1. **Define a class to represent a complex number called Complex. Provide the following methods:**
2. **To assign initial values to the Complex object.**
3. **To display a complex number in a+ib format.**
4. **To add 2 complex numbers. (the return type should be Complex)**
5. **To subtract 2 complex numbers Write a main method to test the class.**

CODE:

class complex{

int a=0;

int b=0;

void assign(int A, int B)

{

this.a=A;

this.b=B;

}

void display()

{

System.out.println("complex number is");

System.out.println(a+"+i"+b);

}

complex add(complex c1, complex c2)

{

complex c3=new complex();

c3.a=c2.a+c1.a;

c3.b=c2.b+c1.b;

return c3;

}

complex subtract(complex c1, complex c2)

{

complex c3=new complex();

c3.a=c2.a-c1.a;

c3.b=c2.b-c1.b;

c3.a=Math.abs(c3.a);

c3.b=Math.abs(c3.b);

return c3;

}

public static void main(String[] args)

{

complex c1=new complex();

complex c2=new complex();

complex c=new complex();

c1.assign(5,2);

c2.assign(1,2);

c=c1.add(c1,c2);

System.out.println("sum is:");

c.display();

c=c1.subtract(c1,c2);

System.out.println("difference is");

c.display();

}

}

INPUT/OUTPUT:

sum is:

complex number is

6+i4

difference is

complex number is

4+i0

2.**Create a class called Time that has instance variables to represent hours, minutes and seconds. Provide the following methods:**

1. **To assign initial values to the Time object.**
2. **To display a Time object in the form of hh:mm:ss {24 hours format}**
3. **To add 2 Time objects (the return type should be a Time )**
4. **To subtract 2 Time objects (the return type should be a Time )**
5. **To compare 2 Time objects and to determine if they are equal or if the first is greater or smaller than the second one.**

CODE:

class Time{

int hrs;

int min;

int sec;

void assign(int hh,int mm, int ss)

{

hrs=hh;

min=mm;

sec=ss;

}

void display(){

System.out.println(hrs+":"+min+":"+sec);

}

Time add(Time t1, Time t2)

{

Time t3=new Time();

t3.hrs=t1.hrs+t2.hrs;

t3.min=t1.min+t2.min;

t3.sec=t1.sec+t2.sec;

if((t3.sec/60)>0){

t3.min=t3.min+(t3.sec/60);

t3.sec=t3.sec%60;

}

if((t3.min)%60>0)

{

t3.hrs=t3.hrs+(t3.min/60);

t3.min=t3.min%60;

}

return t3;

}

Time sub(Time t1, Time t2)

{

Time t3=new Time();

int T1=t1.hrs\*3600+t1.min\*60+t1.sec;

int T2=t2.hrs\*3600+t2.min\*60+t2.sec;

int T3=0;

if(T2>T1)

T3=T2-T1;

else

T3=T1-T2;

t3.hrs=T3/3600;

T3=T3%3600;

t3.min=T3/60;

T3=T3%60;

t3.sec=T3;

return t3;

}

void compare(Time t1, Time t2)

{

Time t3=new Time();

int T1=t1.hrs\*3600+t1.min\*60+t1.sec;

int T2=t2.hrs\*3600+t2.min\*60+t2.sec;

int T3=t3.hrs\*3600+t3.min\*60+t3.sec;

if(T2>T1)

{

t2.display();

System.out.println("between the two, t2 is greater");

}

else if(T2<T1)

{

t1.display();

System.out.println("between the two, t1 is greater");

}

else

{

System.out.println("both objects are equal");

}

}

public static void main(String[] args)

{

Time t1=new Time();

Time t2=new Time();

Time t4=new Time();

t1.assign(5,40,30);

t2.assign(6,35,2);

System.out.println("t1: ");

t1.display();

System.out.println("t2: ");

t2.display();

t4.compare(t1,t2);

t4=t4.add(t1,t2);

System.out.println("after addition");

t4.display();

t4=t4.sub(t1,t2);

System.out.println("after subtraction");

t4.display();

}

}

INPUT/OUTPUT:

t1:

5:40:30

t2:

6:35:2

6:35:2

between the two, t2 is greater

after addition

12:15:32

after subtraction

0:54:32

**Programs on Constructors and Static Members**

1. **Consider the already defined Complex class. Provide a default constructor and parameterized constructor to this class. Also provide a display method. Illustrate all the constructors as well as the display method by defining Complex objects.**

CODE:

class Complex{

int a;

int b;

public Complex() //default constructor

{

a=0;

b=0;

}

public Complex(int A, int B) //parameterized constructor

{

this.a=A;

this.b=B;

}

void display()

{

System.out.println("complex number is");

System.out.println(a+" i"+b);

}

Complex add(Complex c1, Complex c2)

{

Complex c3=new Complex();

c3.a=c2.a+c1.a;

c3.b=c2.b+c1.b;

return c3;

}

Complex subtract(Complex c1, Complex c2)

{

Complex c3=new Complex();

c3.a=c2.a-c1.a;

c3.b=c2.b-c1.b;

c3.a=Math.abs(c3.a);

c3.b=Math.abs(c3.b);

return c3;

}

public static void main(String[] args)

{

Complex c1=new Complex(5,1);

Complex c2=new Complex(2,6);

Complex c=new Complex();

c=c1.add(c1,c2);

System.out.println("sum is:");

c.display();

c=c1.subtract(c1,c2);

System.out.println("difference is");

c.display();

}

}

INPUT/OUTPUT:

sum is:

complex number is

7 i7

difference is

complex number is

3 i5

1. **Create a class called Counter that contains a static data member to count the number of Counter objects being created. Also define a static member function called showCount() which displays the number of objects created at any given point of time. Illustrate this.**

CODE:

class counter{

static int count=0;

counter()

{

count=count+1;

}

static void showcount(){

System.out.println("count is "+count);

}

public static void main(String[] args)

{

counter a=new counter();

counter b=new counter();

counter c=new counter();

counter.showcount();

}

}

INPUT/OUTPUT:

count is 3