

Learn to Program

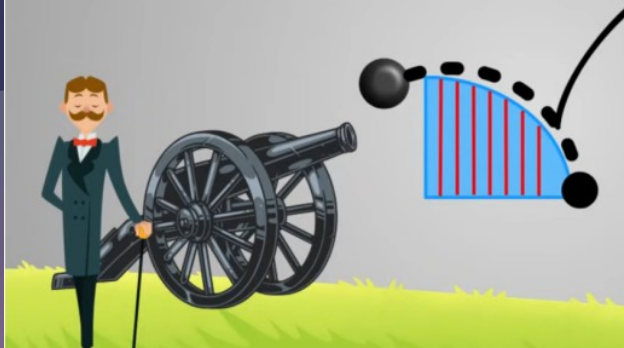
For the Induction Programme, BSE 2025/26 OUSL
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Recap: Hardware, Software/program

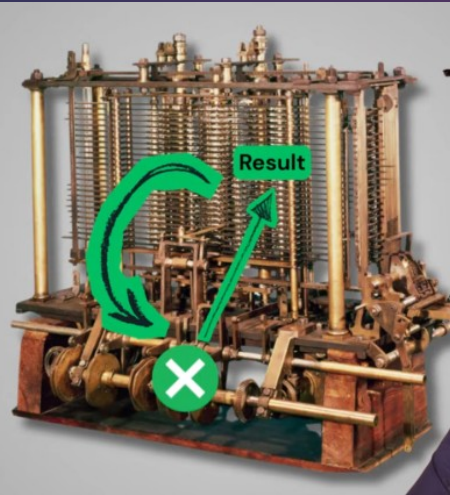
Euler MacLaurin Formula

$$S^{(0)} = \frac{B_0}{0!} \int_{x=0}^n f(x) dx + \frac{B_1}{1!} [f(n) - f(0)] + \frac{B_2}{2!} [f^{(1)}(n) - f^{(1)}(0)] + \dots$$



Fetch
↓
Compute
↓
Loop

Store
(RAM)



$$(2 * x^{**3} - 2)$$

x/10 13/5 → 2.6 float division

floor division 13//5 → 2

remainder (modulo) div 13%5 → 3

sqrt(48) sin(x) cos(y)

Number of Operations	Variables used open	Variables involving results	Indication of change in the value of any Variable	Statement of Results	Den.	$\frac{1}{2} \frac{1}{2} \frac{1}{2}$	$\frac{1}{2} \frac{1}{2} \frac{1}{2}$	$\frac{1}{2} \frac{1}{2} \frac{1}{2}$	$\frac{1}{2} \frac{1}{2} \frac{1}{2}$	$\frac{1}{2} \frac{1}{2} \frac{1}{2}$	$\frac{1}{2} \frac{1}{2} \frac{1}{2}$	$\frac{1}{2} \frac{1}{2} \frac{1}{2}$	$\frac{1}{2} \frac{1}{2} \frac{1}{2}$	$\frac{1}{2} \frac{1}{2} \frac{1}{2}$	$\frac{1}{2} \frac{1}{2} \frac{1}{2}$	$\frac{1}{2} \frac{1}{2} \frac{1}{2}$	$\frac{1}{2} \frac{1}{2} \frac{1}{2}$	$\frac{1}{2} \frac{1}{2} \frac{1}{2}$	$\frac{1}{2} \frac{1}{2} \frac{1}{2}$
1	$V_1 = V_1$	$V_1 = V_1$	$V_1 = V_1$	$= 2x$	1	2	x	2x	2x	2x									
2	$V_2 = V_1$	$V_2 = V_1$	$V_2 = V_1$	$= 2x - 1$	1	-	-	$2x - 1$	$2x - 1$	$2x - 1$									
3	$V_3 = V_2$	$V_3 = V_2$	$V_3 = V_2$	$= 2x - 1$	-	-	0	0	0	0									
4	$V_4 = V_3$	$V_4 = V_3$	$V_4 = V_3$	$= \frac{1}{2} \frac{2x-1}{2x-1}$	2	-	-	-	-	-									
5	$V_5 = V_4$	$V_5 = V_4$	$V_5 = V_4$	$= \frac{1}{2} \frac{2x-1}{2x-1} = \frac{1}{2}$	-	-	-	-	-	-									
6	$V_6 = V_5$	$V_6 = V_5$	$V_6 = V_5$	$= \frac{1}{2} \frac{2x-1}{2x-1} = \frac{1}{2}$	1	-	x	-	-	-									

Recap: Mathematical expressions

Evaluate:

$$1.2 + (2.4 - (3.6/3))$$

Answer: 2.4



1.1 Mathematical expressions with constants

Evaluate:

$$-x + (a - 1)*6$$

Answer: 31



1.2 Mathematical expressions with variables

Note that the computer marking is sensitive to where you put space character and where not. This example shows the correct use:

$$2*a*(3*x + 5) - 5*b/(y - 9)$$

$$3 * x + 5$$

- no space before or after * and /

- always a space before and after + and - unless unary plus and minus, eg. $a = +1.1$ or $b = -1.1$)

- no space after (or before)

2. Variables, the assignment Operator

main.py

```
1 print("Calculates the area of a rectangular triangle")
2 x = 4.2
3 y = 5.0
4
5 # TODO
6 # Enter the missing code line below
7
8 # Hint: a = ...
9
10 print("x = ", x)
11 print("y = ", y)
12 print("The area = ", a)
```

variable ← value

variable ← expression of values

variable ← expression of values
and variables

'=' is the assignment operator

The variable a has a value of 5 and the variable x has a value -7.

Is this True or False? $x + 2*a = 12$

True

False

'==' test for equality (comes later)

2. Basic input

2.4 VPL Fahrenheit to Centigrade

main.py

```
1 f = float(input("Type a temperature in Fahrenheit: "))
2
3 print("Temperature in Fahrenheit:", f)
4
5 # TODO : Convert Fahrenheit to Centigrade
6
7
8 print("Temperature in Centigrade:", c)
9
```

'==' test for equality (comes later)

Question time!