Today's agenda

- factorial
- ^nC_r & ^nP_r
- functions

Q) factorial

↳ Given N, Print factorial of N.

Quiz 1: fact(4): 1 * 2 * 3 * 4 = 24

fact(N) = 1 * 2 * 3 * ..... * N

```
main () {
    Scanner scn = new Scanner (System.in);
    int n = scn.nextInt();

    int ans = 1;
    for (int i = 1; i <= n; i++){
        ans = ans * i;
    }

    S.o.p (ans);
}
```

N iterations ←

n=4

ans=1 n=4 4

```
int ans = 1;
for (int i=1; i<=n; i++){
    ans = ans * i;
}
```

i	i<=n	ans: ans*i	n: n-i
1	T	ans=1	~~n=4~~
2	T	ans=2	~~n=3~~
3	T	ans=6	

If ${}^nC_r$ and ${}^nP_r$

${}^nC_r \rightarrow \frac{n!}{r!(n-r)!}$ ${}^nP_r \rightarrow \frac{n!}{(n-r)!}$

Quiz 2: ${}^5C_3 = {}^{n=5}_{r=3} = \frac{5!}{3!2!} = \frac{120}{12} = 10$

Quiz 3: ${}^5P_3 = {}^{n=5}_{r=3} = \frac{5!}{2!} = \frac{120}{2} = 60$

Q) Given n and r, write an algorithm to Calculate ^nC_r.

$\frac{n!}{r!(n-r)!}$

```
main ()
    Scanner scn = new Scanner(System.in);
    int n = scn.nextInt();
    int r = scn.nextInt();

    int ans1 = 1; → n
    for (int i=1; i<=n; i++){
        ans1 = ans1*i;
    }

    int ans2 = 1; → r
    for (int i=1; i<=r; i++){
        ans2 = ans2*i;
    }

    int ans3 = 1; → n-r
    for (int i=1; i<=n-r; i++){
        ans3 = ans3*i;
    }

    int ans = ans1/(ans2*ans3);
    S.O.P(ans);
}
```

DRY: Do not repeat yourself.

Syntax:

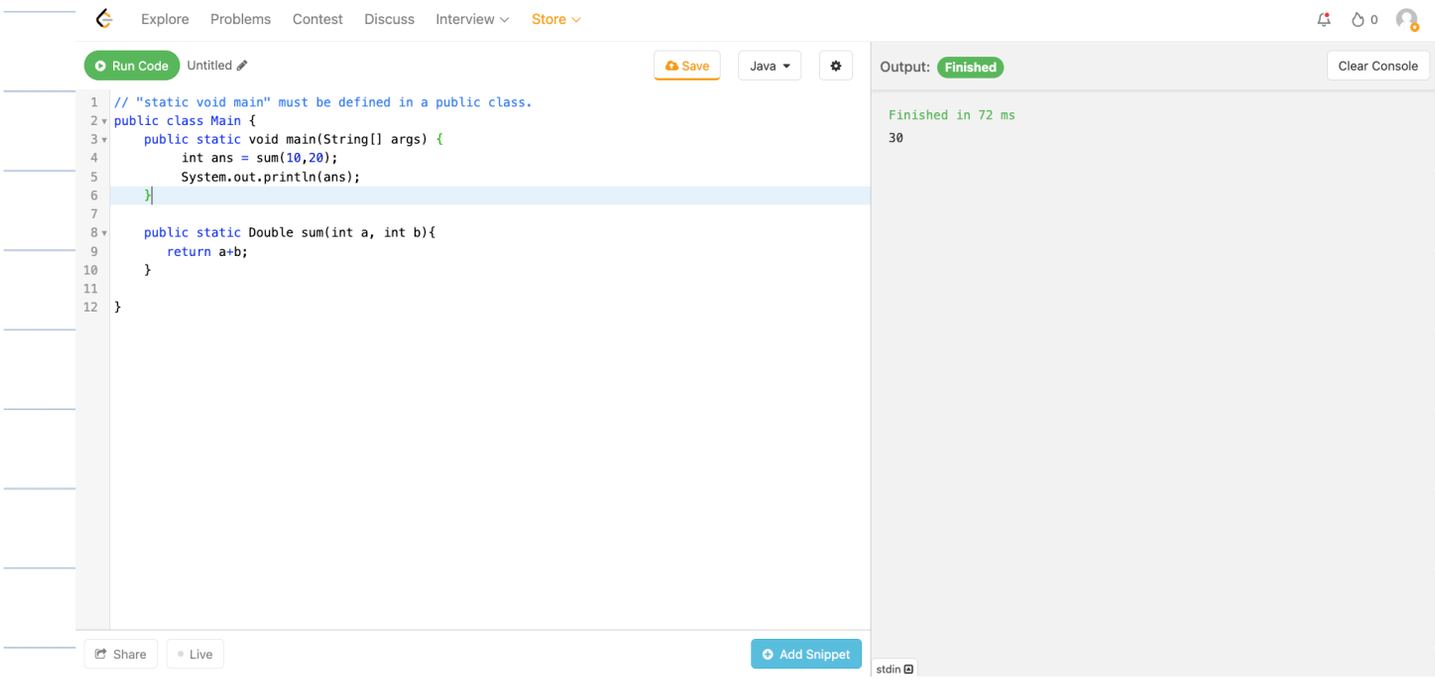
```
Public static int name (input){
    //Statements
    .
    .
    .
}
```



```
// "static void main" must be defined in a public class.
public class Main {
    public static void main(String[] args) {
        int temp = add(10,20,30); 60
        System.out.println(temp);  → 60
    }

    public static int add(int a, int b,int c){
        return a+b+c;
    }  60

}
```


