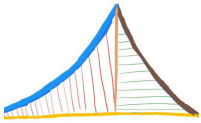
Algebra



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About this Book

This book introduces quadratic equations, complex numbers and other concepts in algebra. All problems in the book are from NCERT mathematics textbooks from Class 9-12. Exercises are from CBSE and JEE exam papers.

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April 14, 2025

Github: https://github.com/gadepall/algebra

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1 Integers

1.0.1 Do the following addition through a C program

$$17 + 23$$

Solution:

```
//Code by GVV Sharma
//Adding two integers
//April 14, 2025
#include <stdio.h>

//begin main function
int main(void)
{
//Declaring integers
int a = 17, b = 23;
//printing the sum
printf("%d\n",a+b);
        return 0;
}
//end main function
```

1.0.2 Do the following subtraction through a C program

$$7 - 9$$

Solution:

```
//Code by GVV Sharma
//Adding negative integer
//April 14, 2025
#include <stdio.h>

//begin main function
int main(void)
{
//Declaring integers
int a = 7, b = 9;
//printing the difference
printf("%d\n",a-b);
        return 0;
}
//end main function
```

Compute the following

1.0.3 $(-75) + 18$

1.0.4 $19 + (-25)$

1.0.5 $27 + (-27)$

1.0.6 $(-20) + 0$

1.0.7 $(-35) + (-10)$

1.0.8 $(-10) + 3$

1.0.9 $17 - (-21)$

In a quiz, team A scored $a_1 = -40, a_2 = 10, a_3 = 0$ and team B scored $b_1 = 10, b_2 = 0, b_3 = -40$ in three successive rounds.

1.0.10 If the total scores are

$$a = a_1 + a_2 + a_3 \tag{1.0.10.1}$$

$$b = b_1 + b_2 + b_3 \tag{1.0.10.2}$$

which team scored more?

Solution:

```
//Code by Harini
//February 23, 2025
//Revised by GVV Sharma
//April 14, 2025
//add two sets of numbers and compare
#include <stdio.h>

//begin main function
int main() {
// first team scores
 int a1=-40,a2=10,a3=0;
// second team scores
 int b1=10,b2=0,b3=-40;

 //declaring scores variables
int a,b;
 //sum of scores
 a=a1+a2+a3;
 b=b1+b2+b3;
 //comparing scores
 if (a>b){
            printf("a scored more\n");
           }
 else if (a<b){
            printf("b scored more\n");
           }
 else {
            printf("they are equal\n");
}
```

```
//end comparison
  return 0;
}
//end main function
```

1.0.11 Write a function to compare the final scores. Check for the cases when $a = -40, b = -40; a = 30, b = 20; a = -20, b = -10$.
Solution:

```
//code by harini
//feb 23 2025
//code by GVV Sharma
//April 14 2025
//function to compare two numbers

#include <stdio.h>

//function to compare the numbers a and b
void compare(int a,int b){
            if (a>b){
            printf("a scored more\n");
}
  else if (a<b){
            printf("b scored more\n");
}
  else {
            printf("they are equal\n");
}
           }
//end function to compare the numbers a and b
//begin main function
int main() {
  int a=-40,b=-40;

  //call the function to compare the numbers
  compare(a,b);

  return 0;
}
//end main function
```

1.0.12 Use arrays and a for loop to evaluate

$$a = \sum_{i=0}^{2} a_i \tag{1.0.12.1}$$

$$b = \sum_{i=0}^{2} b_i \tag{1.0.12.2}$$

Solution:

```
//code by harini
//feb 23 2025
//revise by GVV Sharma
//April 14 2025
//compares sum of 2 arrays using a for loop
#include <stdio.h>

//compare function
void compare(int a,int b){
        if (a>b){
        printf("a scored more\n");
}
 else if (a<b){
        printf("b scored more\n");
}
 else {
        printf("they are equal\n");
}
       }
///end compare function
//begin main function
int main() {
       //Declaring arrays
int a1[]={-40,10,0};
int b1[]={10,0,-40};
//Initializing sums
int a=0,b=0;
  for (int i = 0; i <= 2; i++){
        a=a+a1[i];
        b=b+b1[i];
  }
//Call compare function
  compare(a,b);
 return 0;
}
//end main function
```

1.0.13 Revise the above code using only functions.

Solution:

```
//code by harini
//feb 23 2025
//revise by GVV Sharma
//April 14 2025
//using functions for arrays
#include <stdio.h>

//Declaring functions
void compare(int a,int b);
int sum(int a[]);

//begin main function
int main() {
        //Declaring arrays
int a1[]={-40,10,0};
int b1[]={10,0,-40};
//Initializing sums
int a=0,b=0;
//finding sum for A
a = sum(a1);
//finding sum for B
b = sum(b1);
//Call compare function
   compare(a,b);
 return 0;
}
//end main function

//compare function
void compare(int a,int b){
            if (a>b){
            printf("a scored more\n");
}
 else if (a<b){
            printf("b scored more\n");
}
 else {
            printf("they are equal\n");
}
          }
//end compare function
```

```
//sum function
int sum(int a1[]){
int a=0;
   for (int i = 0; i <= 2; i++){
            a=a+a1[i];
   }
   return a; //returning the sum to main
   }
//end sum function
```

