//Assignment 10 : Java Program to Implement Booth Algorithm

import java.util.Scanner;

/\*\* Class Booth \*\*/

public class boothalg

{

public static Scanner s = new Scanner(System.in);

/\*\* Function to multiply \*\*/

public int multiply(int n1, int n2)

{

int[] m = binary(n1);

int[] m1 = binary(-n1);

int[] r = binary(n2);

int[] A = new int[9];

int[] S = new int[9];

int[] P = new int[9];

for (int i = 0; i < 4; i++)

{

A[i] = m[i];

S[i] = m1[i];

P[i + 4] = r[i];

}

display(A, 'A');

display(S, 'S');

display(P, 'P');

System.out.println();

for (int i = 0; i < 4; i++)

{

if (P[7] == 0 && P[8] == 0);

// do nothing

else if (P[7] == 1 && P[8] == 0)

add(P, S);

else if (P[7] == 0 && P[8] == 1)

add(P, A);

else if (P[7] == 1 && P[8] == 1);

// do nothing

rightShift(P);

display(P, 'P');

}

return getDecimal(P); }

/\*\* Function to get Decimal equivalent of P \*\*/

public int getDecimal(int[] B)

{

int p = 0;

int t = 1;

for (int i = 7; i >= 0; i--, t \*= 2)

p += (B[i] \* t);

if (p > 64)

p = -(256 - p);

return p;

}

/\*\* Function to right shift array \*\*/

public void rightShift(int[] A)

{

for (int i = 8; i >= 1; i--)

A[i] = A[i - 1];

}

/\*\* Function to add two binary arrays \*\*/

public void add(int[] A, int[] B)

{

int carry = 0;

for (int i = 8; i >= 0; i--)

{

int temp = A[i] + B[i] + carry;

A[i] = temp % 2;

carry = temp / 2;

}

}

/\*\* Function to get binary of a number \*\*/

public int[] binary(int n)

{

int[] bin = new int[4];

int ctr = 3;

int num = n;

/\*\* for negative numbers 2 complment \*\*/

if (n < 0)

num = 16 + n;

while (num != 0)

{

bin[ctr--] = num % 2;

num /= 2;

}

return bin;

}

/\*\* Function to print array \*\*/

public void display(int[] P, char ch)

{

System.out.print("\n"+ ch +" : ");

for (int i = 0; i < P.length; i++)

{

if (i == 4)

System.out.print(" ");

if (i == 8)

System.out.print(" ");

System.out.print(P[i]);

}

}

/\*\* Main function \*\*/

public static void main (String[] args)

{

Scanner scan = new Scanner(System.in);

System.out.println("Booth Algorithm Test\n");

/\*\* Make an object of Booth class \*\*/

boothalg b = new boothalg();

/\*\* Accept two integers \*\*/

System.out.println("Enter two integer numbers\n");

int n1 = scan.nextInt();

int n2 = scan.nextInt();

int result = b.multiply(n1, n2);

System.out.println("\n\nResult : "+ n1 +" \* "+ n2 +" = "+ result);

}

}

============OUTPUT=============

Booth Algorithm Test

Enter two integer numbers

8

-3

A : 1000 0000 0

S : 1000 0000 0

P : 0000 1101 0

P : 1100 0110 1

P : 0010 0011 0

P : 1101 0001 1

P : 1110 1000 1

Result : 8 \* -3 = -24