CECS 524 ASSIGNMENT 8-2

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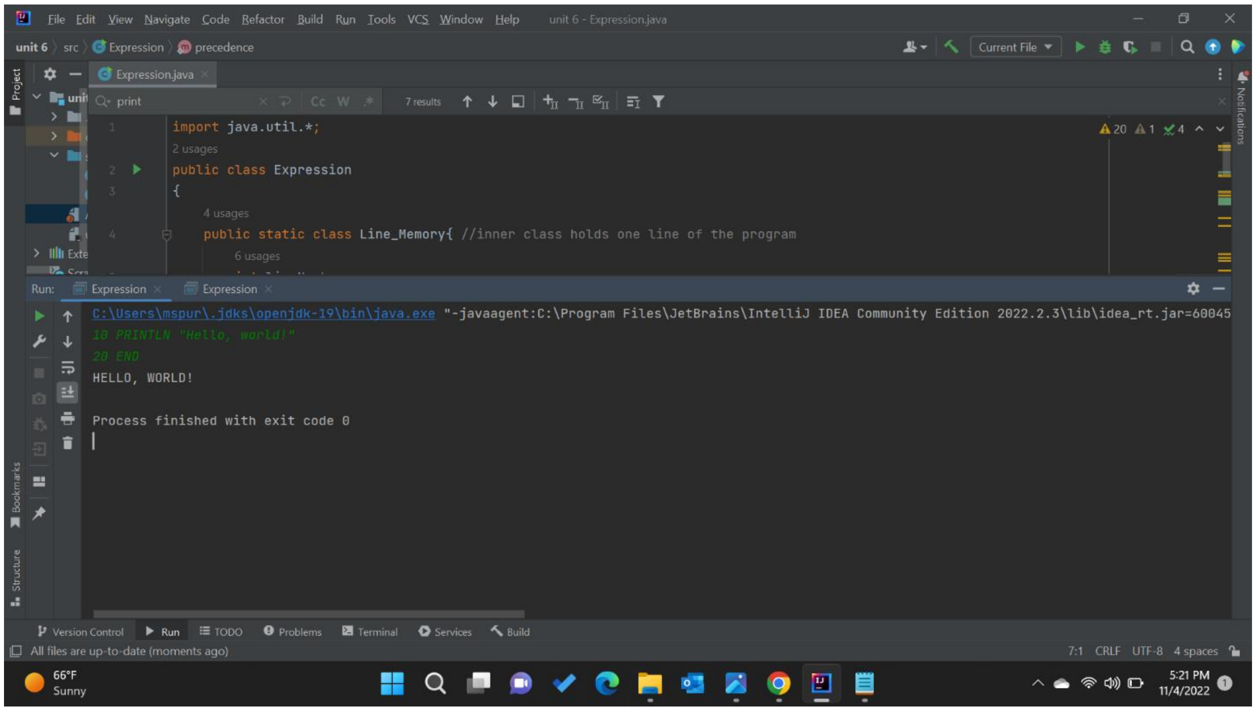
Code:

```
import java.util.*;
public class Expression
{
    public static class Line_Memory{
        int lineNumber;
        String line;
    }

    private static ArrayList<Line_Memory> program=new
ArrayList<Line_Memory>() ; //the entire SIL program is in this array
    private static int curr_line; //the current line that is executing
    private static boolean mEOL, mEOF;

    public static  HashMap<String,Integer> memory=new
HashMap<String,Integer>();

    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        String in;
        int k=0;
        while(sc.hasNextLine())
        {
            in=sc.nextLine().toUpperCase();

            Expression.Line_Memory lm=new Expression.Line_Memory();
            lm.lineNumber=Integer.parseInt(in.substring(0,
in.indexOf(' ')));
            lm.line=in.substring(in.indexOf(' ')+1);
            program.add(lm);
            if(lm.line.equals("END"))
            {

                parseProgram();

            }
        }

    }
    public static void parseProgram()
```

```
{
    int end_line=program.size();
    int i=0,low,high;
    while(i!=end_line)
    {

        curr_line=program.get(i).lineNumber;
        int x=parse(program.get(i).line,curr_line);

        if(x==curr_line)
        {

            i++;
        }

        else if(x<curr_line)
        {
            low=0;
            high=i;
            i=search(x, low,high);
            curr_line=program.get(i).lineNumber;

        }
        else
        {
            low=i;
            high=program.size()-1;
            i=search(x, low,high);
            curr_line=program.get(i).lineNumber;

        }

    }

}

public static void takeInput(String [] vars)
{
    Scanner sc = new Scanner(System.in);
    String p=sc.nextLine();
    String [] nums=p.split(" ");
    int [] values=new int[nums.length];
    //for(int i=0;i<nums.length;i++)

    for(int i=0;i<nums.length;i++)
        values[i]=Integer.parseInt(nums[i]);
    if(vars.length!=values.length||values.length==0)
        System.err.println("Line n missing input value");
    else {
        for (int i = 0; i < vars.length; i++) {
            memory.put(vars[i], values[i]);
        }
        }
    }
    public static int parse(String in,int ln)
    {


        in.trim();
        if(in.equals("END"))
        {

            System.exit(0);
        }