1.0.14 Use files for the input data.

Solution:

```
//Code by GVV Sharma
//April 14 2025
//using files
#include <stdio.h>

//Declaring functions
void compare(int a,int b);
int sum(int a[]);

//begin main function
int main() {
        //Declaring arrays
int a1[3], b1[3];
//declare file pointer
FILE *fp;
int i;
//Initializing sums
int a=0,b=0;
        //Read a from file a.dat
        //Open file pointer
fp = fopen("a.dat", "r");

//load data from file to array a1
 for(i=0;i<=2;i++){
    fscanf(fp,"%d",&a1[i]);
   }

//Cose file pointer

fclose(fp);
        //Read a from file b.dat
        //Open file pointer
fp = fopen("b.dat", "r");
```

```
//load data from file to array b1
 for(i=0;i<=2;i++){
    fscanf(fp,"%d",&b1[i]);
  }
//Close file pointer
fclose(fp);

//finding sum for A
a = sum(a1);
//finding sum for B
b = sum(b1);
//Call compare function
  compare(a,b);
 return 0;
}
//end main function

//compare function
void compare(int a,int b){
            if (a>b){
            printf("a scored more\n");
}
 else if (a<b){
            printf("b scored more\n");
}
 else {
            printf("they are equal\n");
}
          }
//end compare function
//sum function
int sum(int a1[]){
int a=0;
  for (int i = 0; i <= 2; i++){
             a=a+a1[i];
  }
  return a; //returning the sum to main
  }
//end sum function
```

1.0.15 Revise the files program using pointer arrays

Solution:

```
//Code by GVV Sharma
//April 14 2025
```

```
//using pointer arrays
#include <stdio.h>
#include <stdlib.h>

//Declaring functions
void compare(int a,int b);
int sum(int a[], int m);

//begin main function
int main() {
//declare pointer arrays
int *a1,*b1,m = 3;
//Initializing sums
int a=0,b=0,i;
//File pointer
FILE *fp;

//Create a1
a1= (int *)malloc(m * sizeof( a1));
b1= (int *)malloc(m * sizeof( b1));

        //Read a from file a.dat
        //Open file pointer
fp = fopen("a.dat", "r");

//load data from file to array a1
 for(i=0;i<=2;i++){
   fscanf(fp,"%d",&a1[i]);
  }

//Cose file pointer

fclose(fp);
        //Read a from file b.dat
        //Open file pointer
fp = fopen("b.dat", "r");

//load data from file to array b1
 for(i=0;i<=2;i++){
   fscanf(fp,"%d",&b1[i]);
  }
//Close file pointer
fclose(fp);

//finding sum for A
```

```
a = sum(a1,m);
//finding sum for B
b = sum(b1,m);
//Call compare function
compare(a,b);

//free memory
free(a1);
free(b1);
 return 0;
}
//end main function

//compare function
void compare(int a,int b){
            if (a>b){
            printf("a scored more\n");
}
 else if (a<b){
            printf("b scored more\n");
}
 else {
            printf("they are equal\n");
}
          }
//end compare function
//sum function
int sum(int *vec,int m){
int a=0;
  for (int i = 0; i < m; i++){
             a=a+vec[i];
  }
  return a; //returning the sum to main
  }
//end sum function
```

1.0.16 Revise the files program using only functions

Solution:

```
//Code by GVV Sharma
//April 14 2025
//using functions for all
#include <stdio.h>
#include <stdlib.h>

//Declaring functions
```

```
void compare(int a,int b);
int sum(int a[], int m);
int *loadVec(char *str,int m);
int *createVec(int m);

//begin main function
int main() {
//Initializing sums
int a=0,b=0,m = 3;
//declare pointer arrays
int *a1,*b1;
        //Read a from file a.dat
a1= loadVec("a.dat",m);
b1= loadVec("b.dat",m);
        //Read b from file b.dat

//finding sum for A
a = sum(a1,m);
//finding sum for B
b = sum(b1,m);
//Call compare function
compare(a,b);
 return 0;
}
//end main function

//compare function
void compare(int a,int b){
          if (a>b){
          printf("a scored more\n");
}
 else if (a<b){
          printf("b scored more\n");
}
 else {
          printf("they are equal\n");
}
         }
//end compare function
//sum of vector elements
int sum(int *vec,int m){
int a=0;
  for (int i = 0; i < m; i++){
           a=a+vec[i];
  }
```

```
   return a; //returning the sum to main
   }
//end sum function
//loading file data into vector
int *loadVec(char *str,int m){
FILE *fp;
int i;
int *vec=createVec(m);
          //Open file pointer
fp = fopen(str, "r");

//load data from file to array a1
 for(i=0;i<m;i++){
    fscanf(fp,"%d",&vec[i]);
   }

//Cose file pointer

fclose(fp);
return vec;
}

//end loading file data into vector
//Defining the function for vector creation
int *createVec(int m)
{
 int *vec;

 //Allocate memory to the pointer
vec = (int *)malloc(m * sizeof( vec));
 return vec;
}
```