 8 & 52 \\ \hline 8 & 6 \\ \hline 0 & \end{array}$$

↓  
6

$$(100)_{10} \rightarrow (64)_{16}$$

$$\begin{array}{r|l} 16 & 100 \\ \hline 16 & 6 \\ \hline 0 & \end{array}$$

↓  
6

Decimal  $\rightarrow$  (any base)<sub>b</sub>

↓  
1, i.e b

①  $(75)_{10} \rightarrow (\underline{\underline{1001011}})_2$

$$\begin{array}{r|l} 2 & 75 \\ \hline 2 & 37 & 1 \\ \hline 2 & 18 & 1 \\ \hline 2 & 9 & 0 \\ \hline 2 & 4 & 1 \\ \hline 2 & 2 & 0 \\ \hline 2 & 1 & 0 \\ \hline 0 & & 1 \end{array}$$

↑

$$\left[ \begin{array}{l} (1011101)_2 \rightarrow (93)_{10} \\ \text{Any base} \xrightarrow{\quad\quad\quad} \text{Decimal} \\ \begin{array}{r} \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \\ 1 0 1 1 1 0 1 \\ \hline \underline{1 8 4 3 2 1 0} \end{array} \rightarrow (1 \times 2^6) + (0 \cdot 2^5) + (1 \cdot 2^4) + (1 \cdot 2^3) + (1 \cdot 2^2) + (0 \cdot 2^1) + (1 \cdot 2^0) \\ \text{Place value} \end{array} \right]$$

$$64 + 0 + 16 + 8 + 4 + 0 + 1 \Rightarrow 93$$

$$\left[ \begin{array}{l} (1AC)_{16} \rightarrow (428)_{10} \\ \begin{array}{r} \downarrow \\ 1 \ A \ C \\ \hline \underline{2 \ 1 \ 0} \end{array} \rightarrow (1 \cdot 16^2) + (A \cdot 16^1) + (C \cdot 16^0) \\ 256 + 160 + 12 \Rightarrow 428 \end{array} \right]$$

$$\left[ \begin{array}{l} (1343)_5 \rightarrow (\quad)_{10} \\ \begin{array}{r} \downarrow \downarrow \downarrow \downarrow \\ 1 3 4 3 \\ \hline \underline{3 2 1 0} \end{array} \rightarrow (1 \cdot 5^3) + (3 \cdot 5^2) + (4 \cdot 5^1) + (3 \cdot 5^0) \rightarrow 125 + 75 + 20 + 3 \\ \Rightarrow 223 \end{array} \right]$$

(Any Base  ~~$\rightarrow$~~  Any Base )  
 $b_1$        $b_2$

```
graph TD; A["(Any Base → Any Base)"] --> B["( )"]; A --> C["l0"]
```

$(S^7)_{10} \rightarrow (\quad)_2$

57

2

$$\begin{array}{r|rr} 2 & 57 \\ \hline 2 & 28 \\ \hline 2 & 14 \\ \hline 2 & 7 \\ \hline 2 & 3 \\ \hline 2 & 1 \\ \hline 0 & \end{array}$$

$$\begin{aligned}
 1 &\times \underline{1(10^0)} = 1 \\
 0 &\times \underline{10(10^1)} = 0 \\
 0 &\times \underline{100(10^2)} = 0 \\
 1 &\times \underline{1000(10^3)} = 1000 \\
 1 &\times \underline{10000(10^4)} = 10000 \\
 0 &\qquad\qquad\qquad \underline{\underline{= 100000}}
 \end{aligned}$$

$$\underline{\underline{111001}} \Rightarrow \underline{\underline{1 \cdot 10^5 + 1 \cdot 10^4 + 1 \cdot 10^3 + 0 \cdot 10^2 + 0 \cdot 10^1 + 1 \cdot 10^0}} \Rightarrow \underline{\underline{111001}}$$

```

while(){
    int rem = n % b;
    n = n / b;
}

public static int getValueInBase(int n, int b){
    int res = 0;
    int mul = 1;
    while(n != 0){
        int rem = n % b;
        res = res + (rem * mul);
        n = n / b;
        mul = mul * 10;
    }
    return res;
}

```

$$(111001)_2 \rightarrow (\quad )_{10}$$

$111001$

$\times 2$

$(111001) \rightarrow 1 \cdot 2^5 + 1 \cdot 2^4 + 1 \cdot 2^3 + 0 \cdot 2^2 + 0 \cdot 2^1 + 1 \cdot 2^0 = \Sigma 2^i$

