```
int a = 5
int b = 7
  ⋮
int h = 19


int[] array = {5, 7, 72, 9, 15, 23, 19}
                0  1  2  3   4   5   6
println(array[3]); // 9
            └─── int ───┘

int x = array[5];
println(x); // 23

array[2] = 72;
int y = array[2];
println(y); // 72


array[8]   ⎫
array[-1]  ⎬ Java error
array[2.5] ⎭
```

$$\begin{matrix} 0 & 1 & 2 & 3 \end{matrix}$$
$$[\ 3,\ -13,\ 24,\ 11\ ]$$

$i \rightarrow 0 .. 3$

max $\boxed{24}$

i $\boxed{4}$

n $\boxed{4}$

$$\begin{matrix} 0 & 1 & 2 & 3 \end{matrix}$$
arr $[\ -1001, -1007, -9000, -3000\ ]$

n $\boxed{4}$

max $\boxed{-1001}$

i $\boxed{4}$

i=1   1 2 3 4 5
i=2   1 2 3 4
i=3   1 2 3
i=4   1 2
i=5   1

1 to $n-i+1$

$5-3+1$

3

1 2 3

i=1   1 2
i=2   1 2 3
i=3   1 2 3 4
i=4   1 2 3 4 5

$\boxed{1 \text{ to } i+1}$

s [Scanner]

n [4]

arr | 5 | 3 | 7 | -1 |
    0 1 2 3

prod [-105]

avg [3.5] double

$$\frac{14}{4} = 3$$

x [10] int

y [4] int

a [2] int

b [2.0] double

c [0.2] double

$$\frac{2.0}{10} = 0.2$$

```
int x = 7;
int [] arr = new int[3];

arr[0] = 3
arr[1] = 7
arr[2] = -1
int y = arr[0]
```

```
      0          1          2
{ {1,2,3}, {4,5,6}, {8,9,11}}
  0 1 2
```

```
int[][] arr =
```

```
                          y
int[] y = arr[1]; {4,5,6}
 int x = y[0]        x = 4
```

```
int x1 = arr[2][1]; //9
```

[1 2 3 4 5]

[1 2 3 4 5]
↑

[1 2 3 4 5]
↑

[1 2 3]

print([)
print(_)
print(1)
print(_)
print(2)
print(_)
print(3)
print(_)
print(])

```
int x = 5;                        x  5

String xStr = Integer.toString(x);
```

```
arr = {5, 2, 3}

arr[0] = 5;
```

```
   11  6  5       3  2  1
  [1 , 2 , 3 , 4 , 5 , 6 , 11]
   0  1  2  3  4  5  6
```

1. swap 0 & 6   i=0
2. swap 1 & 5   i=1
3. swap 2 & 4   i=2

```
n = size of array
for i=0; i<n/2; i++:
      swap i & n-i-1
```

```
   61  35  24  13  21  11
  [11, 21, 13, 24, 35, 61]
```

1. swap 0 & 5
2. swap 1 & 4
3. swap 2 & 3

n=6
for i in 0 to 2:
    swap i & n-i-1

Alternate sum

$$a[0] - a[1] + a[2] - a[3] + a[4]$$

```
sum = 0
for  0 ≤ i < n {
    if (i % 2 == 0) {
        sum =
          sum + a[i];
    } else {
        sum = sum - a[i];
    }
}
```

sum ☐
i   ☐

```
arr = {11}
n = arr.length
pSum = 0
nSum = 0

for i=0, i <n, i=i+2 {
    pSum = pSum + arr[i];
}

for i=1, i<n, i=i+2 {
    nSum = nSum + arr[i];
}

println("sum: " + (pSum
                    -nsum))
```

```
arr = { 23, 11}
aSum = 0
print("Alternate sum = ");

for 0≤i<n {
    print(arr[i]);
    if (i%2 == 0) {
        if (i != n-1) { print(" - "); }
        asum = asum + arr[i];
    }
    else {
        if (i != n-1) { print(" + "); }
        asum = asum - arr[i];
    }
}
println(" = " + aSum);
```

