

The Expressive Mr C

ESC101: Foundations of Computing

Purushottam Kar

Announcements

- No ESC101 lecture tomorrow, no ESC101 lab tomorrow
- Extra ESC101 lecture on Saturday 18 Aug, 12noon, L20
- Extra ESC101 lab for sections B10, B11, B12, B14 on Saturday 18 Aug, 2PM, New Core Labs CC-01, CC-02



Recap



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Saw several datatypes int, long, float, double



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Can be printed (printf) and input (scanf)



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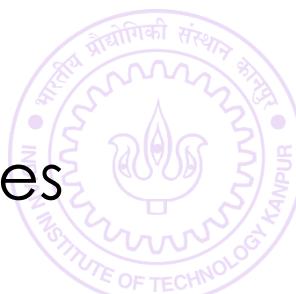
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Be careful about using correct notation in printf, scanf

Use %d for int, %ld for long, %f or %e for float and double

Do not use %d for float – will get strange answers

Can experiment in free time but be careful during labs/exams/quizzes



Today

13



ESC101: Fundamentals
of Computing

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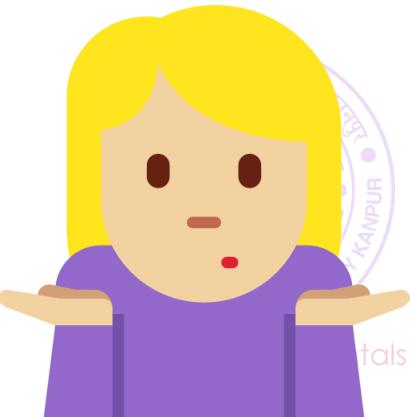
Find out if Mr C went to primary school



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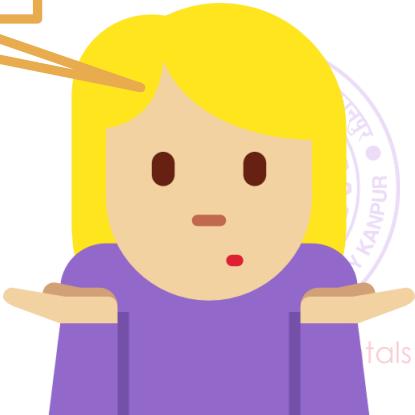
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Does he know the
BODMAS rule?

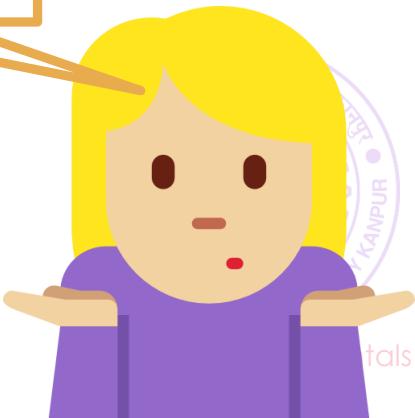


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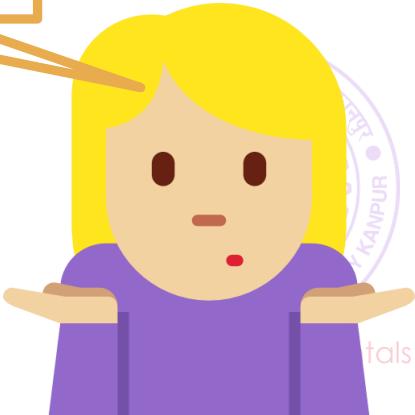
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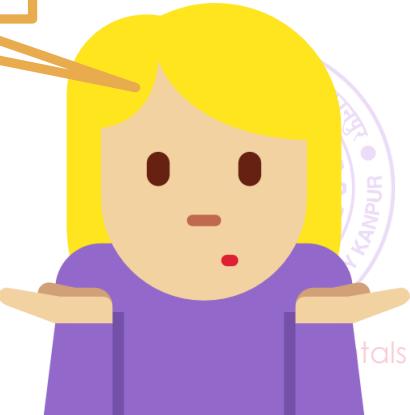
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That would be
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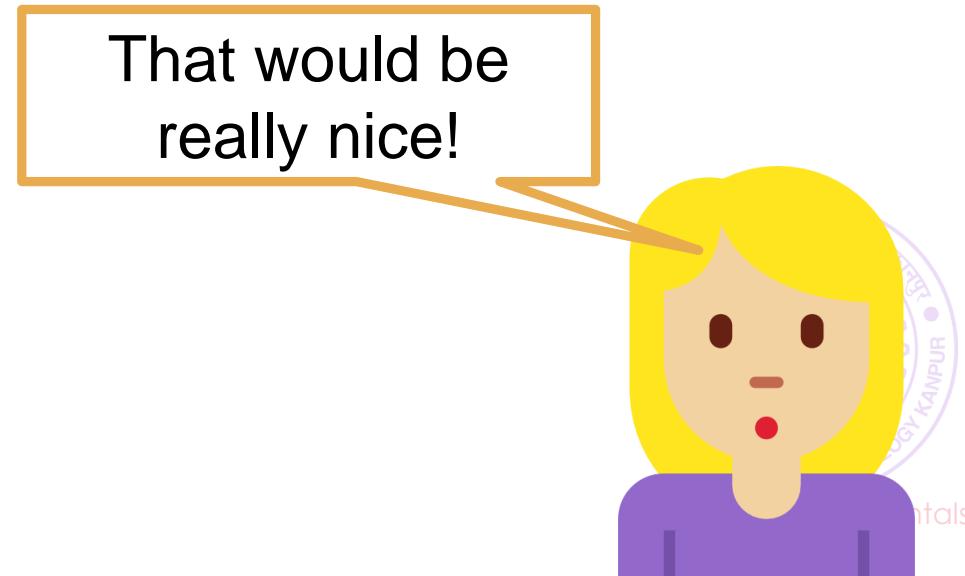
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But first, let us finish the unfinished business from last class ☺

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Math Formulae and Expressions