        String ins = in.substring(0, in.indexOf(' '));
        String str = in.substring(in.indexOf(' ') + 1);
        if(ins.equals("LET"))
        {

memory.put(toString(str.charAt(0)),expr(str.substring(2)));
        }
        if(ins.equals("INPUT"))
        {

            takeInput(str.split(","));

        }
        if(ins.equals("GOTO"))
        {

            return Integer.parseInt(str);


        }

        if(ins.equals("IF"))
        {
            String condition = str.split("THEN")[0];
            String action= in.split("THEN")[1];

            String op="";
            if(condition.contains("="))
                op="=";
            else if(condition.contains("<"))
                op="<";
            else if(condition.contains(">"))
                op=">";
            else if(condition.contains("!"))
                op="!";
            int  x=
calculate(expr(condition.split(op)[0]),expr(condition.split(op)[1]),op
);
```

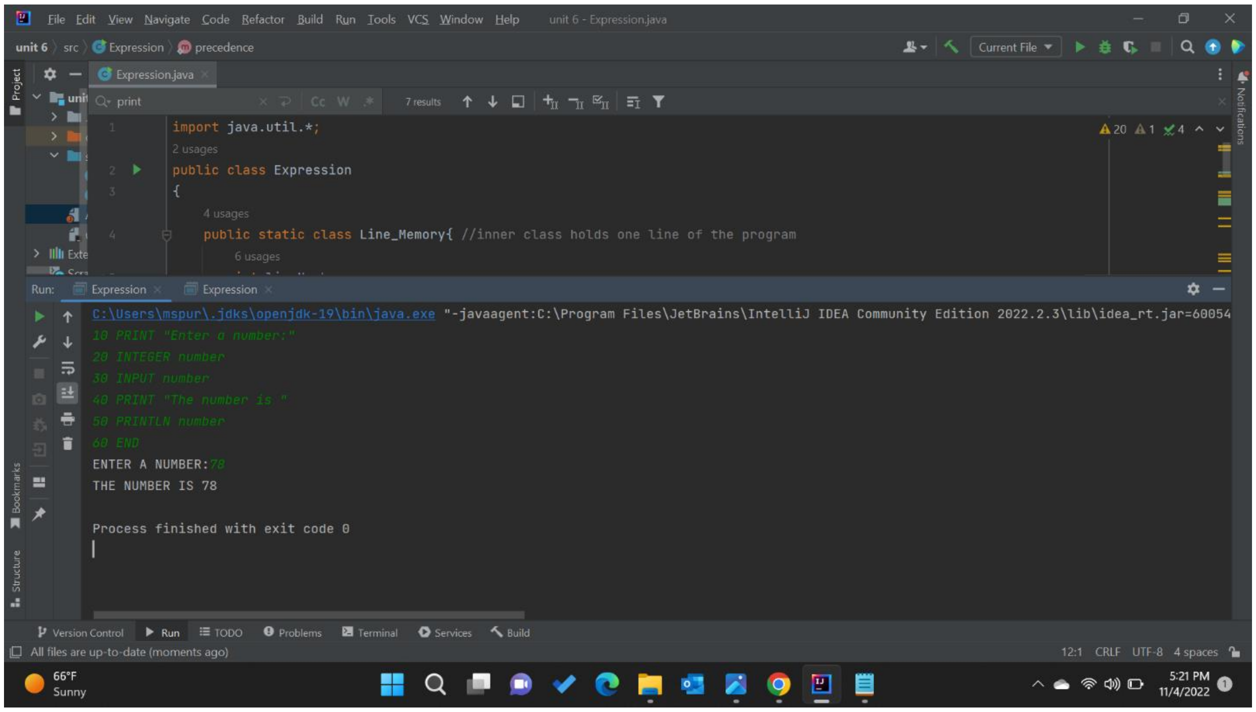
```
            if(x==1)
            {

                int p=  parse(action.trim(),curr_line);
                return p;

            }


            return curr_line;
        }

        if(ins.equals("INTEGER"))
        {
            String [] variables=str.split(",");
            for(int i=0;i<variables.length;i++)
            {
                memory.put(variables[i],0);
            }

        }


        if(ins.equals("PRINTLN"))
        {

            if(containsOperand(str)||memory.containsKey(str))
                System.out.println(atom(str));
            else
                System.out.println(str.substring(1,str.length()-1));


        }

        if(ins.equals("PRINT"))
        {

            if(containsOperand(str)||memory.containsKey((str)))
                System.out.print(atom(str));
            else
                System.out.print(str.substring(1,str.length()-1));
        }
        return curr_line;
    }

    public static int search(int target,int low,int high)
    {


        int mid=low  + ((high - low) / 2);
        while(low<=high)
        {
            mid=low  + ((high - low) / 2);
            if(program.get(mid).lineNumber==target)
                return mid;
            else if(program.get(mid).lineNumber<target)
                low=mid+1;
            else
                high=mid-1;

        }
        return -1;
    }
    public static int expr(String s)
    {

        Stack<Integer> v=new Stack<Integer>();
        Stack<String> op=new Stack<String>();