Alternate_sum_=_23_-_11

aSum 12

Binary - decimal systems

$$395 = 300 + 90 + 5$$
$$= 3(10^2) + 9(10^1) + 5(10^0)$$

$$1702 = 1000 + 700 + 0 + 2$$
$$= 1(10^3) + 7(10^2) + 0(10^1) + 2(10^0)$$

Digits in our decimal → 0 to 9
System

$$9(10^1) + 7(10^0) = 97$$

$$8(10^4) + 3(10^3) + 7(10^1) \quad \overset{0(10^2)}{} \quad +0(10^0)$$
$$= 83070$$

$$10(10^1) + 7(10^0)$$

$$1(10^2) + 0(10^1) + 7(10^0)$$
$$= 107$$

Binary system

$$7625 = 7(10^3) + 6(10^2) + 2(10^1) + 5(10^0)$$
$$3 \ 2 \ 1 \ 0$$

$$12_{10} = 1(10^1) + 2(10^0)$$
$$1100_2 = 1(2^3) + 1(2^2) + 0(2^1) + 0(2^0)$$
$$110_3 = 1(3^2) + 1(3^1) + 0(3^0)$$

$$1011_2 = 1(2^3) + 0(2^2) + 1(2^1) + 1(2^0)$$
$$3 \ 2 \ 1 \ 0$$
$$= 11_{10}$$

$$
\begin{array}{ll}
97 & 2^6 - 1 \\
\downarrow & 2^5 - 1 \\
33 & 2^4 - 0 \\
\downarrow & 2^3 - 0 \\
| & 2^2 - 0 \\
\downarrow & 2^1 - 0 \\
0 & 2^0 - 1
\end{array}
$$

$$1100001_2$$

$$
\begin{array}{ll}
59_{10} & 2^5 - 1 \\
\downarrow & 2^4 - 1 \\
27 & 2^3 - 1 \\
\downarrow & 2^2 - 0 \\
11 & 2^1 - 1 \\
\downarrow & 2^0 - 1 \\
3 & \\
\downarrow & 111011_2 \\
1 & \\
\downarrow & \\
0 &
\end{array}
$$

Characters

char	int (ASCII value)
A	65
B	66
⋮	⋮
Z	90
a	97
b	98
⋮	⋮
z	122

```
"a" - 'b'  → Error
'a' - 'b'  → -1
'a' + 5 - 'b' + "df"  → "4df"
```

```
String x = "a";
int y = x;

int p = 97;
char c = p;
print(c)  // a
```

```
char ch = 'a';  //97
                //  1100001
int x = 97;  // 1100001
```

```
string a = "hi";
int y = 7;
print(a+y);  // hi7
print(a+y);  // 104
print(ch+x);  // 194
print(a+ch+x);  //hia97
```

```
"a" + "b"        ab
 ⌣     ⌣
string  string

"a" + 'b'        ab
"a" + 51         a51
'a' + "b"        ab
```

```
7 + "ab"      7ab

'a' + "bcd" + 7
  ⌣_____⌣
   "abcd"

'a' + 'b' + "bcd"
 ⌣____⌣
  195
  ⌣_____⌣
   "195bcd"
```

```
println("Hello");
println("Good morning");
println("Bye!");

greeting() {
    println(..);
    println(.);
    println(..);
}

greeting();
```

a = "hello"

b = "how're you doing"

Rohan says "Hi" and end

c = "Rohan says \"Hi\" and end";

"	h	i	3

"	a	n	d		h	e	l	l	o	10

"	h	i	"	a	n	d		h	e	l	l	o

\\\\ " \ " \ ' " \hello" \

$f(x) = x^2 - 5 \rightarrow$ Definition

$f(5) \rightarrow 20 \quad \rightarrow$ using it / calling it

$g(x, y) = x^2 + xy + y^2$

$g(10, 2) \rightarrow 124$

$g(-5, 3)$

```
int n = 5
int fac = 1;
for i in 1..n {
    fac = fac × i
}
fac → 120
```

```
int factorial (int n) {
    int prod = 1
    for i in 1..n {
        prod = prod × i;
    }
    return prod;
}
```

```
n = len(str)
str
for c in 'a' to 'z' of
    count = 0
    for i in 0 to n-1 {
        if (str.charAt(i) == c) {
            count = count + 1;
        }
    }
    printth(c + ": " + count);
}
```

$x \rightarrow$ **fac** $\rightarrow x!$

$x, y \rightarrow$ **sum** $\rightarrow x + y$

$x = 5$

$y = x * x$

$x = x + 2$

$println("hello");$

```
1  int a = 5
2  int b = 10              ↗15
3  int sum = calcSum(a,b);
                        ↓   ↓
                        5   10
4  print(sum);
```

a [5]

b [10]