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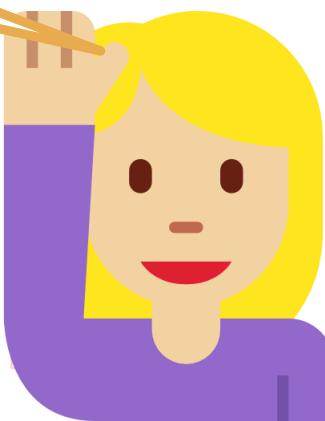
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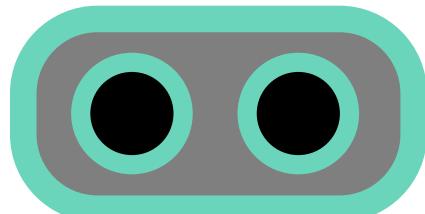
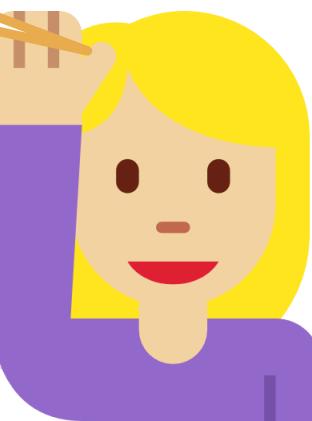
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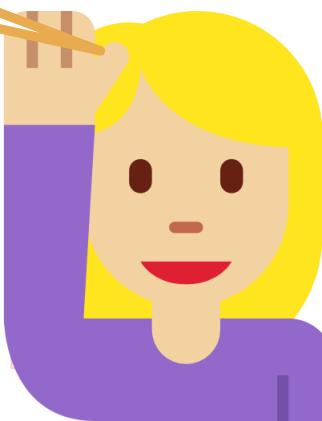
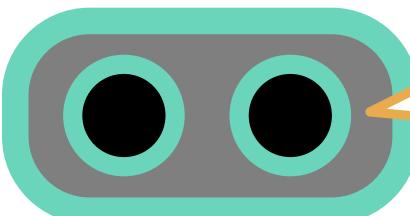
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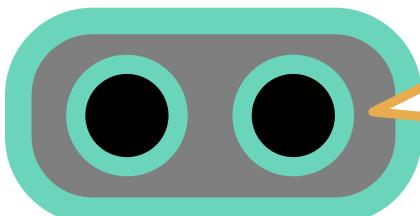
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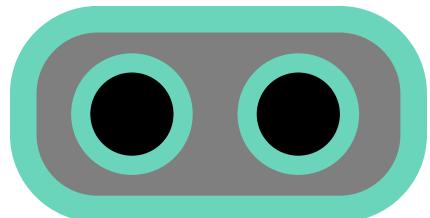
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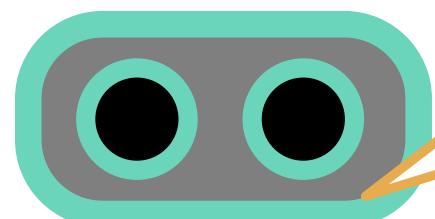
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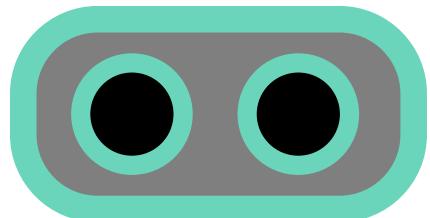
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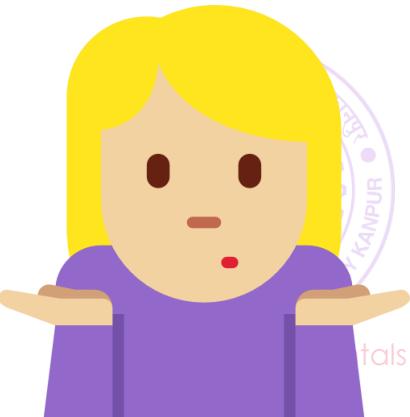
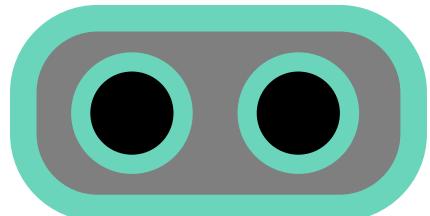
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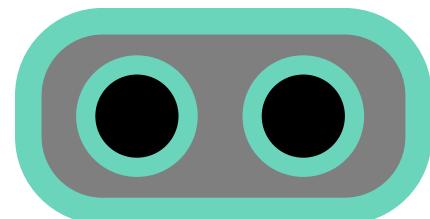
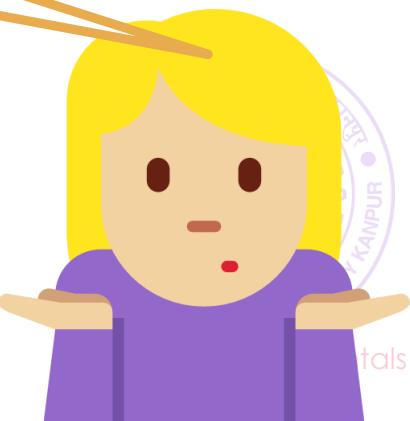
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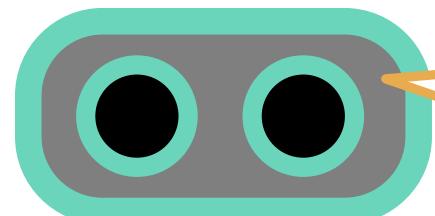
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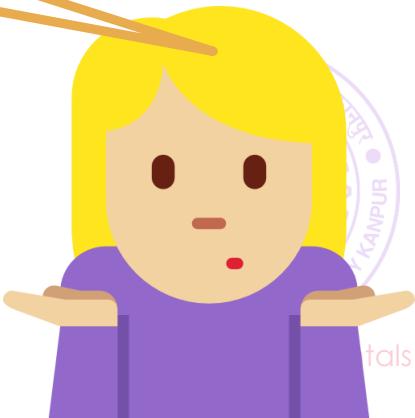
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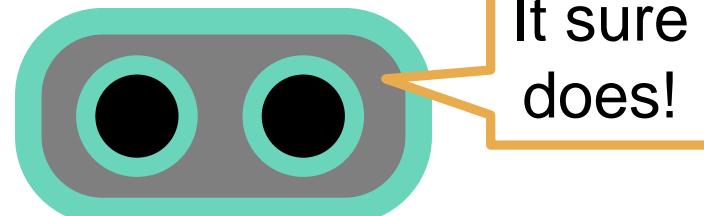
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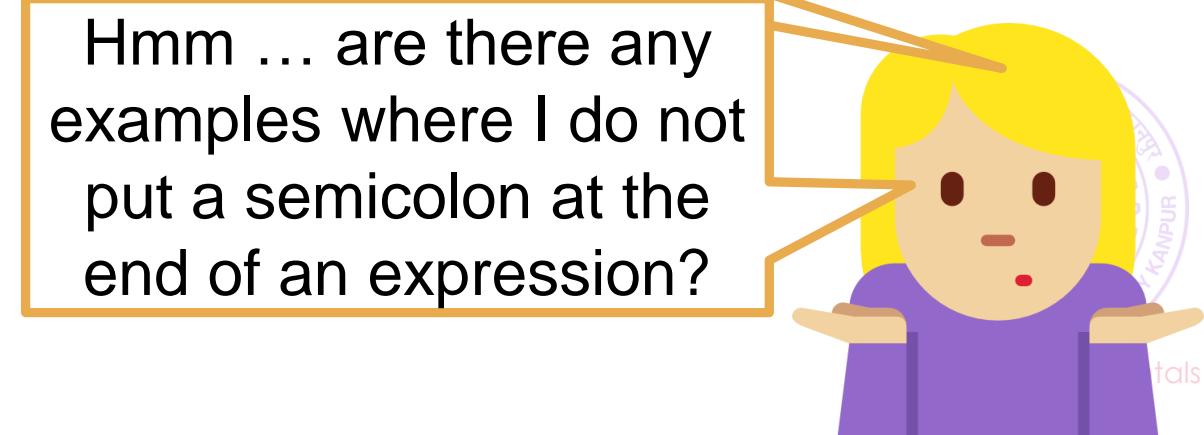
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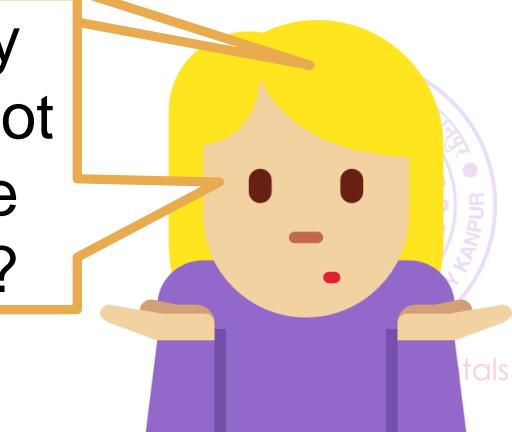
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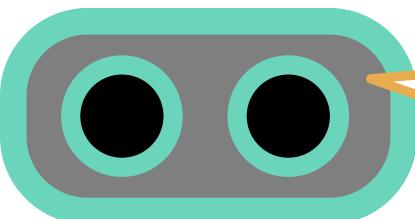
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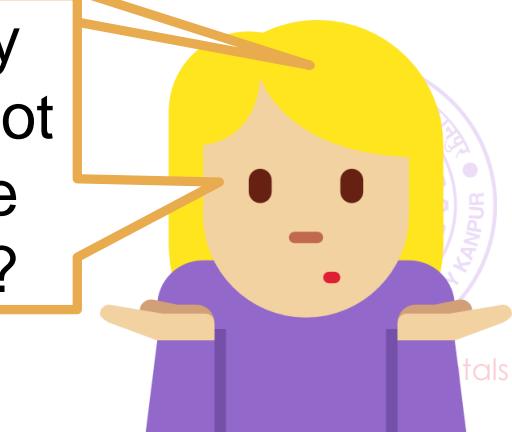
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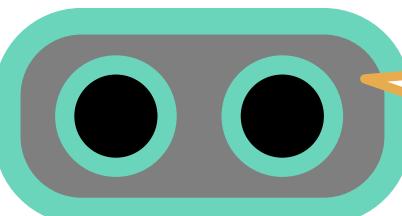
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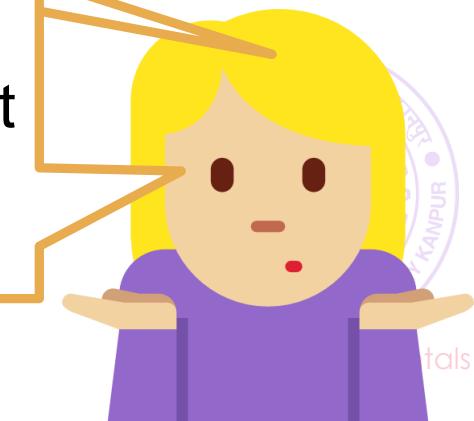
b/5 is an expression
sitting inside a statement



It sure
does!

So I can take any expression,
put a semicolon at the end,
and it becomes a statement?

Hmm ... are there any
examples where I do not
put a semicolon at the
end of an expression?



Expressions and Statements

41

Remember, we use semicolon ; as a full-stop in C

$a = b / 5$ would be an incorrect thing to write in a C program

$a = b / 5;$ is the correct way to divide b by 5 and store result in a

$a = b / 5;$ is called a *statement* in C

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`printf("%d",b/5);`

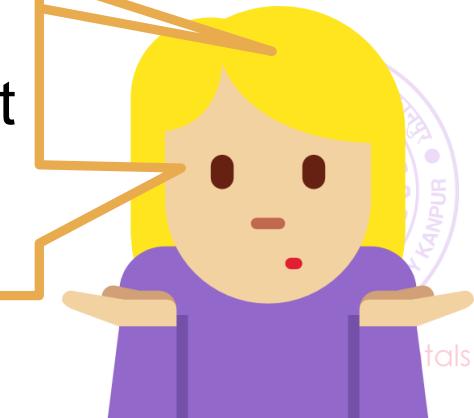
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Correct!
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A Quiz for Mr C

58



ESC101: Fundamentals
of Computing

A Quiz for Mr C

58

Suppose we have int a, b = 5, c = 3, d = 2;



A Quiz for Mr C

Suppose we have `int a, b = 5, c = 3, d = 2;`

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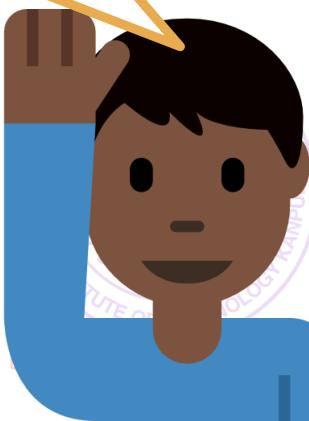
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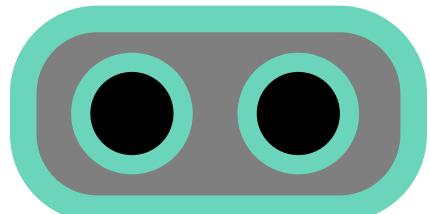
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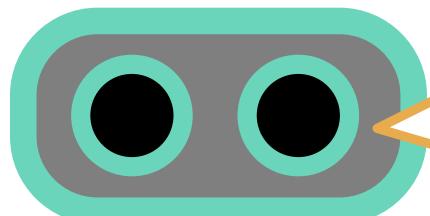
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All binary math operators
`+, -, /, *, %` behave this
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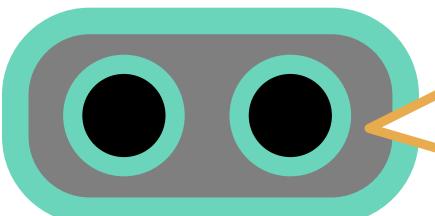
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A teal and grey robot head icon is located in the bottom left corner.

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Brackets and evaluation
go from left to right



A Quiz for Mr C

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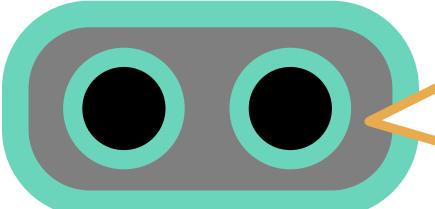
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What if I want the second answer?