        int i=0;
        while(i<s.length())
        {
            String p=toString(s.charAt(i));

            if(isNumeric(p))
            {
                String num="";
                int in=i;
                while(in<s.length()&&isNumeric(s.substring(in,in+1)))
                {

                    num+=s.charAt(in);
                    in++;
                }
                i=in-1;
                v.push(Integer.parseInt(num));


            }

            else if(memory.containsKey(p))
            {

                v.push(memory.get(p));

            }

            else if(s.charAt(i)=='(')
            {
                String brac="";
                int x=i+1;
                while(x<s.length()&&s.charAt(x)!=')')
                {
                    brac+=s.charAt(x);
                x++;
            }
            i=x;

            if(isNumeric(brac))
                v.push(Integer.parseInt(brac));
            else
                v.push(expr(brac));

        }


        else  if(isOperand(p))
        {

            while(op.size()>0&&precedence(op.peek(),p))
            {

                String c=op.pop();
                int op1=v.pop();
                int op2=v.pop();
                v.push(calculate(op1,op2,c));
            }
            op.push(p);

        }
        i++;
    }
    while(op.size()>0)
    {
        String c=op.pop();
        int op1=v.pop();
        int op2=v.pop();
        v.push(calculate(op1,op2,c));
    }

    return v.pop();

}


public static int atom(String s)
{


    if(isNumeric(s))

        return Integer.parseInt(s);
    else if(memory.containsKey(s))

        return memory.get(s);
        else
            return expr(s);

    }

    public static String toString(char ch)
    {
        return Character.toString(ch);
    }

    public static  boolean isNumeric(String s)
    {

        try
        {
            Integer.parseInt(s);
            return true;
        }
        catch( Exception e )
        {
            return false;
        }
    }


    public static boolean isOperand(String s)
    {



if(s.contains("+")||s.contains("-")||s.contains("*")||s.contains("/"))
            return true;
        return false;
    }
    public static boolean containsOperand(String s)
    {



if(s.contains("+")||s.contains("-")||s.contains("*")||s.contains("/"))
            return true;
        if(s.contains("THEN"))

if(s.contains("<")||s.contains(">")||s.contains("=")||s.contains("!"))
