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**PROBLEM STATEMENT:**

Define two structures, polar and rectangular, with required members to define a polar and rectangular quantity respectively. Provide functions to

1. Create and display these structure variables
2. Add two structure variables of
  - a. Similar type
  - b. Different type

Write a main program to test the above functions.

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**PROGRAM CODE:**

```
#include<iostream.h>
#include<conio.h>
#include<math.h>
#define pi 3.141592654
struct rect
{
    float x,y;
}r[10];
struct pol
{
    float r,th;
}p[10];
void creater(int i)
{
    cout<<"Enter the x"<<i+1<<": ";
    cin>>r[i].x;
    cout<<"Enter the y"<<i+1<<": ";
    cin>>r[i].y;
}
void createp(int i)
{
    cout<<"Enter the magnitude r"<<i+1<<": ";
    cin>>p[i].r;
    cout<<"Enter the angle theta(radian)"<<i+1<<": ";
    cin>>p[i].th;
}
void dispr(rect a)
{
    cout<<"\n"<<a.x<<"+j"<<a.y;
}
```

```
void dispp(pol a)
{
    cout<<"\n"<<a.r<<"(cos"<<a.th<<" + jsin"<<a.th<<")";
}

void addrr(rect a,rect b)
{
    float m,n;
    m=a.x+b.x;
    n=a.y+b.y;
    cout<<"\nResult: "<<m<<" + j"<<n;
    cout<<"\nPress Enter key!\n";
    getch();
}

void addpp(pol a,pol b)
{
    float m,n,p,q;
    m=((a.r)*cos(a.th)+(b.r)*cos(b.th));
    n=((a.r)*sin(a.th)+(b.r)*sin(b.th));
    p=sqrt((m*m)+(n*n));
    if(m>0&& n>0)
        q=atan(n/m);
    else if(m<0&& n>0)
        q=pi+atan(n/m);
    else if(m<0&& n<0)
        q=atan(n/m)-pi;
    else
        q=atan(n/m);
    cout<<"\nResult: "<<p<<"(cos"<<q<<" + jsin"<<q<<")";
    cout<<"\nPress Enter key!\n";
    getch();
}

void addrp(rect a,pol b)
{
    float m,n,p,q;
    m=(b.r)*cos(b.th);
    n=(b.r)*sin(b.th);
    p=a.x+m;
    q=a.y+n;
    cout<<"\nResult: "<<p<<" + j"<<q;
    cout<<"\nPress Enter key!\n";
    getch();
}
```

```
main()
{
    int ch,nr,np,i,j,k;
    cout<<"Enter the number of rectangular quantities: ";
    cin>>nr;
    cout<<"Enter the number of polar quantities: ";
    cin>>np;
    for(i=0;i<nr;i++)
        creater(i);
    for(i=0;i<np;i++)
        createp(i);
    for(i=0;i<nr;i++)
        dispr(r[i]);
    for(i=0;i<np;i++)
        dispp(p[i]);
    start:
    cout<<"\n\nChoose one of these: \n1. Rect + Rect\n2. Pol + Pol\n3. Rect + Pol\n";
    cin>>ch;
    switch(ch)
    {
        case 1:
            cout<<"Enter which two Rectangular quantities you wish to add: ";
            cin>>j>>k;
            addrr(r[j-1],r[k-1]);
            goto start;
        case 2:
            cout<<"Enter which two Polar quantities you wish to add: ";
            cin>>j>>k;
            addpp(p[j-1],p[k-1]);
            goto start;
        case 3:
            cout<<"Enter which Rectangular quantity and Polar quantity you wish to add: ";
            cin>>j>>k;
            addrp(r[j-1],p[k-1]);
            goto start;
        default:
            cout<<"Invalid choice!";
            goto start;
    }
    getch();
}
```

**OUTPUT:**

```
Enter the number of rectangular quantities: 2
Enter the number of polar quantities: 2
Enter the x1: 1
Enter the y1: 2
Enter the x2: 3
Enter the y2: 4
Enter the magnitude r1: 5
Enter the angle theta(radian)1: 2
Enter the magnitude r2: 6
Enter the angle theta(radian)2: 3

1+j2
3+j4
5<cos2+ jsin2>
6<cos3+ jsin3>

Choose one of these:
1. Rect + Rect
2. Pol + Pol
3. Rect + Pol
1
Enter which two Rectangular quantities you wish to add: 1 2

Result: 4+ j6
Press Enter key!

Choose one of these:
1. Rect + Rect
2. Pol + Pol
3. Rect + Pol
2
Enter which two Polar quantities you wish to add: 2 1

Result: 9.66531<cos2.54962+ jsin2.54962>
Press Enter key!

Choose one of these:
1. Rect + Rect
2. Pol + Pol
3. Rect + Pol
3
Enter which Rectangular quantity and which Polar quantity you wish to add: 2 2

Result: -2.93995+ j4.84672
Press Enter key!
```

**RESULT:**

The structures are defined and various operations are performed on them using functions. A main program is written as well, to test these functions.