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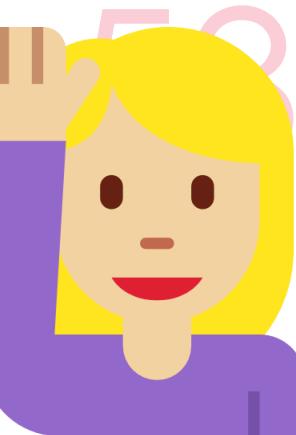
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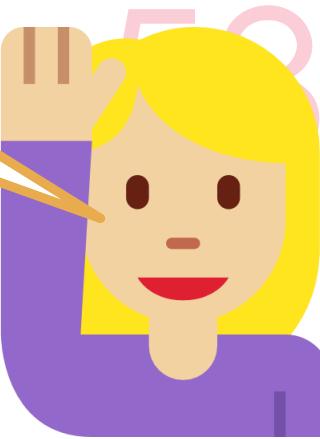
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Use brackets
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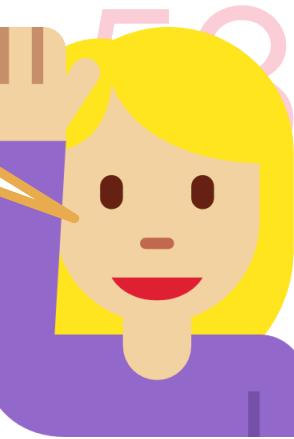
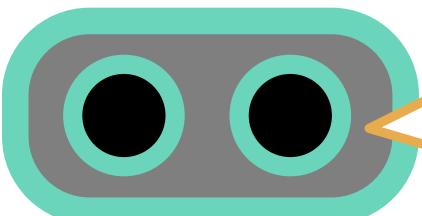
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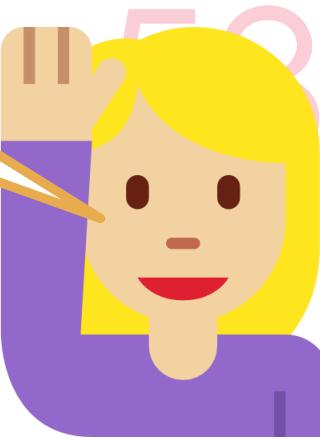
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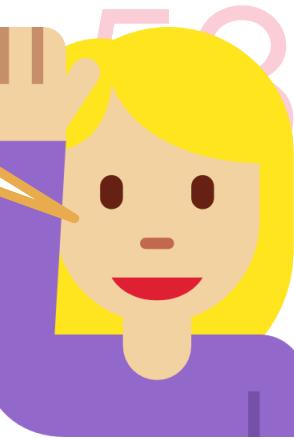
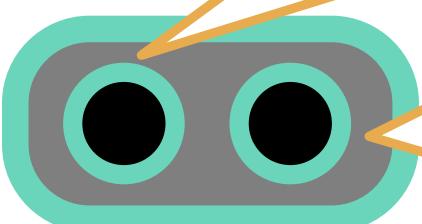


Exactly! It is always a good idea to put
brackets. Less confusion, less chance of error

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Multi-operator expressions

77



Multi-operator expressions

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If multiple operators inside a formula (expression),
BODMAS rule applies



Multi-operator expressions

77

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Operator Name	Symbol/Sign	Associativity
Bracket	()	Left

Multiplication/division/ remainder	* , /, %	Left
---------------------------------------	----------	------

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----------------------	-------	------



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HIGH
PRECEDENCE



LOW
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Multi-operator expressions

77

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Operator Name	Symbol/Sign	Associativity	HIGH PRECEDENCE ↑
Bracket	()	Left	
Multiplication/division/ remainder	* , / , %	Left	
Addition/subtraction	+ , -	Left	
$a + b - c * d \% e / f$ is same as $(a+b) - (((c *d) \% e) / f)$			LOW PRECEDENCE ↓



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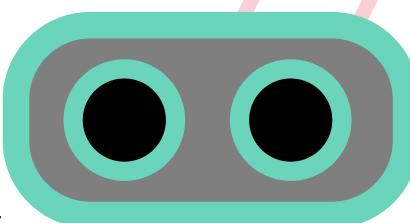
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Any operators
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Multi-operator expressions

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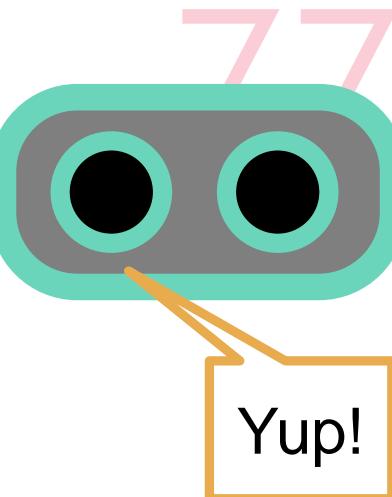
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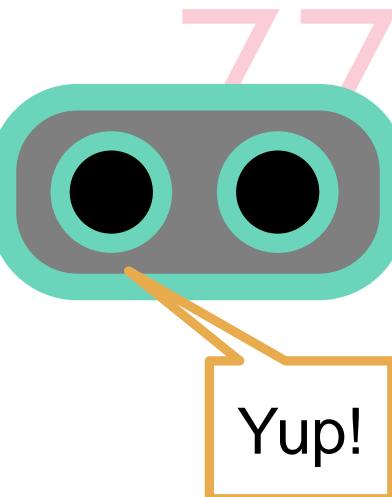
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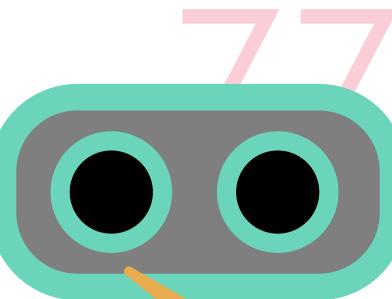
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HIGH
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Aha! = is also
an operator

Any operators
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Associativity?



Multi-operator Multi-type formulae

88



Multi-operator Multi-type formulae⁸⁸

Be very very careful about these



Multi-operator Multi-type formulae

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Mr C will apply his automatic typecasts, but only in the order defined in the BODMAS table in the previous slide



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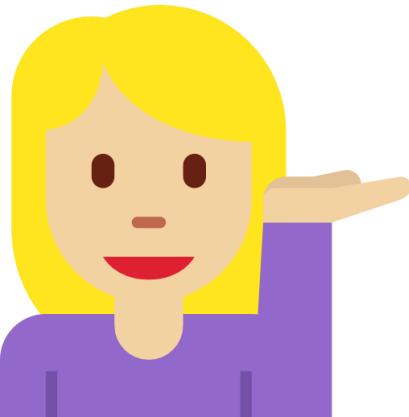


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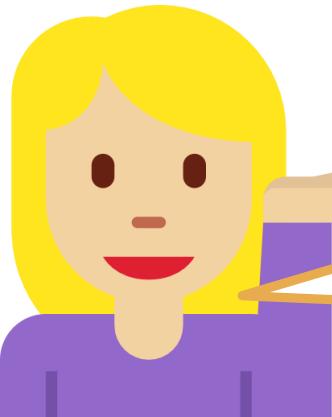


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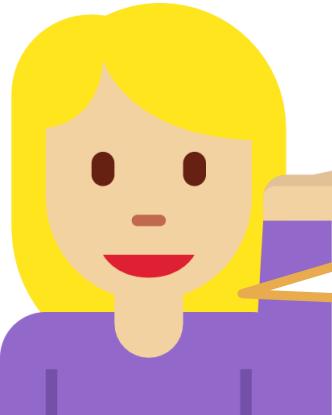
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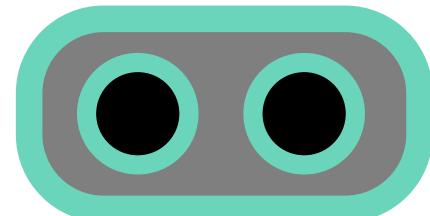
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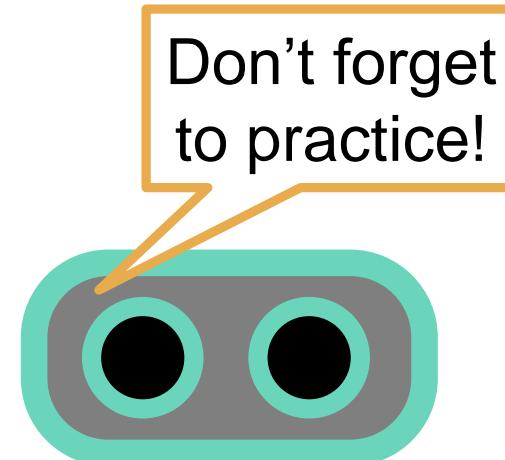
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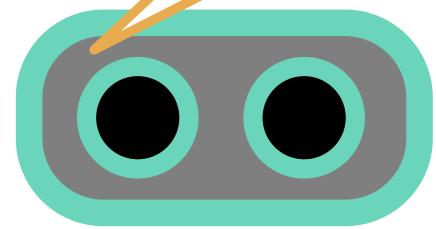
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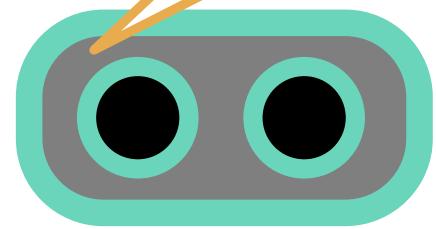
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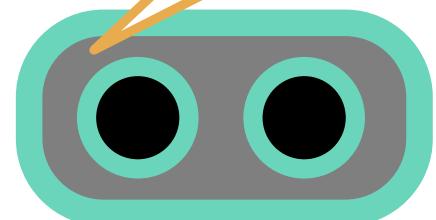
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Also a good idea to typecast yourself.



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Aadhar Leak



Aadhar Leak

- If input is 6744,08/11/1978, password is 674411



Aadhar Leak

- If input is 6744,08/11/1978, password is 674411
- If input is 6744,08/05/1978, password is 674405



Aadhar Leak

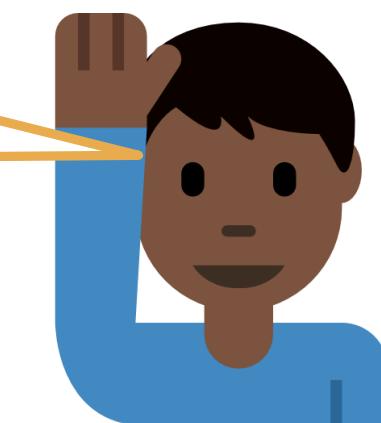
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Just print a 0
before the month!



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int main(){
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#include <stdio.h>
int main(){
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int main(){
    int p, d, m, y;
    scanf("%d,%d/%d/%d",&p,&d,&m,&y);
    printf("%d0%d",p,m);
}
```

Just print a 0
before the month!

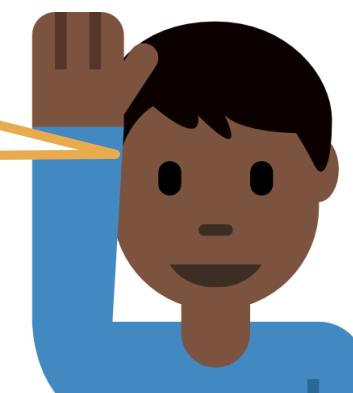


Aadhar Leak

- If input is 6744,08/11/1978, password is 674411
- If input is 6744,08/05/1978, password is 674405

```
#include <stdio.h>
int main(){
    int p, d, m, y;
    scanf("%d,%d/%d/%d",&p,&d,&m,&y);
    printf("%d0%d",p,m);
}
```

Just print a 0
before the month!

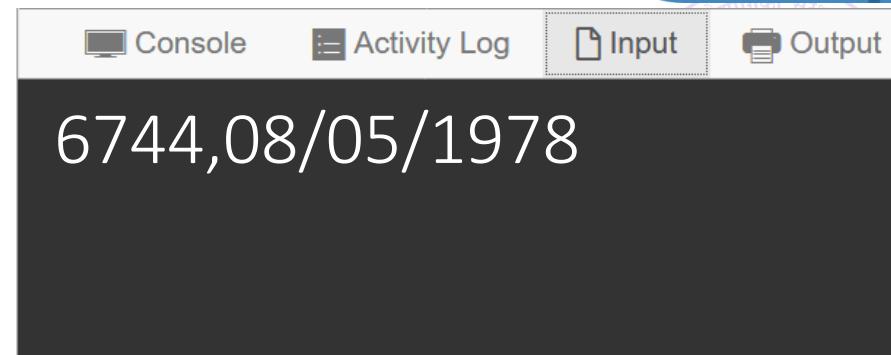


Aadhar Leak

- If input is 6744,08/11/1978, password is 674411
- If input is 6744,08/05/1978, password is 674405