$1_0$	$11100\bar{1}$	$\begin{array}{l} \text{mul} \\ \hline 1 \times (2^0) 1 \\ 0 \times (2^1) 2 \\ 0 \times (2^2) 4 \\ 1 \times (2^3) 8 \\ 1 \times (2^4) 16 \\ 1 \times (2^5) 32 \\ \hline (2^6) \end{array}$
$1_0$	$1110\bar{0}$	
$1_0$	$111\bar{0}$	
$1_0$	$1\bar{1}$	
$1_0$	$\bar{1}$	
$1_0$	0	

```

int res = 0;
int mul = 1;
while(){
    int rem = n % 10;
    res = res + (rem * mul);
    n = n / 10;
    mul = mul * b;
}

```

$\Rightarrow \Sigma 2^i$

$$\begin{array}{r}
 \begin{array}{r}
 1 & 1 & 1 & 1 \\
 1 & 2 & 3 & 4 & 5 \\
 + & 9 & 9 & 8 & 7 \\
 \hline
 2 & 1 & 2 & 1 & 3 & 1 & 2 \\
 \hline
 2 & 2 & 3 & 3 & 2
 \end{array}
 \end{array}$$

$(b=10)$

digit  $\Rightarrow$  sum % b

carry  $\Rightarrow$  sum / b

$$\begin{array}{r}
 1 & 1 & 1 \\
 7 & 7 & 7 \\
 \hline
 b=8
 \end{array}$$

$$\begin{array}{r}
 + 0 0 1 \\
 \hline
 1 8 8 8 \\
 \hline
 1 0 0 0
 \end{array}$$

$$\begin{array}{r}
 1 & 1 & 1 & 0 \\
 0 & 5 & 6 & 4 \\
 + 0 3 2 7 \\
 \hline
 1 9 9 1 1 \\
 \hline
 1 1 1 3
 \end{array}$$

$b=8$

$\rightarrow$  sum

$\rightarrow$  carry

0 1 1 1  
0 5 6 4

base = 8

res =

$$\begin{array}{r} 0 3 2 7 \\ + 1 1 1 3 \\ \hline 1 0 3 (0 2) (0 1) (0 0) \end{array}$$

int res = 0, carry = 0;

```
while(){
    int d1 = n1 % 10;
    int d2 = n2 % 10;

    int sum = d1 + d2 + carry;
    int digit = sum % b;
    carry = sum / b;

    n1 = n1 / 10;
    n2 = n2 / 10;
}
```

n <sub>1</sub>	n <sub>2</sub>	(sum/b)	carry	d <sub>1</sub>	d <sub>2</sub>	Sum	(sum%b) <u>digit</u>
564	327	0	0	4	7	11	3
56	32	1	1	6	2	9	1
5	3	1	1	5	3	9	1
0	0	1	0	0	0	1	1
0	0	0					

$$\begin{array}{r}
 11 \\
 200 \\
 + 156 \\
 \hline
 0 \ 6 \ 6 \\
 \hline
 0 \ 4 \ 4
 \end{array}$$

$$\underline{n_1 = 156}$$

$$\underline{n_2 = 200}$$

$$b = 10$$

H.W.

$$\left\{
 \begin{array}{l}
 \begin{array}{r}
 11 \ 1 \ 0 \\
 1 \ 5 \ 1 \ 6 \\
 - 0 \ 9 \ 9 \ 9 \\
 \hline
 0 \ 5 \ 9 \ 3 \\
 \hline
 0 \ 5 \ 1 \ 7
 \end{array} \\
 (n_2) \quad \boxed{1 \leq 1 \leq 6} \\
 (n_1) - \boxed{0 \ 9 \ 9 \ 9}
 \end{array}
 \right.$$

while ( $n_2 \neq 0$ ) { }

(base = b)

diff  $\Rightarrow$   $d_2 - d_1 - \text{borrow}$ ;

if (diff < 0) {  
 diff = diff + base;  
 borrow = 1;  
 } else {  
 borrow = 0;  
 }

$$\frac{1}{\overline{1}} \quad \frac{0}{\overline{5}} \quad \frac{1}{\overline{6}}$$

$$\begin{array}{r}
 1 \ 1 \ 1 \ 0 \\
 1 \ 5 \ 4 \ 6 \\
 + 0 \ 7 \ 5 \ 7 \\
 \hline
 0 \ 3 \ 2 \ 1 \\
 \hline
 0 \ 5 \ 6 \ 7
 \end{array}$$

base = 8

0 62

✓ Introduction To Functions

✓ Digit Frequency

✓ Introduction To Number System

☰ Number System - Mcq

✓ Decimal To Any Base

✓ Any Base To Decimal

✓ Any Base To Any Base

✓ Any Base Addition

✓ Any Base Subtraction

✗ Any Base Multiplication

Watch

Thursday

Wednesday

Pathways  
$$\begin{array}{r} 08100 \\ \times 913 \\ \hline 908100 \end{array}$$

discussed