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Key Exchange

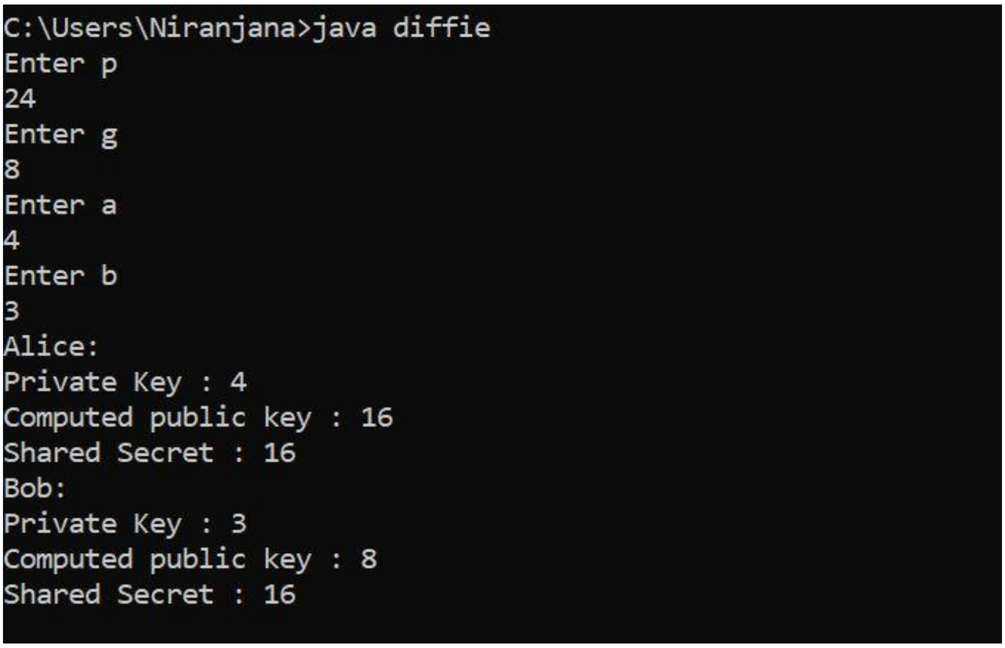
1) Diffie:

Program:

```
import java.util.*;
import java.lang.*;
import java.math.*;
public class diffie
{
     public static BigInteger power(BigInteger a,int
b,BigInteger p)
     {
          if(b==1)
               return a;
          else
               return (a.pow(b)).mod(p);
     }
     public static void keygen()
     {
     Scanner sc=new Scanner(System.in);
 int b,i,a;
 BigInteger x,y,ka,kb,g,p;
 System.out.println("Enter p");
 p=sc.nextBigInteger();
 System.out.println("Enter g");
 g=sc.nextBigInteger();
 System.out.println("Enter a");
 a=sc.nextInt();
 x=power(g,a,p);
 System.out.println("Enter b");
 b=sc.nextInt();
 y=power(g,b,p);
 ka=power(y,a,p);
 System.out.println("Alice:");
 System.out.println("Private Key : "+a);
 System.out.println("Computed public key : "+x);
 System.out.println("Shared Secret : "+ka);
 kb=power(x,b,p);
 System.out.println("Bob:");
 System.out.println("Private Key : "+b);
System.out.println("Computed public key : "+y);
 System.out.println("Shared Secret : "+kb);
```

```
    }
    public static void main(String[] args)
    {
    keygen();
    }
}
```

ScreenShot:



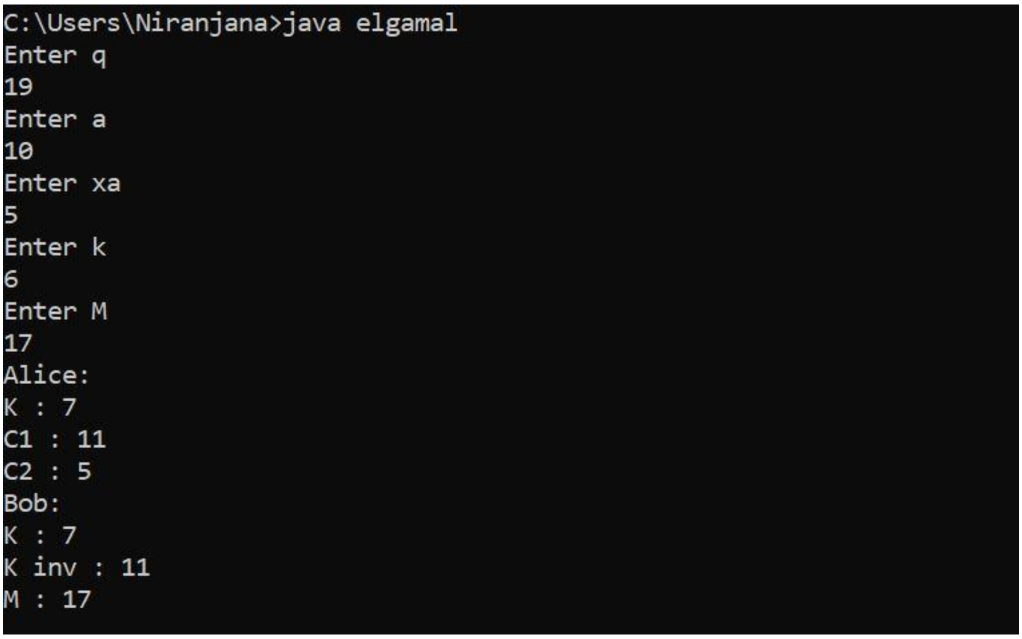
```
C:\Users\Niranjana>java diffie
Enter p
24
Enter g
8
Enter a
4
Enter b
3
Alice:
Private Key : 4
Computed public key : 16
Shared Secret : 16
Bob:
Private Key : 3
Computed public key : 8
Shared Secret : 16
```

2) Elgamal:

Program:

```
import java.util.*;
import java.lang.*;
import java.math.*;
public class elgamal
{
    public static BigInteger power(BigInteger a,int
b,BigInteger p)
    {
        if(b==1)
            return a;
        else
            return (a.pow(b)).mod(p);
    }
    public static void keygen()
    {
     Scanner sc=new Scanner(System.in);
 int b,i,xa;
 BigInteger x,y,ka,kb,q,a;
 System.out.println("Enter q");
 q=sc.nextBigInteger();
 System.out.println("Enter a");
 a=sc.nextBigInteger();
 System.out.println("Enter xa");
 xa=sc.nextInt();
 x=power(a,xa,q);
 System.out.println("Enter k");
 b=sc.nextInt();
 y=power(x,b,q);
 BigInteger c1,c2,m;
 c1=power(a,b,q);
 System.out.println("Enter M");
 m=sc.nextBigInteger();
 c2=(m.multiply(y)).mod(q);
 System.out.println("Alice:");
 System.out.println("K : "+y);
 System.out.println("C1 : "+c1);
 System.out.println("C2 : "+c2);
 ka=power(c1,xa,q);
 kb=ka.modInverse(q);
 BigInteger m2;
 m2=(c2.multiply(kb)).mod(q);
 System.out.println("Bob:");
 System.out.println("K : "+ka);
System.out.println("K inv : "+kb);
 System.out.println("M : "+m2);
     }
     public static void main(String[] args)
     {
     keygen();
     }
}
```

ScreenShot:



```
C:\Users\Niranjana>java elgamal
Enter q
19
Enter a
10
Enter xa
5
Enter k
6
Enter M
17
Alice:
K : 7
C1 : 11
C2 : 5
Bob:
K : 7
K inv : 11
M : 17
```