                return true;
        return false;
    }

    public static int calculate(int op2,int op1,String op)
    {
        if(op.equals("+"))
            return op1+op2;
        else if(op.equals("-"))
            return op1-op2;
        else if(op.equals("*"))
            return op1*op2;
        else if(op.equals("/"))
            return op1/op2;
        else if(op.equals("<"))
            return (op2<op1)?1:0;

        else if(op.equals(">"))
            return (op2>op1)?1:0;
        else if(op.equals("="))
            return (op1==op2)?1:0;
        else
            return (op1!=op2)?1:0;
    }

    public static boolean precedence(String op1,String op2)
    {
        HashMap<String,Integer> hm=new HashMap<String,Integer>();
        hm.put("+",1);
        hm.put("-",1);
        hm.put("*",2);
        hm.put("/",2);

        if(hm.get(op1)-hm.get(op2)>0)
            return true;
        else
            return false;

    }

}
```

Output:


File Edit View Navigate Code Refactor Build Run Tools VCS Window Help unit 6 - Expression.java
unit 6 src Expression precedence
Current File
Expression.java
print
7 results
2 usages
4 usages
6 usages
Run: Expression Expression
Version Control Run TODO Problems Terminal Services Build
All files are up-to-date (moments ago)
7:1 CRLF UTF-8 4 spaces
66°F Sunny
5:21 PM 11/4/2022

```java
import java.util.*;
public class Expression
{
    public static class Line_Memory{ //inner class holds one line of the program
```

```
