SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

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DEPARTMENT OF INFORMATION TECHNOLOGY

DATASTRUCTURES

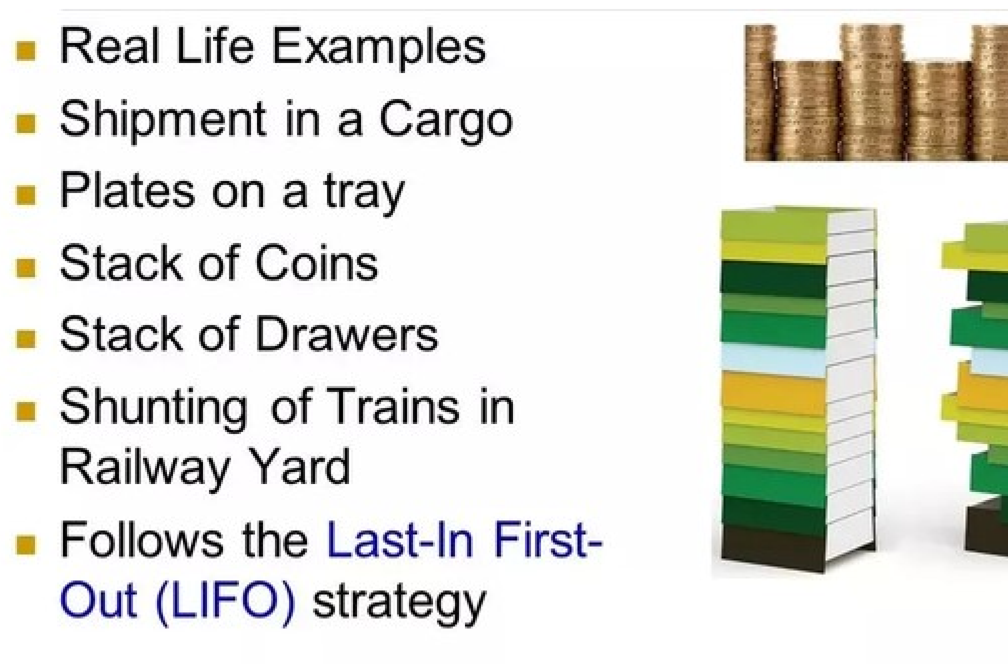
II YEAR III SEM

UNIT 1 –LINEAR STRUCTURES

TOPIC 6-APPLICATION OF STACK

Applications of Stack

- Infix to Postfix Conversion
- Balancing the Symbols
- Function Calls
- Evaluation of Postfix Expression



- Real Life Examples
- Shipment in a Cargo
- Plates on a tray
- Stack of Coins
- Stack of Drawers
- Shunting of Trains in Railway Yard
- Follows the Last-In First-Out (LIFO) strategy