Sum [15]

calcSum

x [5]

y [10]

c [15]
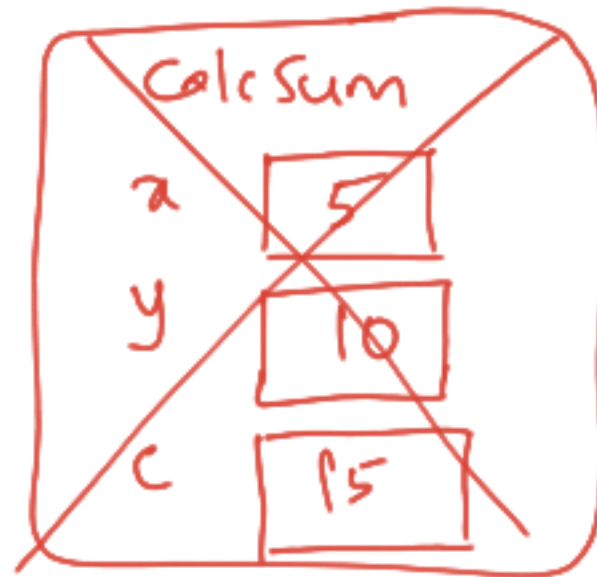
1 int a = 5
2 a += 2
3 int sum = calcSum (a, 17);   →24
4 println(sum);   ↓7 ↓17

calcSum (7, 17)

main
a [7]

sum [24]

calcSum
x [7]
y [17]
c [24]

int y = 7
int x = 5
y *= 2   // y = y*2   →19
int sum = calcSum(y, x);
println(sum);   14 5

main
y [14]
x [5]
sum [ ]

calcSum (14, 5)
x [14]
y [5]
c [19]
↓19

main

y [6]

x [93]

93

f(6)

x [6]

a [12]

b [72]

c [90]   g(12, 72, 6)
                90

g(12, 72, 6)

p [12]

q [72]

r [6]

---

main

x [12]

y [-11]

12 is even
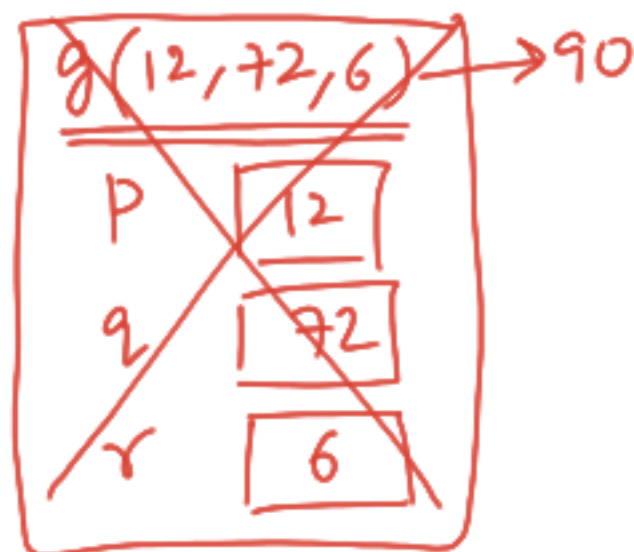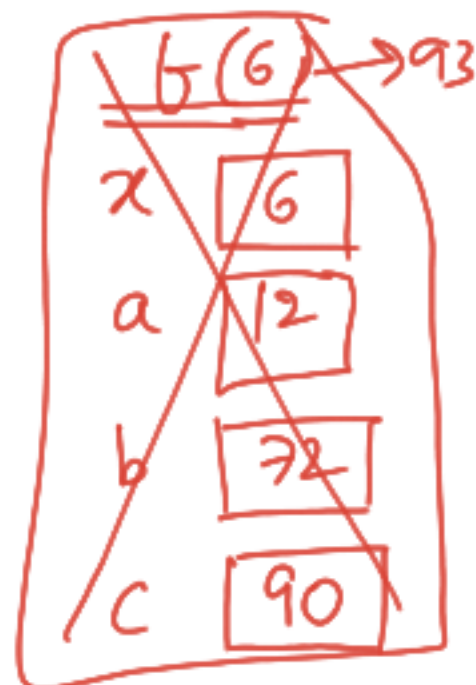-11 is odd

isEven(12)

y [12]

true

isEven(-11)