```
#include <stdio.h>
int main(){
    int p, d, m, y;
    scanf("%d,%d/%d/%d",&p,&d,&m,&y);
    printf("%d0%d",p,m);
}
```

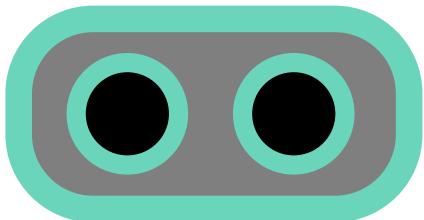
Just print a 0
before the month!



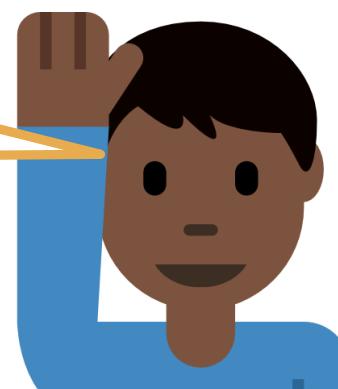
Aadhar Leak

- If input is 6744,08/11/1978, password is 674411
- If input is 6744,08/05/1978, password is 674405

```
#include <stdio.h>
int main(){
    int p, d, m, y;
    scanf("%d,%d/%d/%d",&p,&d,&m,&y);
    printf("%d0%d",p,m);
}
```



Just print a 0
before the month!



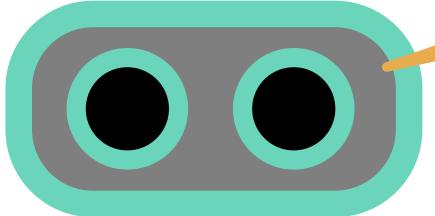
Console Activity Log Input Output

6744,08/05/1978

Aadhar Leak

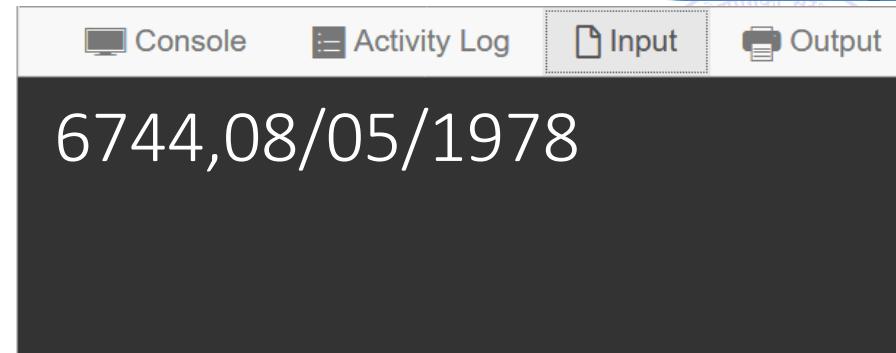
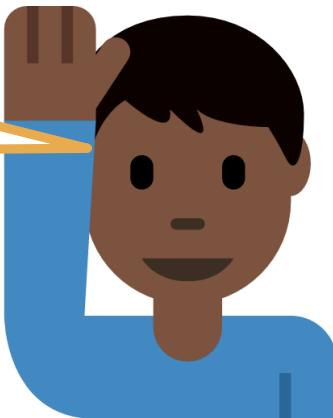
- If input is 6744,08/11/1978, password is 674411
- If input is 6744,08/05/1978, password is 674405

```
#include <stdio.h>
int main(){
    int p, d, m, y;
    scanf("%d,%d/%d/%d",&p,&d,&m,&y);
    printf("%d0%d",p,m);
}
```



674405

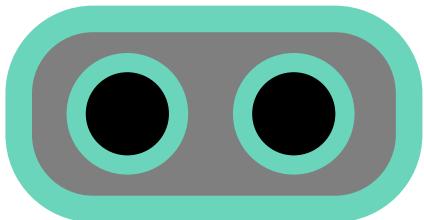
Just print a 0
before the month!



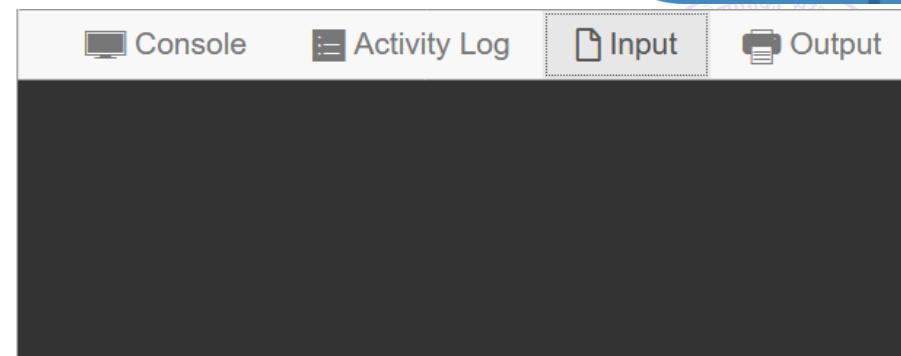
Aadhar Leak

- If input is 6744,08/11/1978, password is 674411
- If input is 6744,08/05/1978, password is 674405

```
#include <stdio.h>
int main(){
    int p, d, m, y;
    scanf("%d,%d/%d/%d",&p,&d,&m,&y);
    printf("%d0%d",p,m);
}
```



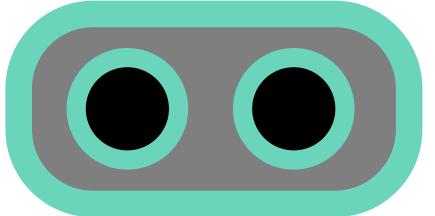
Just print a 0
before the month!



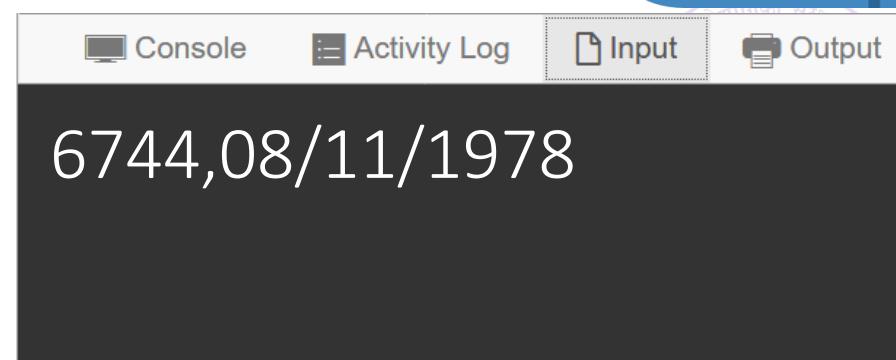
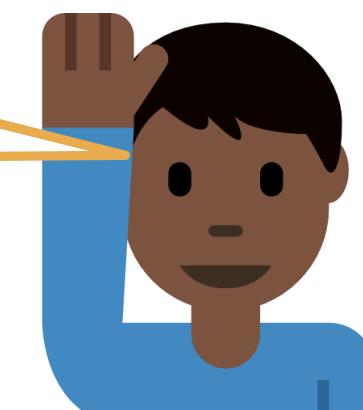
Aadhar Leak

- If input is 6744,08/11/1978, password is 674411
- If input is 6744,08/05/1978, password is 674405

```
#include <stdio.h>
int main(){
    int p, d, m, y;
    scanf("%d,%d/%d/%d",&p,&d,&m,&y);
    printf("%d0%d",p,m);
}
```



Just print a 0
before the month!

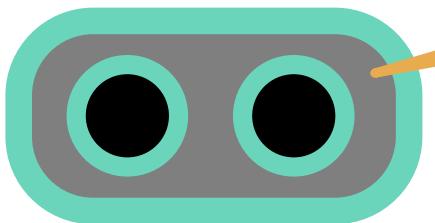


The screenshot shows a programming environment with tabs for Console, Activity Log, Input, and Output. The Input tab is active, displaying the text "6744,08/11/1978". The Output tab shows the result of the program execution, which is "674411".

Aadhar Leak

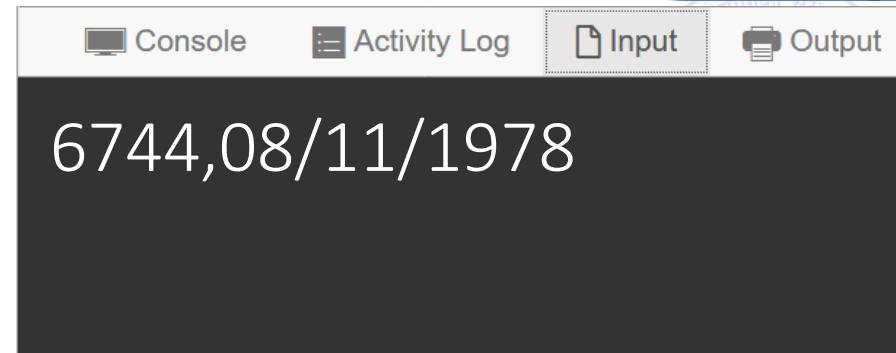
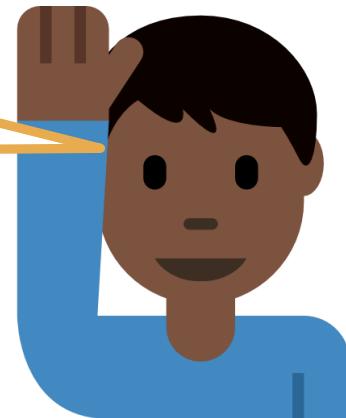
- If input is 6744,08/11/1978, password is 674411
- If input is 6744,08/05/1978, password is 674405