Applications of Stack

Infix Expression

It follows the scheme of **<operand><operator><operand>**

E.g., **A+B**

Postfix Expression

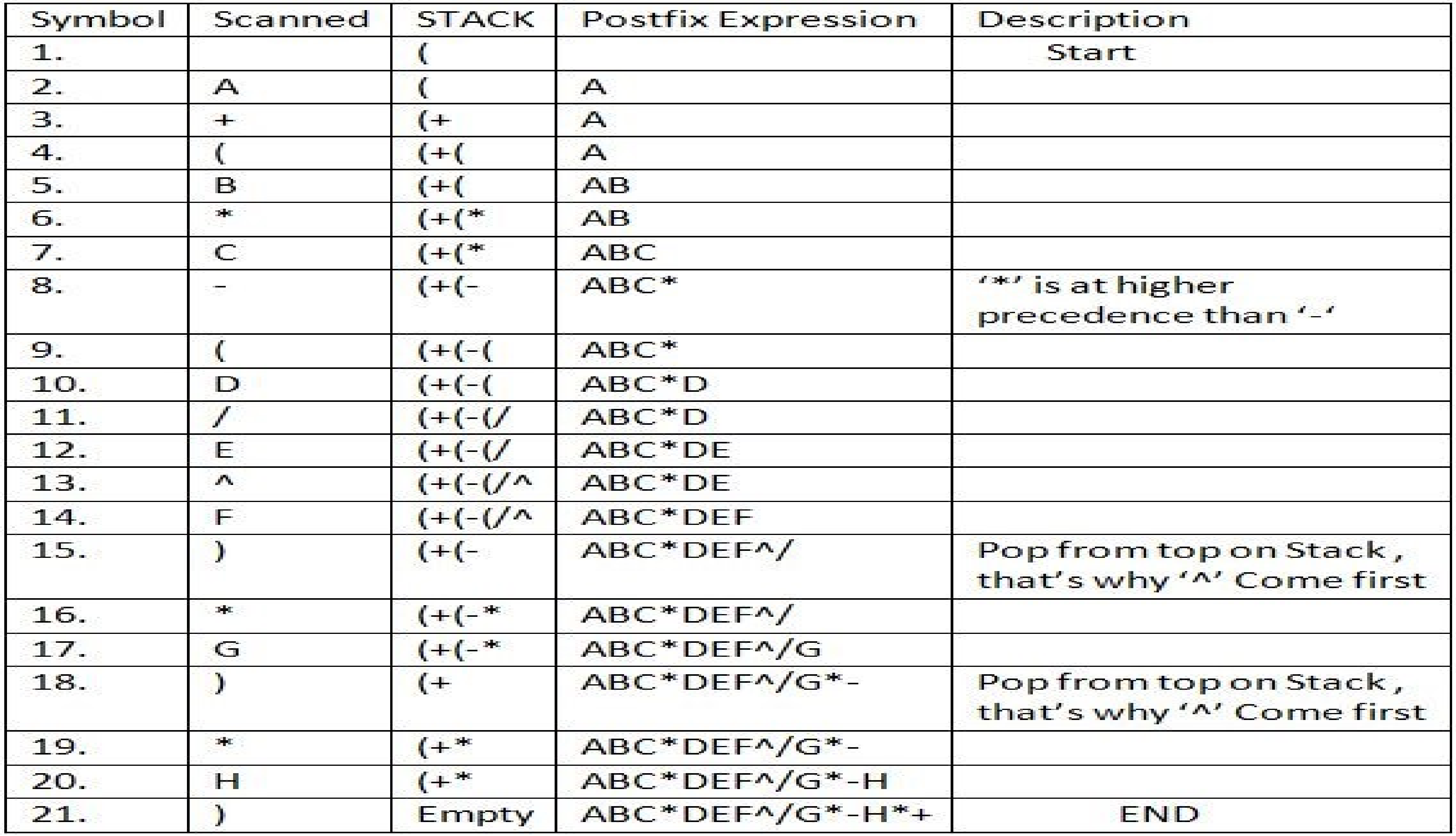
It follows the scheme of <operand><operand><operator> i.e. an <operator> is succeeded by both the <operand>. E.g., AB+

Applications of Stack-Infix to Postfix Conversion

- Push “(“onto Stack, and add “)” to the end of X.
- Scan X from left to right and repeat Step 3 to 6 for each element of X until the Stack is empty.
- If an operand is encountered, add it to Y.
- If a left parenthesis is encountered, push it onto Stack.
- If an operator is encountered ,then:
    - Repeatedly pop from Stack and add to Y each operator (on the top of Stack) which has the same precedence as or higher precedence than operator.
    - Add operator to Stack.
      [End of If]
- If a right parenthesis is encountered ,then:
    - Repeatedly pop from Stack and add to Y each operator (on the top of Stack) until a left parenthesis is encountered.
    - Remove the left Parenthesis.
      [End of If]
      [End of If]
- END.

