

Simpson's 3/8th Rule is a Numerical technique to find the definite integral of a function within a given interval. It's so called because the value 3/8 appears in the formula.

The function is divided into many sub-intervals and each interval is approximated by a cubic curve. And the area is then calculated to find the integral. The more is the number of sub-intervals used, the better is the approximation.

FORMULA:

$$\int_a^b f(x)dx = \frac{3h}{8}(f_0 + 3f_1 + 3f_2 + 2f_3 + 3f_4 + 3f_5 + 2f_6 + \dots + 3f_{n-1} + f_n)$$

where,

$f_i = a + ih$ where i starts from 0 and goes to n

NOTE: The no. of sub-intervals n , should be a multiple of 3 for this method.

PROGRAM:

```

/*****
*****SIMPSON'S 3/8 RULE*****
*****/
#include<stdio.h>
#include<math.h>
double f(double x){
    return x*x;
}
main(){
    int n,i;
    double a,b,h,x,sum=0,integral;
    printf("\nEnter the no. of sub-intervals(MULTIPLE OF 3): ");
    scanf("%d",&n);
    printf("\nEnter the initial limit: ");
    scanf("%lf",&a);
    printf("\nEnter the final limit: ");
    scanf("%lf",&b);
    h=fabs(b-a)/n;
    for(i=1;i<n;i++){
        x=a+i*h;
        if(i%3==0){
            sum=sum+2*f(x);
        }
        else{
            sum=sum+3*f(x);
        }
    }
    integral=(3*h/8)*(f(a)+f(b)+sum);
    printf("\nThe integral is: %lf\n",integral);
}

```

OUTPUT:

```
Enter the no. of sub-intervals(MULTIPLE OF 3): 99
Enter the initial limit: 0
Enter the final limit: 3
The integral is: 9.000000
```



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I'm a physicist specializing in computational material science with a PhD in Physics from Friedrich-Schiller University Jena, Germany. I write efficient codes for simulating light-matter interactions at atomic scales. I like to develop Physics, DFT, and Machine Learning related apps and software from time to time. Can code in most of the popular languages. I like to share my knowledge in Physics and applications using this Blog and a YouTube channel.

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