```
#include <stdio.h>
int main(){
    int p, d, m, y;
    scanf("%d,%d/%d/%d",&p,&d,&m,&y);
    printf("%d0%d",p,m);
}
```



6744011

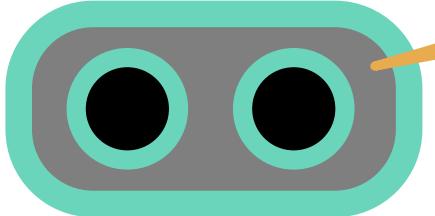
Just print a 0
before the month!



Aadhar Leak

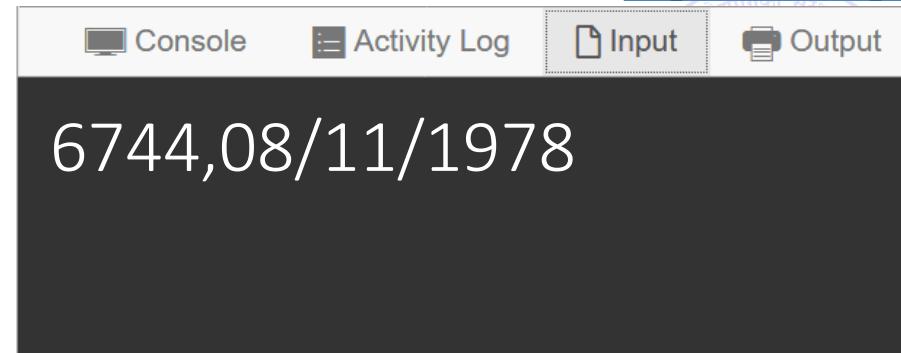
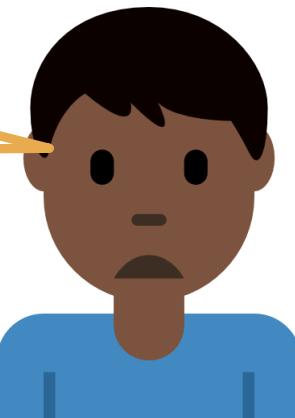
- If input is 6744,08/11/1978, password is 674411
- If input is 6744,08/05/1978, password is 674405

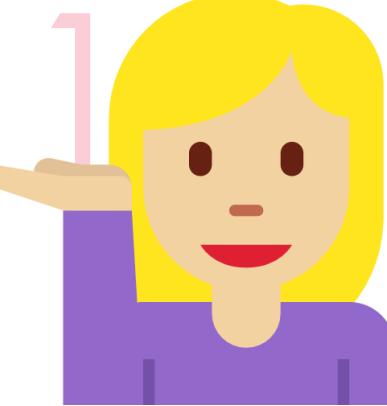
```
#include <stdio.h>
int main(){
    int p, d, m, y;
    scanf("%d,%d/%d/%d",&p,&d,&m,&y);
    printf("%d0%d",p,m);
}
```



6744011

Just print a 0
before the month!

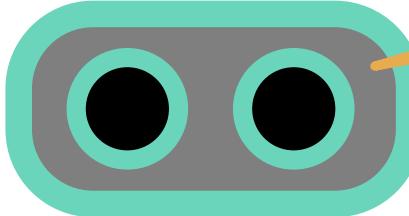




Aadhar Leak

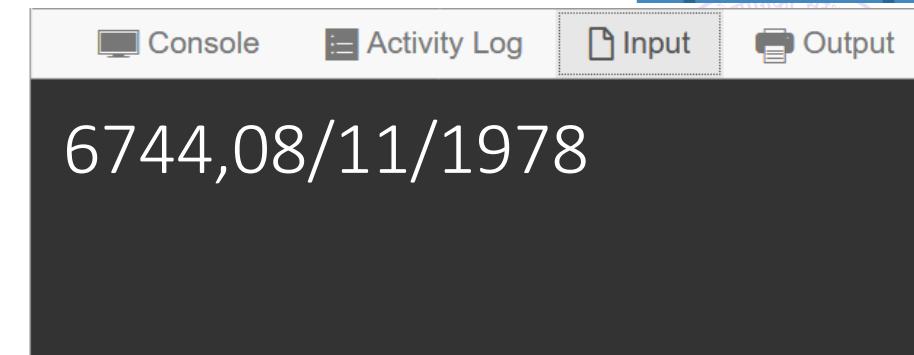
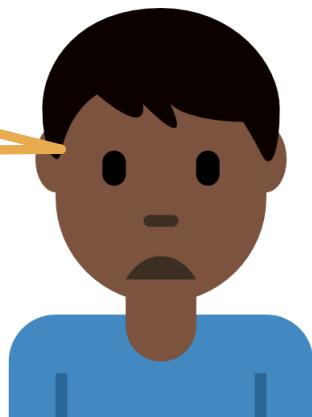
- If input is 6744,08/11/1978, password is 674411
- If input is 6744,08/05/1978, password is 674405

```
#include <stdio.h>
int main(){
    int p, d, m, y;
    scanf("%d,%d/%d/%d",&p,&d,&m,&y);
    printf("%d0%d",p,m);
}
```



6744011

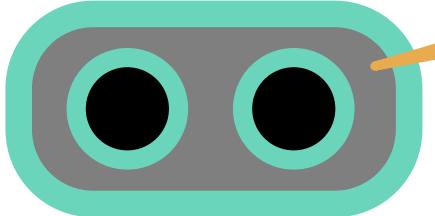
Just print a 0
before the month!



Aadhar Leak

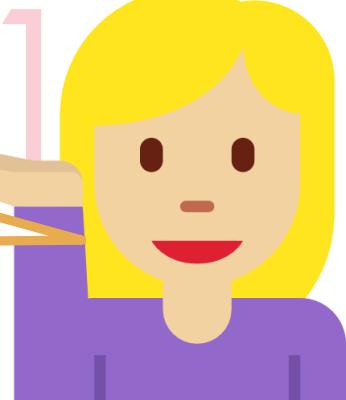
- If input is 6744,08/11/1978, password is 674411
- If input is 6744,08/05/1978, password is 674405

```
#include <stdio.h>
int main(){
    int p, d, m, y;
    scanf("%d,%d/%d/%d",&p,&d,&m,&y);
    printf("%d0%d",p,m);
}
```

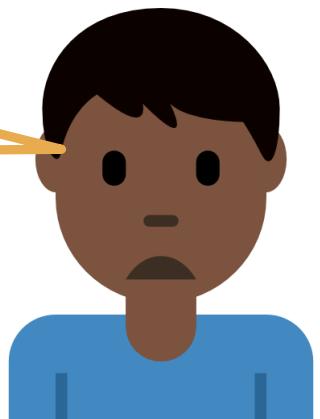


6744011

You want to print a zero
only when the month
number is less than 10



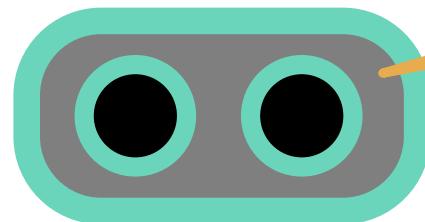
Just print a 0
before the month!



Aadhar Leak

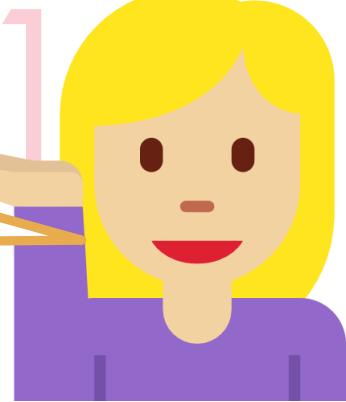
- If input is 6744,08/11/1978, password is 674411
- If input is 6744,08/05/1978, password is 674405

```
#include <stdio.h>
int main(){
    int p, d, m, y;
    scanf("%d,%d/%d/%d",&p,&d,&m,&y);
    printf("%d0%d",p,m);
}
```



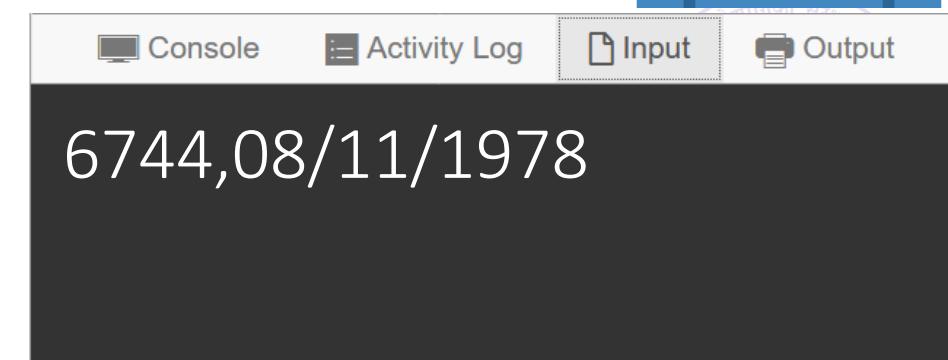
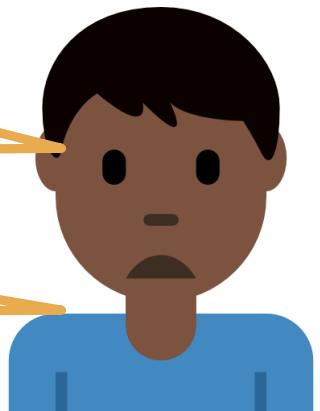
6744011

You want to print a zero
only when the month
number is less than 10



Just print a 0
before the month!

How do I do that?



The much awaited if statement 😊



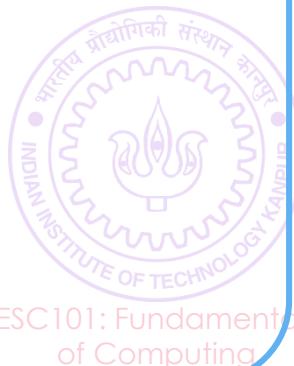
The much awaited if statement 😊 123

HOW WE USUALLY SPEAK TO A HUMAN



The much awaited if statement 😊 123

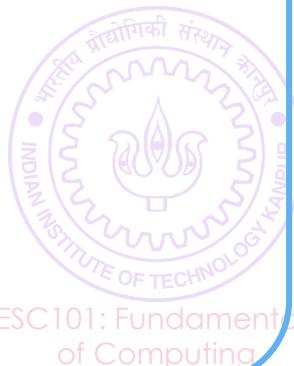
HOW WE USUALLY SPEAK TO A HUMAN



The much awaited if statement 😊 123

HOW WE USUALLY SPEAK TO A HUMAN

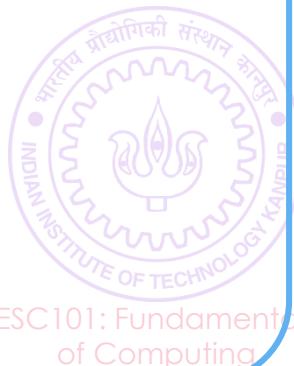
Do you speak English?



The much awaited if statement 😊 123

HOW WE USUALLY SPEAK TO A HUMAN

Do you speak English?
Hello



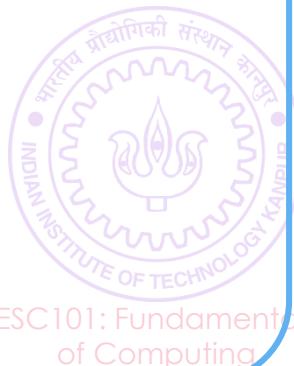
The much awaited if statement 😊 123

HOW WE USUALLY SPEAK TO A HUMAN

Do you speak English?

Hello

m is an integer variable.



The much awaited if statement 😊 123

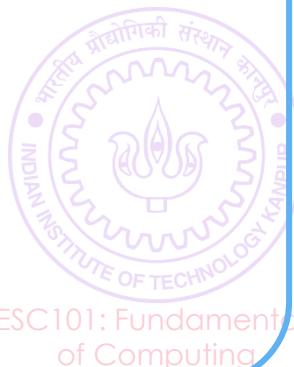
HOW WE USUALLY SPEAK TO A HUMAN

Do you speak English?

Hello

m is an integer variable.

Please ask me for value of m.



The much awaited if statement 😊 123

HOW WE USUALLY SPEAK TO A HUMAN

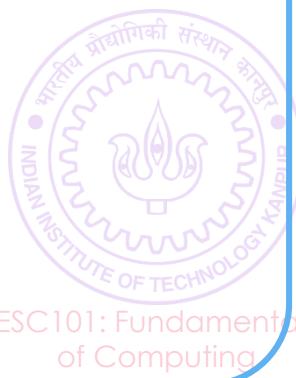
Do you speak English?

Hello

m is an integer variable.

Please ask me for value of m.

If the value of m is less than 10,
then please print a 0



The much awaited if statement 😊 123

HOW WE USUALLY SPEAK TO A HUMAN

Do you speak English?

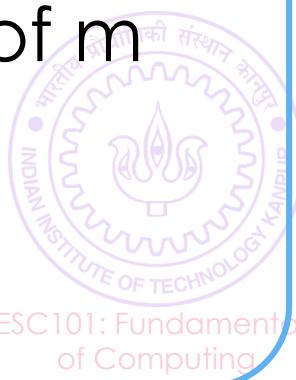
Hello

m is an integer variable.

Please ask me for value of m.

If the value of m is less than 10,
then please print a 0

Now please print value of m



The much awaited if statement 😊 123

HOW WE USUALLY SPEAK TO A HUMAN

Do you speak English?

Hello

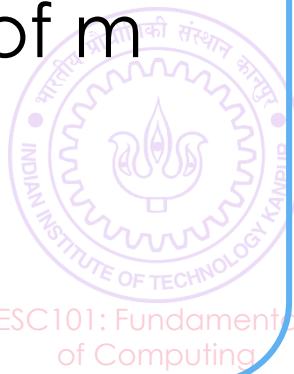
m is an integer variable.

Please ask me for value of m.

If the value of m is less than 10,
then please print a 0

Now please print value of m

Goodbye



The much awaited if statement 😊 123

HOW WE MUST SPEAK TO MR. COMPILER

HOW WE USUALLY SPEAK TO A HUMAN

Do you speak English?

Hello

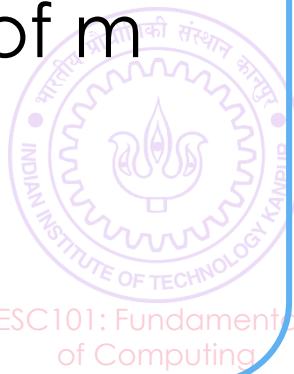
m is an integer variable.

Please ask me for value of m.

If the value of m is less than 10,
then please print a 0

Now please print value of m

Goodbye



The much awaited if statement 😊 123

HOW WE MUST SPEAK TO MR. COMPILER

HOW WE USUALLY SPEAK TO A HUMAN

Do you speak English?

Hello

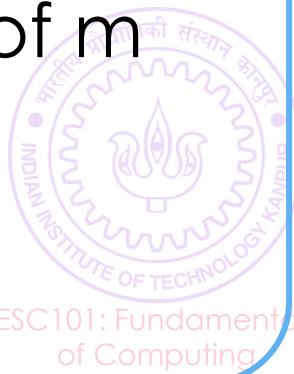
m is an integer variable.

Please ask me for value of m.

If the value of m is less than 10,
then please print a 0

Now please print value of m

Goodbye



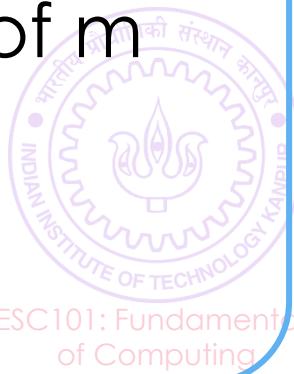
The much awaited if statement 😊 123

HOW WE MUST SPEAK TO MR. COMPILER