y [-11]
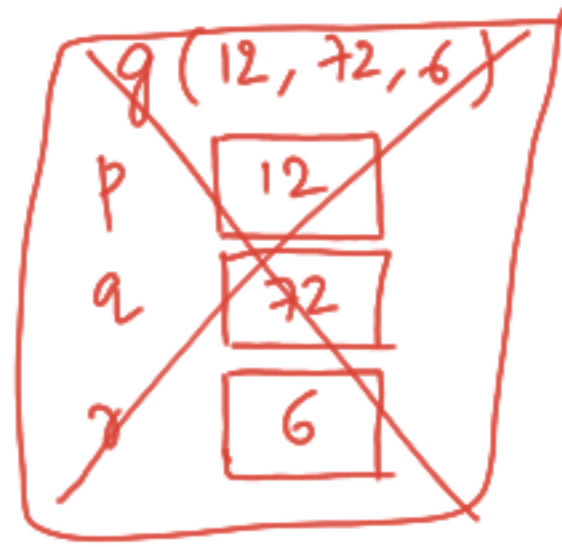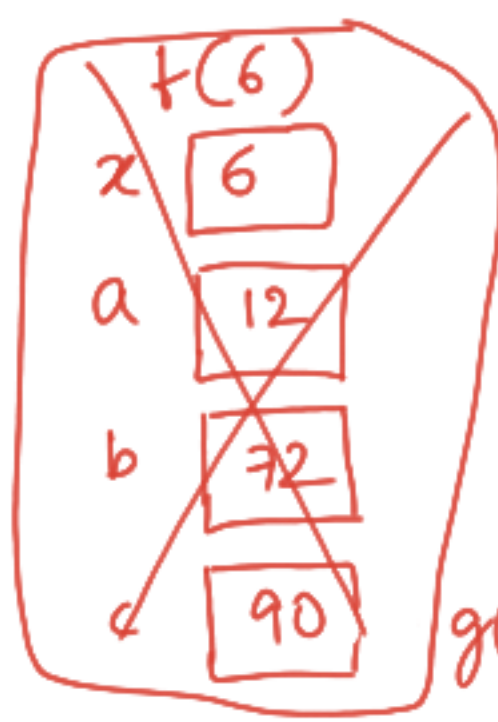
false

main()

f(6)

g(12, 72, 6)

Computed c: 90

93

main

y | 6

x | 93

f(6) →93

x | 6

a | 12

b | 72

c | 90

g(12, 72, 6) →90

P | 12

q | 72

r | 6

5! = 120

6! = 720

main

x | 5

xFac | 120

y | 6

factorial →120

y | 5

prod | 120

factorial(6) →720

y | 6

prod | 720

main

a [5]

x ["hhhhh"]

g (2, 1) → 3

a [2]

b [1]

g (3, 2) → 5

a [3]

b [2]

f ("hello", 5) → "hhhhh"

s ["h"]

n [5]
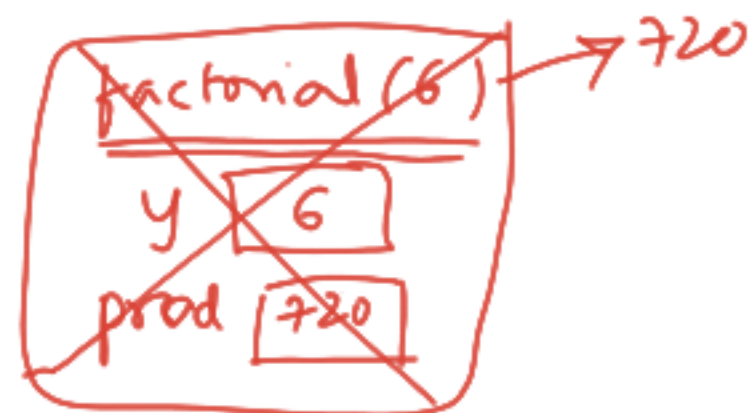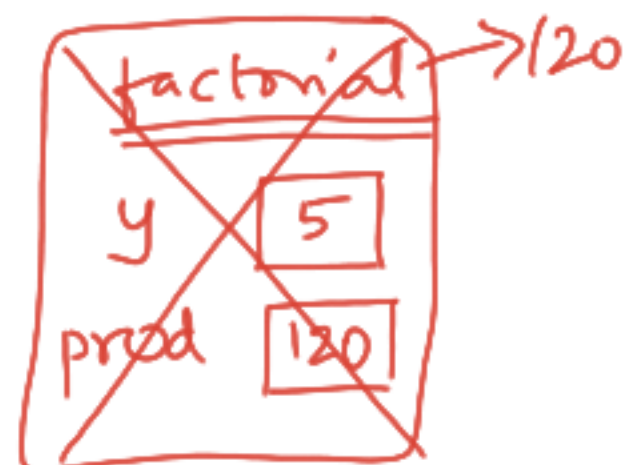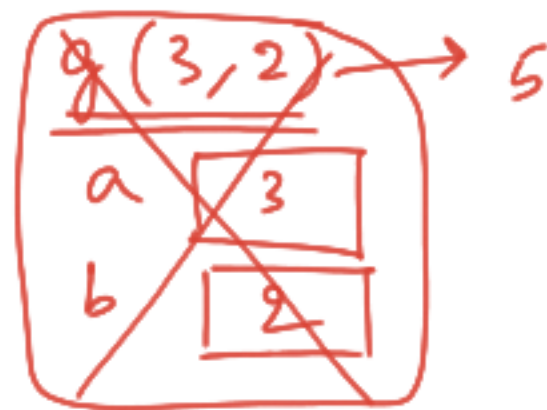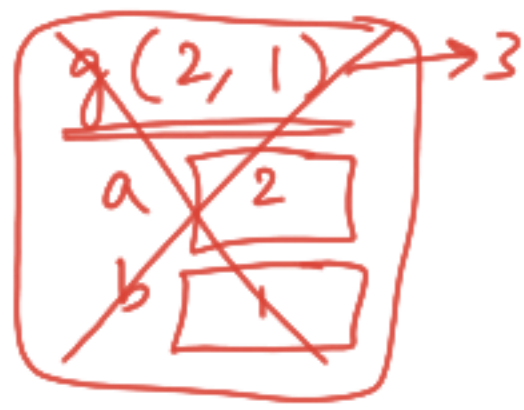
out ["hhhhh"]