Explore
Problems
Contest
Discuss
Interview
Store
Run Code
Untitled
Save
Java
Output:
Finished
Clear Console
// "static void main" must be defined in a public class.
public class Main {
public static void main(String[] args) {
int ans = sum(10,20);
System.out.println(ans);
}
public static Double sum(int a, int b){
return a+b;
}
}
Finished in 72 ms
30
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```
main () {
    Scanner scn = new Scanner (System.in);
    int n = scn.nextInt(); → 5

    int ans = 1;
    for (int i = 1; i <= n; i++) {
        ans = ans * i;
    }

    S.O.P (ans);
}
```

```
main () {
    Scanner scn = new Scanner (System.in);
    int n = scn.nextInt(); → 5

    int n1 = fact(n);
    S.O.P(n1);
}

Public static int fact (int n){
    int ans = 1;
    for (int i = 1; i <= n; i++) {
        ans = ans * i;
    }
    Return ans;
}
```

```
main () {
    Scanner scn = new Scanner (System.in);
    int n = scn.nextInt();

    int n1 = fact(n);
    S.O.P(n1); → 24
}

Public static int fact (int n){
    int ans = 1;
    for (int i = 1; i <= n; i++) {
        ans = ans * i;
    }
}
```

* factorial using function

```
main () {
    Scanner scn = new Scanner (System.in);
    int n = scn.nextInt();

    int ans = 1;
    for (int i=1; i<=n; i++){
        ans = ans * i;
    }

    S.o.p (ans);
}
```

N iterations

⇒

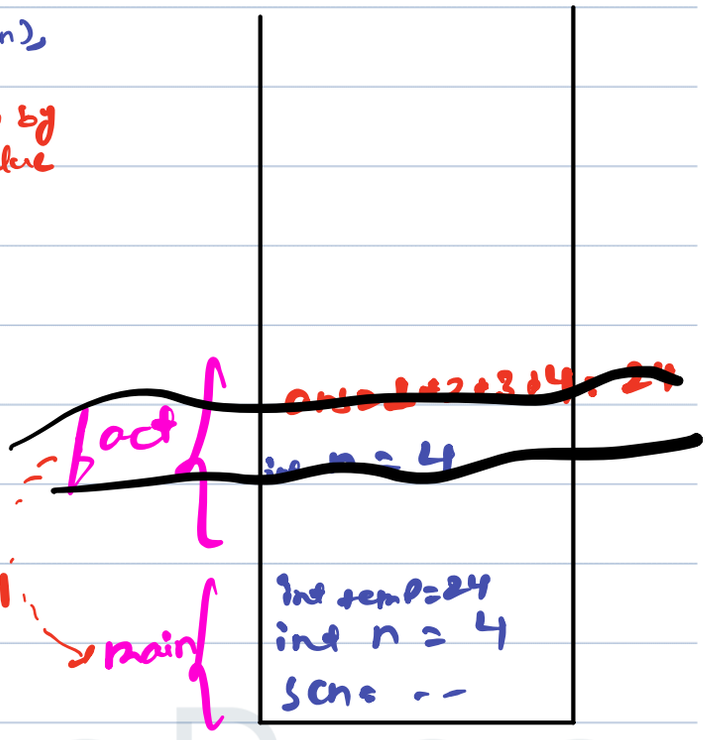
```
main () {
    Scanner scn = new Scanner (System.in);
    int n = scn.nextInt();

    int temp = fact(n);
    S.o.p(temp);
}

Public static int fact (int n){
    int ans = 1;
    for (int i=1; i<=n; i++){
        ans = ans * i;
    }
    return ans;
}
```

```
main () {
    Scanner scn = new Scanner (System.in);
    int n = scn.nextInt();
    int temp = fact(4);        // pass by value
    S.o.p(temp);               // → 24
}

Public static int fact (int n){
    int ans = 1;
    for (int i=1; i<=n; i++){
        ans = ans * i;
    }
    return ans;
}
```



Break till 10:40 pm

nCr using function.