C:\Users\mspur\.jdks\openjdk-19\bin\java.exe "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2022.2.3\lib\idea_rt.jar=60045
10 PRINTLN "Hello, world!"
20 END
HELLO, WORLD!

Process finished with exit code 0
```


File Edit View Navigate Code Refactor Build Run Tools VCS Window Help unit 6 - Expression.java
unit 6 src Expression precedence
Current File
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7 results
2 usages
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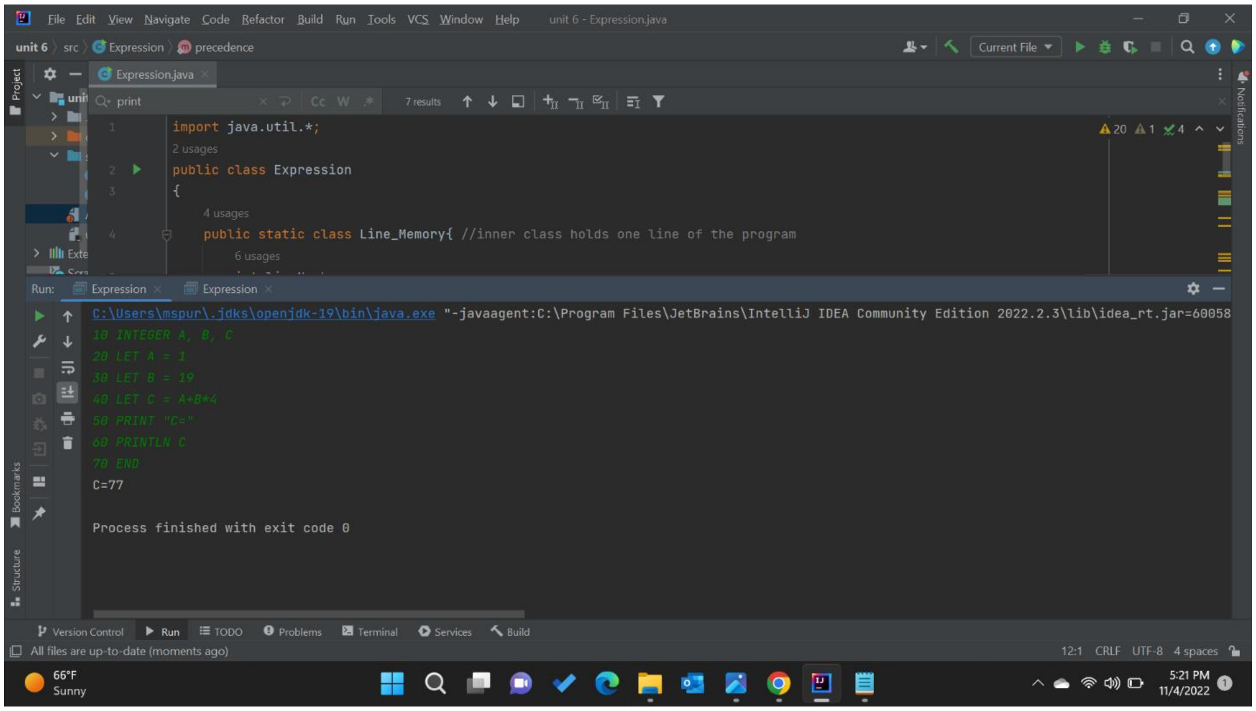
Run: Expression Expression
Version Control Run TODO Problems Terminal Services Build
All files are up-to-date (moments ago)
12:1 CRLF UTF-8 4 spaces
66°F Sunny
5:21 PM 11/4/2022

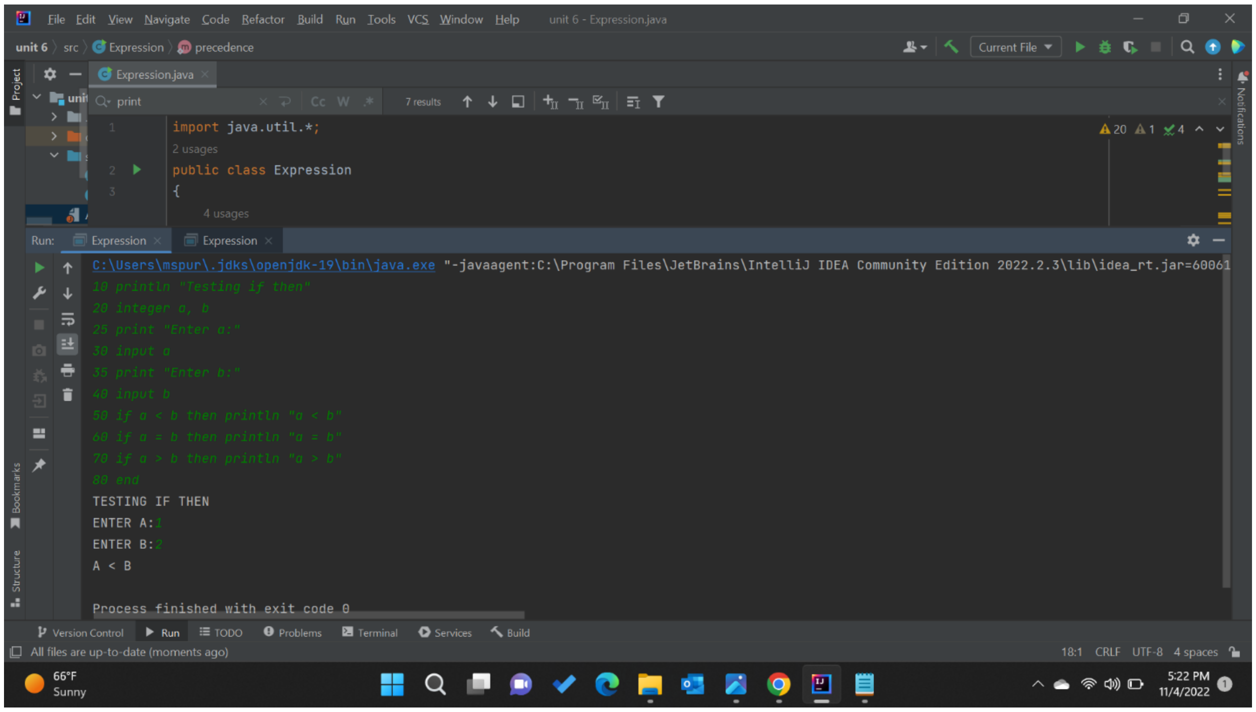
```java
import java.util.*;
public class Expression
{
    public static class Line_Memory{ //inner class holds one line of the program
```

```
C:\Users\mspur\.jdks\openjdk-19\bin\java.exe "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2022.2.3\lib\idea_rt.jar=60054
10 PRINT "Enter a number:"
20 INTEGER number
30 INPUT number
40 PRINT "The number is "
50 PRINTLN number
60 END
ENTER A NUMBER:78
THE NUMBER IS 78

Process finished with exit code 0
```



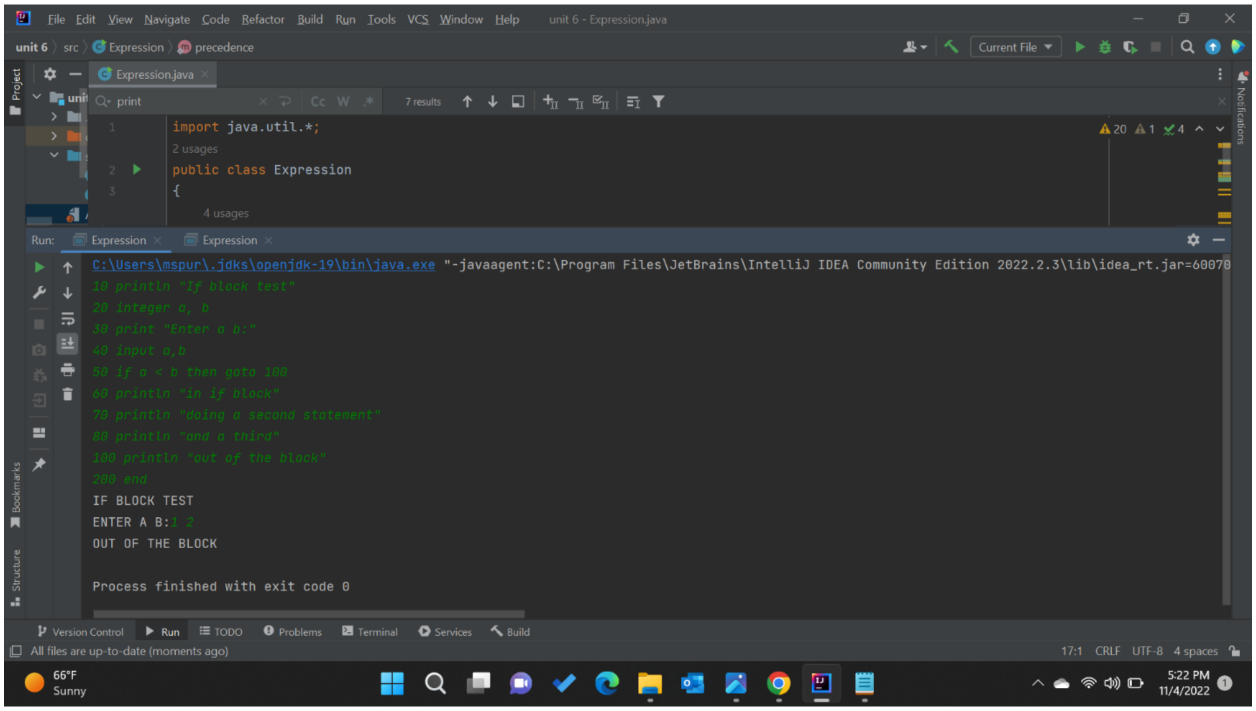
```
import java.util.*;
public class Expression
{
    public static class Line_Memory{ //inner class holds one line of the program
```

```
C:\Users\mspur\.jdks\openjdk-19\bin\java.exe "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2022.2.3\lib\idea_rt.jar=60058