Console
g (2, 1)
g (3, 2)
f (h, 5)
h
hh
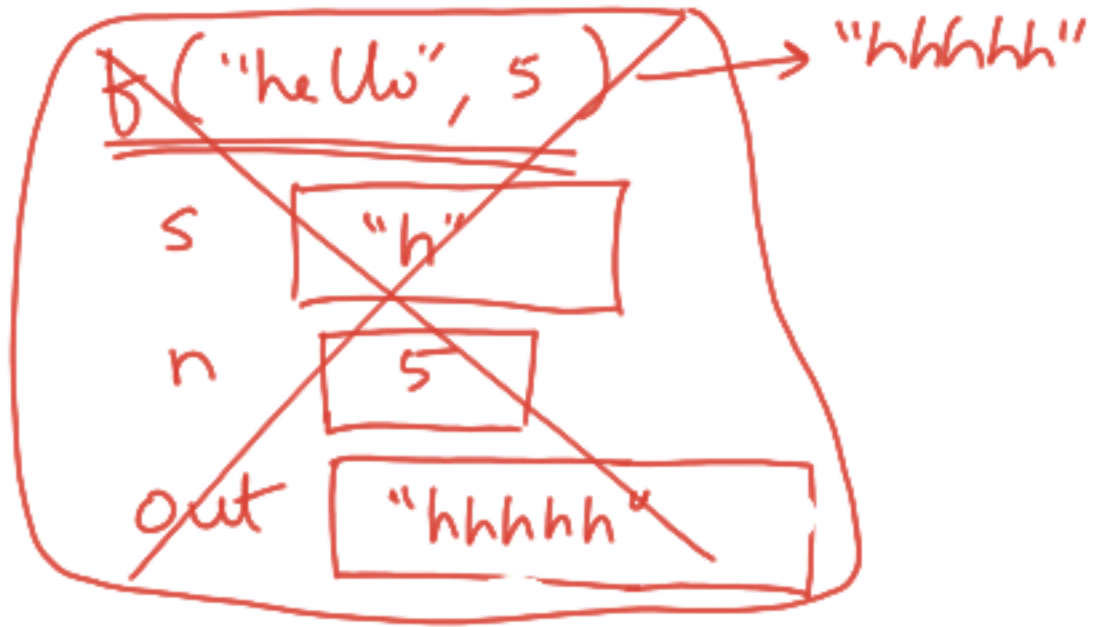hhh
hhhh
hhhhh
output: hhhhh
end

Console
f(0)
f(1)
g(1)
3
f(2)
g(1)
3
g(2)
12
output : 16
end

main
Out | 16

f(0) → 1
n | 0
Out | 1
i | 1

f(1) → 3
n | 1
Out | 3
i | 2

g(1) → 3
a | 1

f(2) → 12
n | 2
Out | 12
i | 3

g(1) → 3
a | 1

g(2) → 4
a | 2