```
#include <stdio.h>
```

HOW WE USUALLY SPEAK TO A HUMAN

Do you speak English?
Hello
m is an integer variable.
Please ask me for value of m.
If the value of m is less than 10,
then please print a 0
Now please print value of m
Goodbye



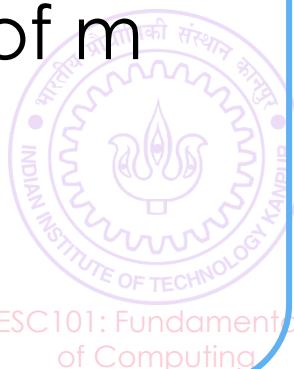
The much awaited if statement 😊 123

HOW WE MUST SPEAK TO MR. COMPILER

```
#include <stdio.h>  
  
int main(){
```

HOW WE USUALLY SPEAK TO A HUMAN

Do you speak English?
Hello
m is an integer variable.
Please ask me for value of m.
If the value of m is less than 10,
then please print a 0
Now please print value of m
Goodbye



The much awaited if statement 😊 123

HOW WE MUST SPEAK TO MR. COMPILER

```
#include <stdio.h>  
  
int main(){  
    int m;
```

HOW WE USUALLY SPEAK TO A HUMAN

Do you speak English?
Hello
m is an integer variable.
Please ask me for value of m.
If the value of m is less than 10,
then please print a 0
Now please print value of m
Goodbye

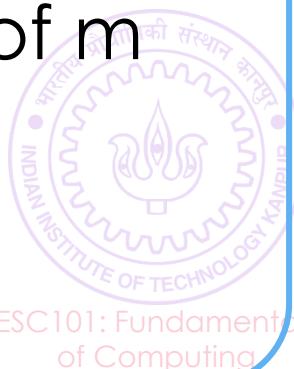
The much awaited if statement 😊 123

HOW WE MUST SPEAK TO MR. COMPILER

```
#include <stdio.h>  
  
int main(){  
    int m;  
    scanf("%d",&m);
```

HOW WE USUALLY SPEAK TO A HUMAN

Do you speak English?
Hello
m is an integer variable.
Please ask me for value of m.
If the value of m is less than 10,
then please print a 0
Now please print value of m
Goodbye



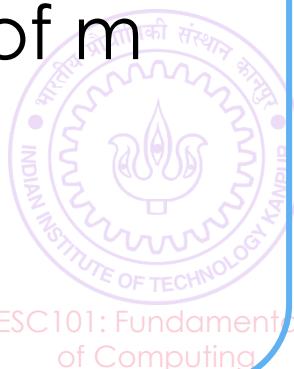
The much awaited if statement 😊 123

HOW WE MUST SPEAK TO MR. COMPILER

```
#include <stdio.h>
int main(){
    int m;
    scanf("%d",&m);
    if(m < 10){
```

HOW WE USUALLY SPEAK TO A HUMAN

Do you speak English?
Hello
m is an integer variable.
Please ask me for value of m.
If the value of m is less than 10,
then please print a 0
Now please print value of m
Goodbye



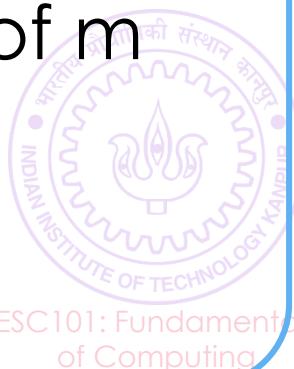
The much awaited if statement 😊 123

HOW WE MUST SPEAK TO MR. COMPILER

```
#include <stdio.h>
int main(){
    int m;
    scanf("%d",&m);
    if(m < 10){
        printf("0");
    }
}
```

HOW WE USUALLY SPEAK TO A HUMAN

Do you speak English?
Hello
m is an integer variable.
Please ask me for value of m.
If the value of m is less than 10,
then please print a 0
Now please print value of m
Goodbye



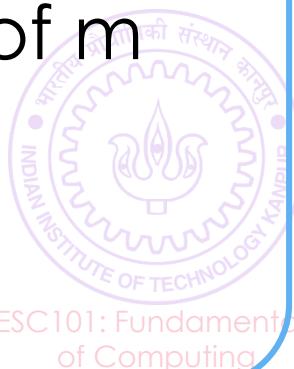
The much awaited if statement 😊 123

HOW WE MUST SPEAK TO MR. COMPILER

```
#include <stdio.h>
int main(){
    int m;
    scanf("%d",&m);
    if(m < 10){
        printf("0");
    }
}
```

HOW WE USUALLY SPEAK TO A HUMAN

Do you speak English?
Hello
m is an integer variable.
Please ask me for value of m.
If the value of m is less than 10,
then please print a 0
Now please print value of m
Goodbye



The much awaited if statement 😊 123

HOW WE MUST SPEAK TO MR. COMPILER

```
#include <stdio.h>
int main(){
    int m;
    scanf("%d",&m);
    if(m < 10){
        printf("0");
    }
    printf("%d",m);
```

HOW WE USUALLY SPEAK TO A HUMAN

Do you speak English?
Hello
m is an integer variable.
Please ask me for value of m.
If the value of m is less than 10,
then please print a 0
Now please print value of m
Goodbye

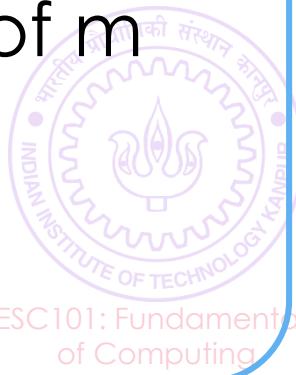
The much awaited if statement 😊 123

HOW WE MUST SPEAK TO MR. COMPILER

```
#include <stdio.h>
int main(){
    int m;
    scanf("%d",&m);
    if(m < 10){
        printf("0");
    }
    printf("%d",m);
}
```

HOW WE USUALLY SPEAK TO A HUMAN

Do you speak English?
Hello
m is an integer variable.
Please ask me for value of m.
If the value of m is less than 10,
then please print a 0
Now please print value of m
Goodbye



The much awaited if statement 😊 123

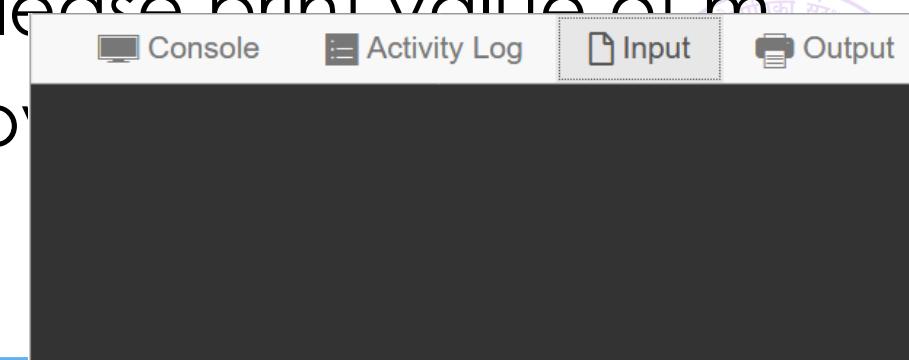
HOW WE MUST SPEAK TO MR. COMPILER