10 INTEGER A, B, C
20 LET A = 1
30 LET B = 19
40 LET C = A+B*4
50 PRINT "C="
60 PRINTLN C
70 END
C=77

Process finished with exit code 0
```



```
import java.util.*;
public class Expression
{
```

```
C:\Users\mspur\.jdks\openjdk-19\bin\java.exe "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2022.2.3\lib\idea_rt.jar=60061
10 println "Testing if then"
20 integer a, b
25 print "Enter a:"
30 input a
35 print "Enter b:"
40 input b
50 if a < b then println "a < b"
60 if a = b then println "a = b"
70 if a > b then println "a > b"
80 end
TESTING IF THEN
ENTER A:1
ENTER B:2
A < B

Process finished with exit code 0
```


File Edit View Navigate Code Refactor Build Run Tools VCS Window Help
unit 6 - Expression.java
unit 6 〉 src 〉 Expression 〉 precedence
Current File
Expression.java
print
7 results
Run: Expression Expression
Version Control Run TODO Problems Terminal Services Build
All files are up-to-date (moments ago)
17:1 CRLF UTF-8 4 spaces
66°F Sunny
5:22 PM 11/4/2022

```java
import java.util.*;
2 usages
public class Expression
{
    4 usages
```

```
C:\Users\mspur\.jdks\openjdk-19\bin\java.exe "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2022.2.3\lib\idea_rt.jar=60070
10 println "If block test"
20 integer a, b
30 print "Enter a b:"
40 input a,b
50 if a < b then goto 100
60 println "in if block"
70 println "doing a second statement"
80 println "and a third"
100 println "out of the block"
200 end
IF BLOCK TEST
ENTER A B:1 2
OUT OF THE BLOCK

Process finished with exit code 0
```