```
main () {
    Scanner scn = new Scanner (System.in);
    int n = scn.nextInt();
    int r = scn.nextInt();

    int ans1 = fact(n);
    int ans2 = fact(r);
    int ans3 = fact(n-r);

    int ans = ans1 / (ans2 * ans3);
    S.o.p(ans);
}
```

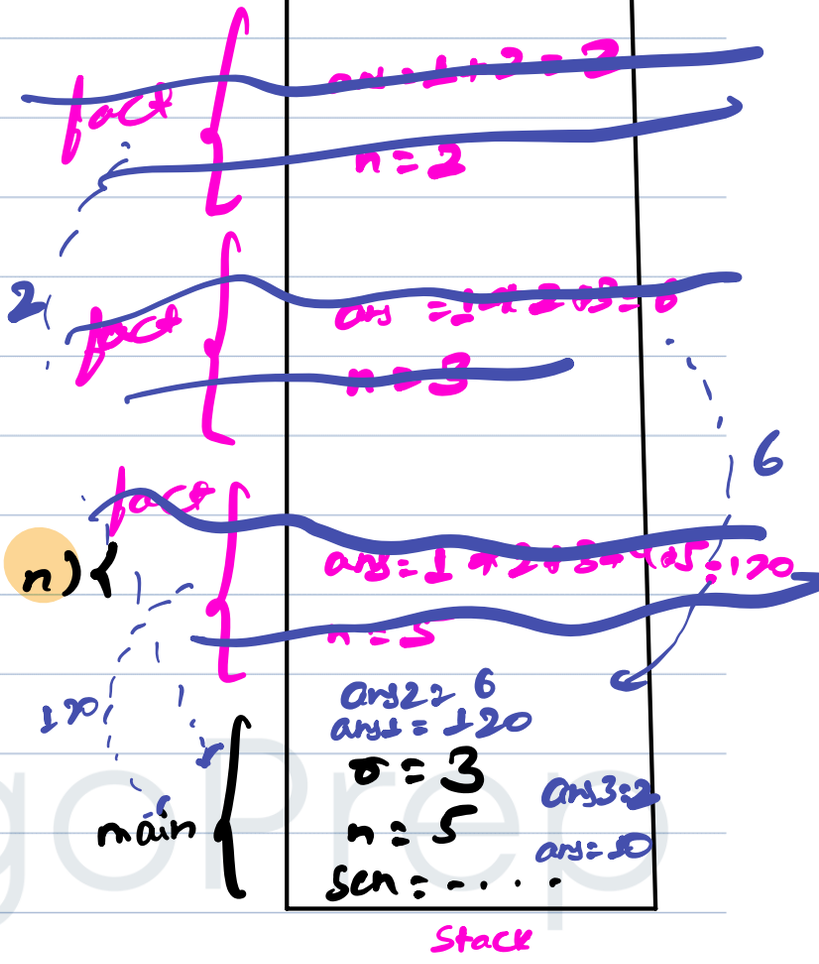
```
Public static int fact (int n){
    int ans = 1;
    for (int i=1; i<=n; i++){
        ans = ans * i;
    }
    return ans;
}
```

```
main()
  Scanner scn = new Scanner(System.in);
  int n = scn.nextInt(); → 5
  int r = scn.nextInt(); → 3

  int ans1 = fact(n);   → 120
  int ans2 = fact(r);   → 6
  int ans3 = fact(n-r); → 2

  int ans = ans1/(ans2*ans3);
  → S.O.P(ans);
      ↳ 10
```

```
Public static int fact(int n){
    int ans = 1;
    for(int i=1; i<=n; i++){
        ans = ans * i;
    }
    → return ans;
}
```



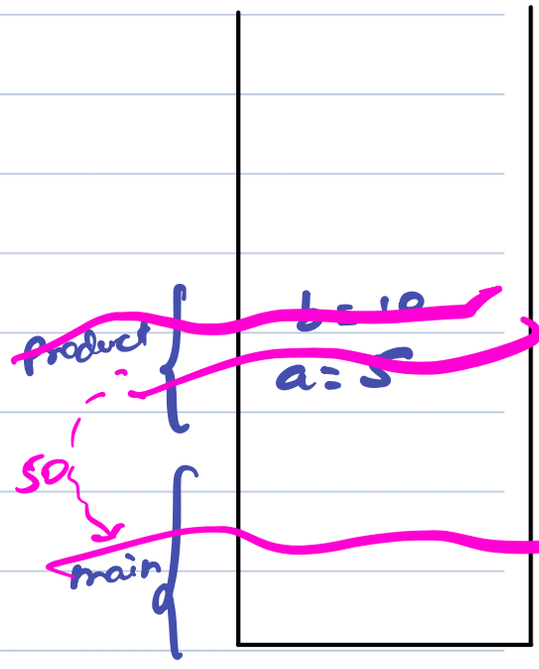
→ you can have no output of a function. In that case return type should be void.

Quiz 4:

```
Public static void main (String[] args){
        Product(5,10);
}

Public static int Product(int a, int b){
        return a*b;
}
```

So



No output

Quiz 5:

```
Public static void main (String[] args){
    int ans = Subtract(5,10);
    System.out.println(ans);
}

Public static void Subtract(int a, int b){
        return a - b;
}
```

error

5

10

Quiz 6:

```
Public static void main (String[] args){
    int n1 = Cube(3);
    System.out.println(add(27, 8));
}

Public static int add (int a, int b){
    return a+b;
}

Public static int cube (int a){
    return a*a*a;
}
```