```
#include <stdio.h>
int main(){
    int m;
    scanf("%d",&m);
    if(m < 10){
        printf("0");
    }
    printf("%d",m);
}
```

HOW WE USUALLY SPEAK TO A HUMAN

Do you speak English?
Hello
m is an integer variable.
Please ask me for value of m.
If the value of m is less than 10,
then please print a 0

Now please print value of m
Goodbye



The much awaited if statement 😊 123

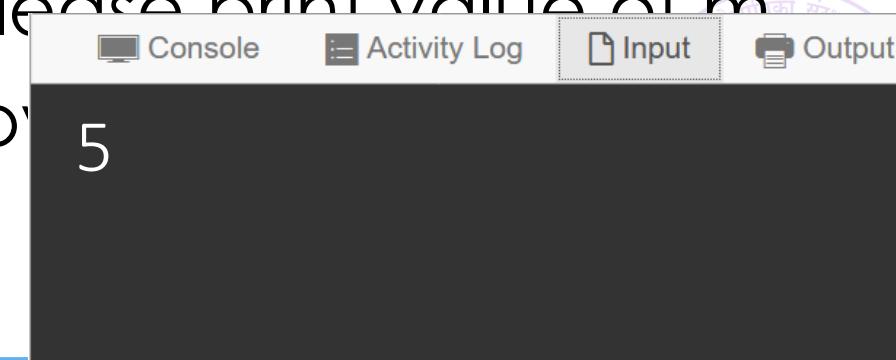
HOW WE MUST SPEAK TO MR. COMPILER

```
#include <stdio.h>
int main(){
    int m;
    scanf("%d",&m);
    if(m < 10){
        printf("0");
    }
    printf("%d",m);
}
```

HOW WE USUALLY SPEAK TO A HUMAN

Do you speak English?
Hello
m is an integer variable.
Please ask me for value of m.
If the value of m is less than 10,
then please print a 0

Now please print value of m

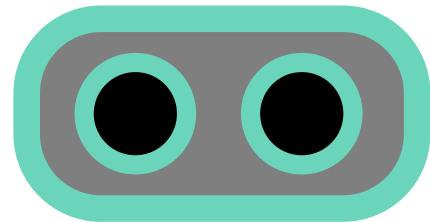


The screenshot shows a software interface with a dark-themed console window. At the top, there are tabs labeled "Console", "Activity Log", "Input" (which is highlighted with a dotted border), and "Output". In the console window, the number "5" is displayed.

The much awaited if statement 😊 123

HOW WE MUST SPEAK TO MR. COMPILER

```
#include <stdio.h>
int main(){
    int m;
    scanf("%d",&m);
    if(m < 10){
        printf("0");
    }
    printf("%d",m);
}
```



HOW WE USUALLY SPEAK TO A HUMAN

Do you speak English?
Hello
m is an integer variable.
Please ask me for value of m.
If the value of m is less than 10,
then please print a 0

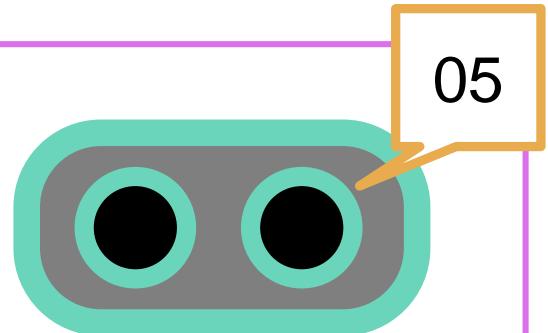
Now please print value of m



The much awaited if statement 😊 123

HOW WE MUST SPEAK TO MR. COMPILER

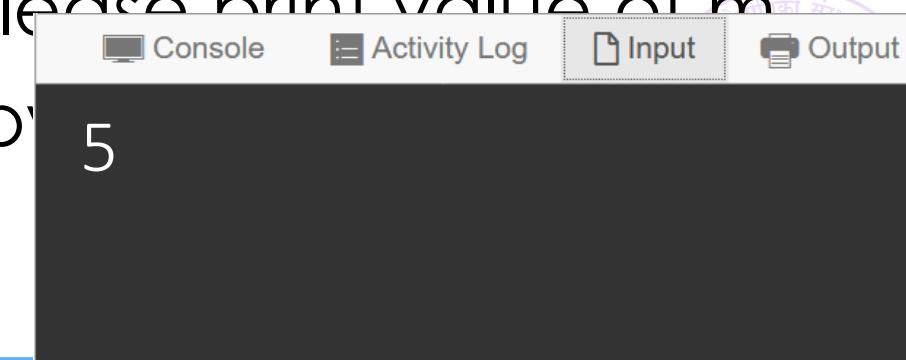
```
#include <stdio.h>
int main(){
    int m;
    scanf("%d",&m);
    if(m < 10){
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    }
    printf("%d",m);
}
```



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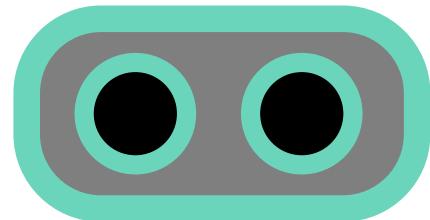
Now please print value of m
Goodbye



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HOW WE MUST SPEAK TO MR. COMPILER

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```

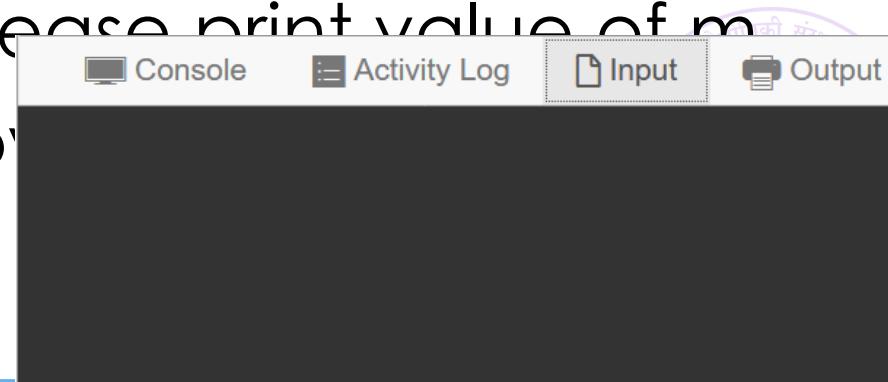


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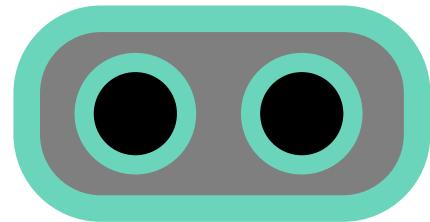
Goodbye



The much awaited if statement 😊 123

HOW WE MUST SPEAK TO MR. COMPILER

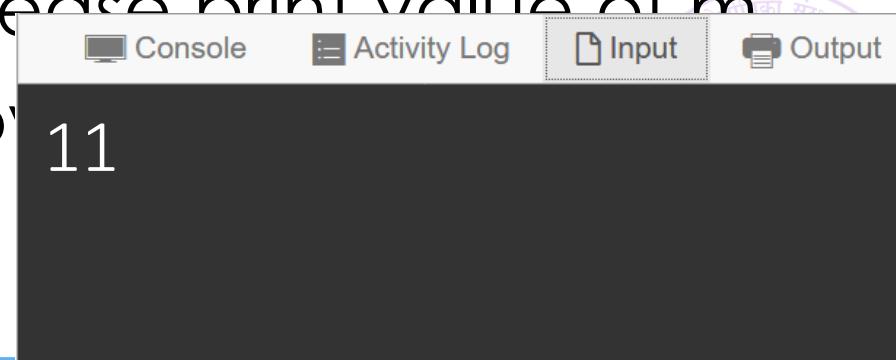
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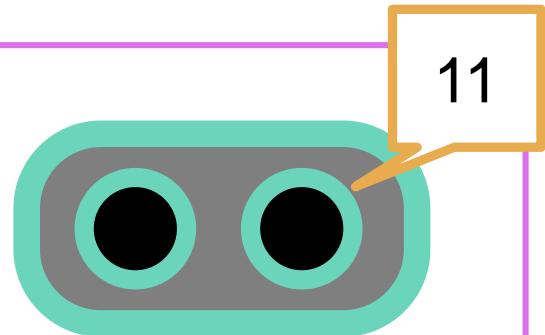
Goodbye

11

The much awaited if statement 😊 123

HOW WE MUST SPEAK TO MR. COMPILER

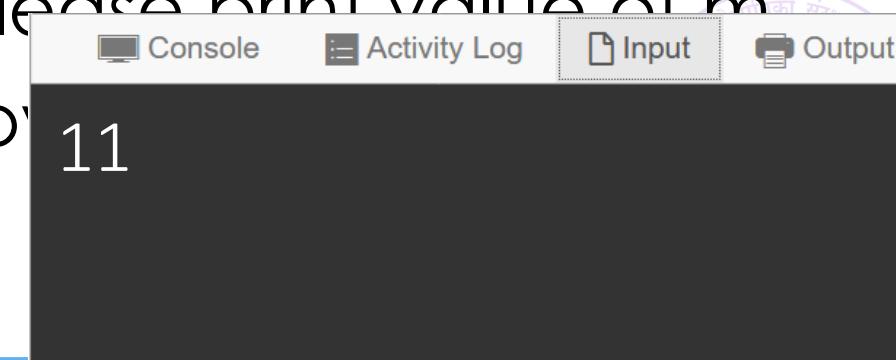
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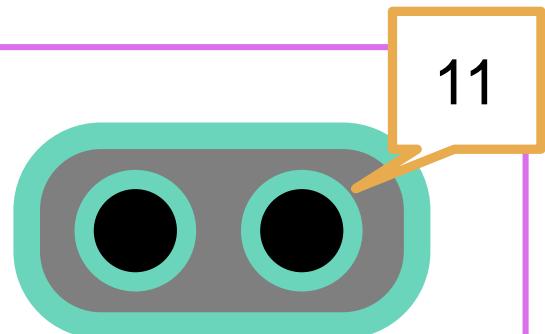
Now please print value of m
Goodbye



The much awaited if statement 😊 123

HOW WE MUST SPEAK TO MR. COMPILER

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#include <stdio.h>
int main(){
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    scanf("%d",&m);
    if(m < 10){
        printf("0")
    }
    printf("%d",m);
}
```



11

This statement is
always executed
whether $m < 10$ or not

HOW WE USUALLY SPEAK TO A HUMAN

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Hello

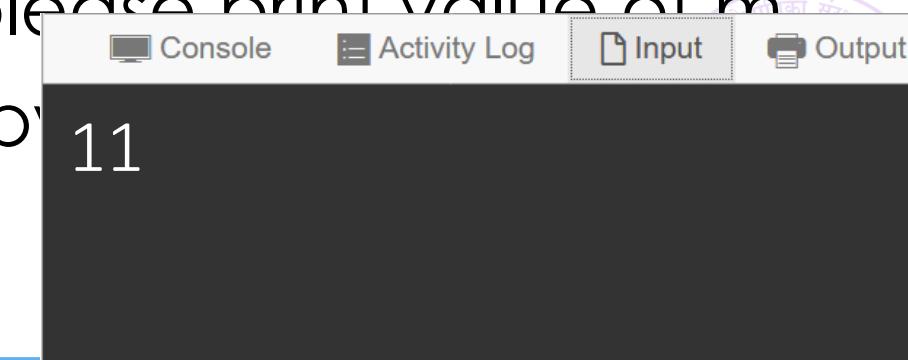
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Now please print value of m

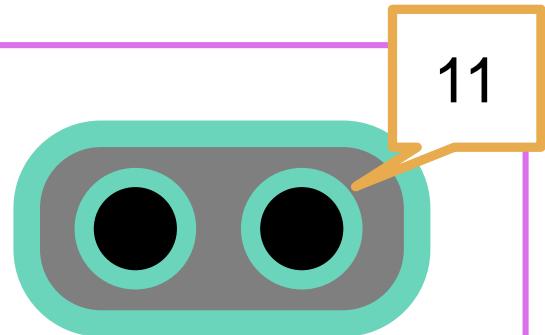
Goodby



The much awaited if statement 😊 123

HOW WE MUST SPEAK TO MR. COMPILER

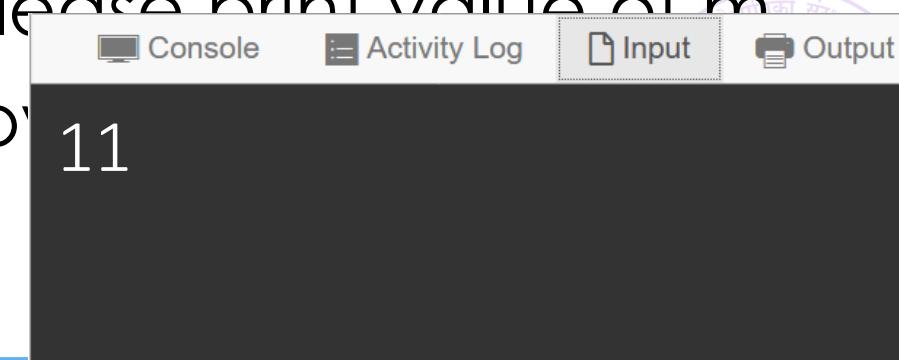
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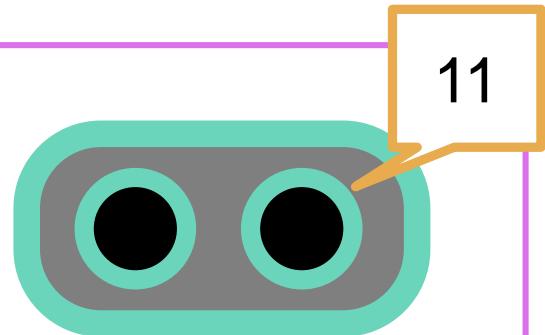
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The much awaited if statement 😊 123

HOW WE MUST SPEAK TO MR. COMPILER

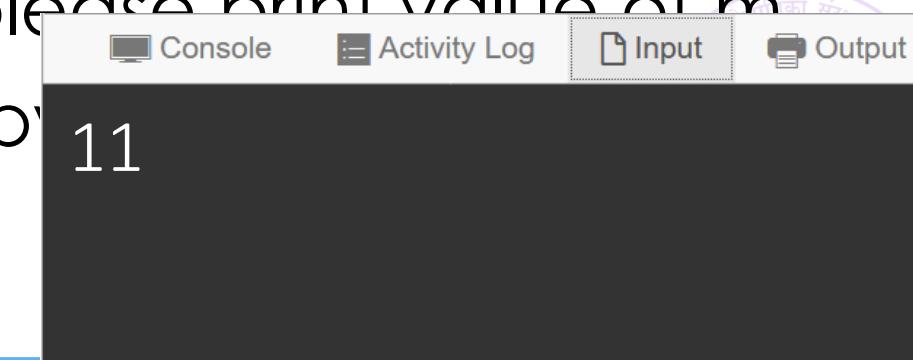
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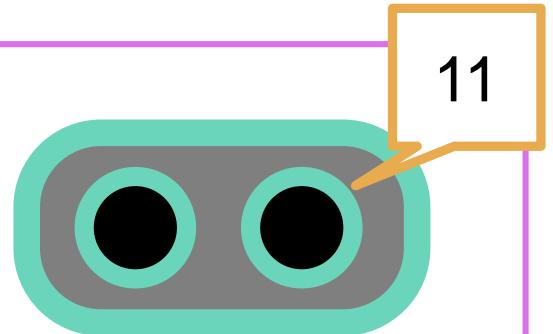
Now please print value of m



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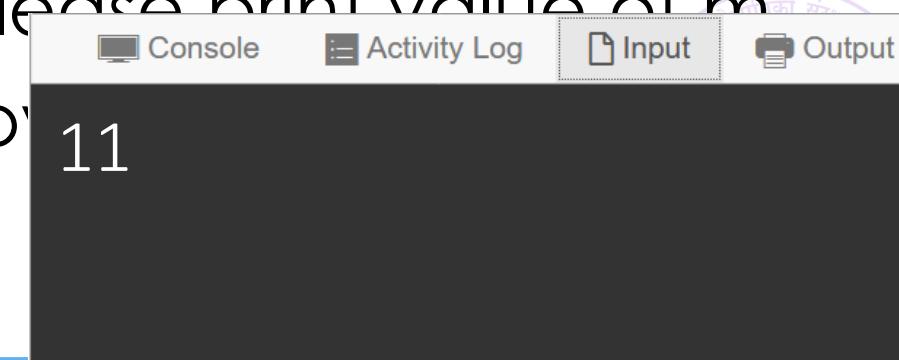


These curly brackets are used to tell Mr. C what all we want him to do if $m < 10$

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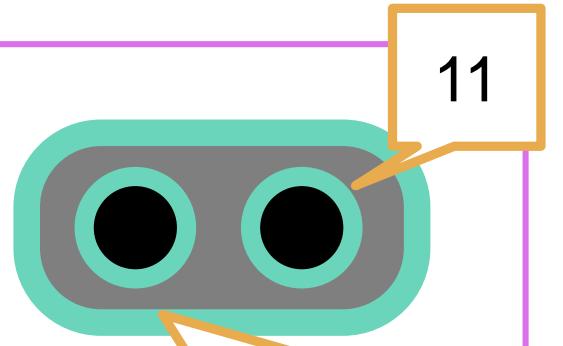
Now please print value of m
Goodbye



The much awaited if statement 😊 123

HOW WE MUST SPEAK TO MR. COMPILER

```
#include <stdio.h>
int main(){
    int m;
    scanf("%d",&m);
    if(m < 10){
        printf("0");
    }
    printf("you");
}
```



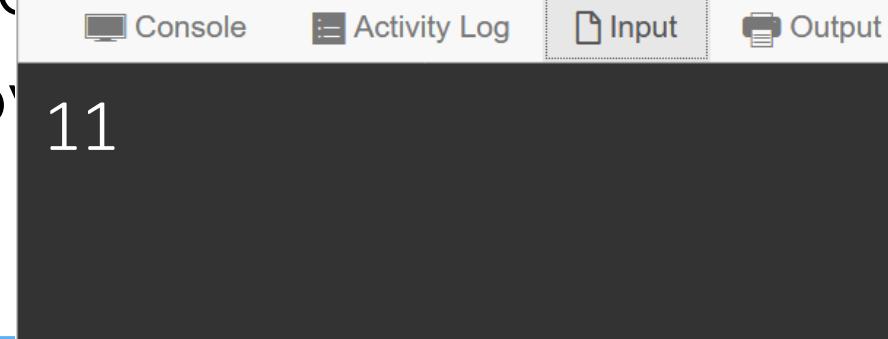
11

Essential in case you want me to do many things if $m < 10$, not just print one 0

HOW WE USUALLY SPEAK TO A HUMAN

Do you speak English?
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 m is an integer variable.
If value of m is less than 10, then please print a 0

Now please print value of m .
Goodbye

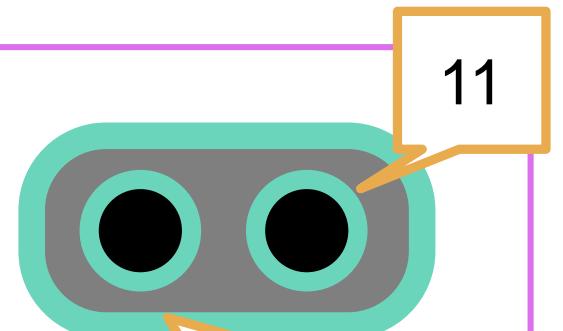


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```



11

Essential in case you want me
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Missing brackets - common mistake

These curly brackets are
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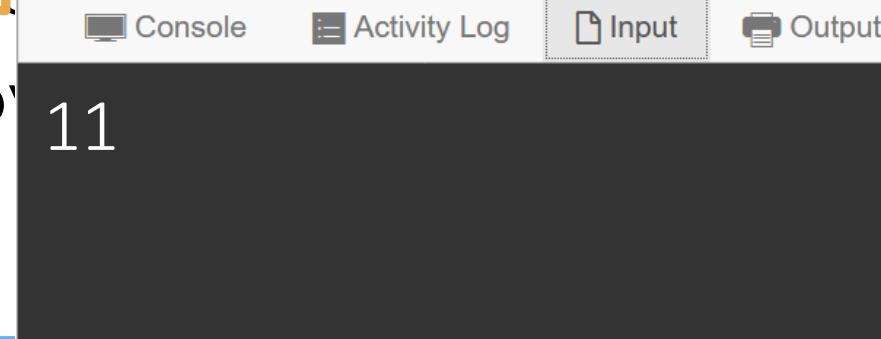
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Please print a 0

Goodbye

case print value of m

11



On Saturday Lecture

157



ESC101: Fundamentals
of Computing

On Saturday Lecture

157

We asked Mr. C to do something special if $m < 10$



On Saturday Lecture

We asked Mr. C to do something special if $m < 10$

We asked him to print an extra 0 in front of the month



On Saturday Lecture

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Can we ask him to do something special if m is not < 10



On Saturday Lecture

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What if someone by mistake enters a negative number?



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What if someone by mistake enters a negative number?

What if we want something special if $m = 10$



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Seven days in a week Monday = 1, Sunday = 7



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Can we ask him to do something special if m is not < 10

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Seven days in a week Monday = 1, Sunday = 7

Can we print Weekday if input is 1 – 5 and Weekend if input is 6 – 7?



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Can we print if the input is a day on which there is an ESC101 lecture?

You are now ready to solve the bonus problem (all of you!)