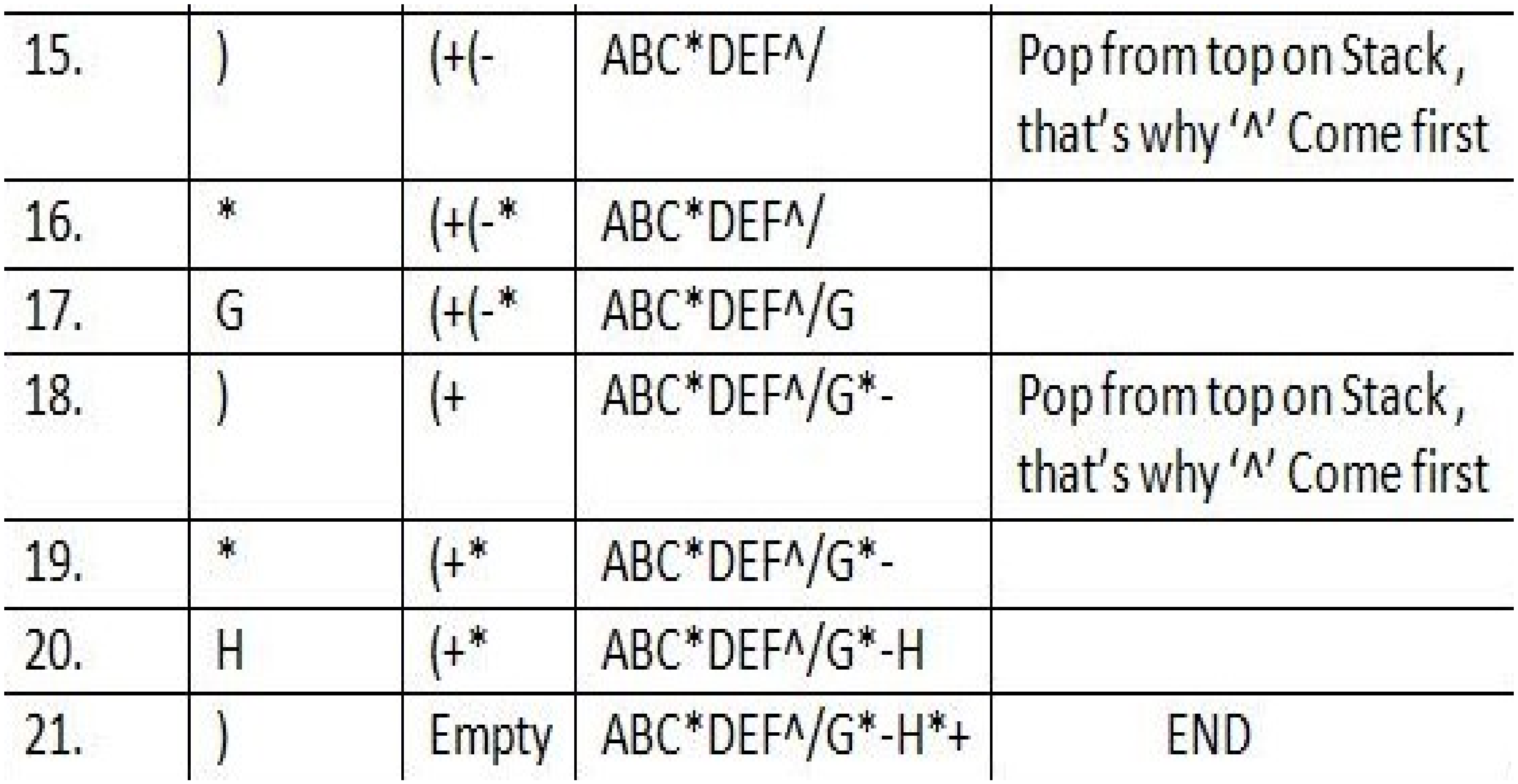
Infix to Postfix Conversion-Example

A+ (B*C-(D/E^F)*G)*H, where **^** is an exponential operator.



Symbol	Scanned	STACK	Postfix Expression	Description
1.		(		Start
2.	A	(	A	
3.	+	(+	A	
4.	(	(+(	A	
5.	B	(+(	AB	
6.	*	(+(*	AB	
7.	C	(+(*	ABC	
8.	-	(+(-	ABC*	'*' is at higher precedence than '-'
9.	(	(+(-(	ABC*	
10.	D	(+(-(	ABC*D	
11.	/	(+(-(/	ABC*D	
12.	E	(+(-(/	ABC*DE	
13.	^	(+(-(/^	ABC*DE	
14.	F	(+(-(/^	ABC*DEF	
15.	)	(+(-	ABC*DEF^/	Pop from top on Stack , that's why '^' Come first
16.	*	(+(-*	ABC*DEF^/	
17.	G	(+(-*	ABC*DEF^/G	
18.	)	(+	ABC*DEF^/G*-	Pop from top on Stack , that's why '^' Come first
19.	*	(+*	ABC*DEF^/G*-	
20.	H	(+*	ABC*DEF^/G*-H	
21.	)	Empty	ABC*DEF^/G*-H*+	END

Applications of Stack-Balancing the Symbols

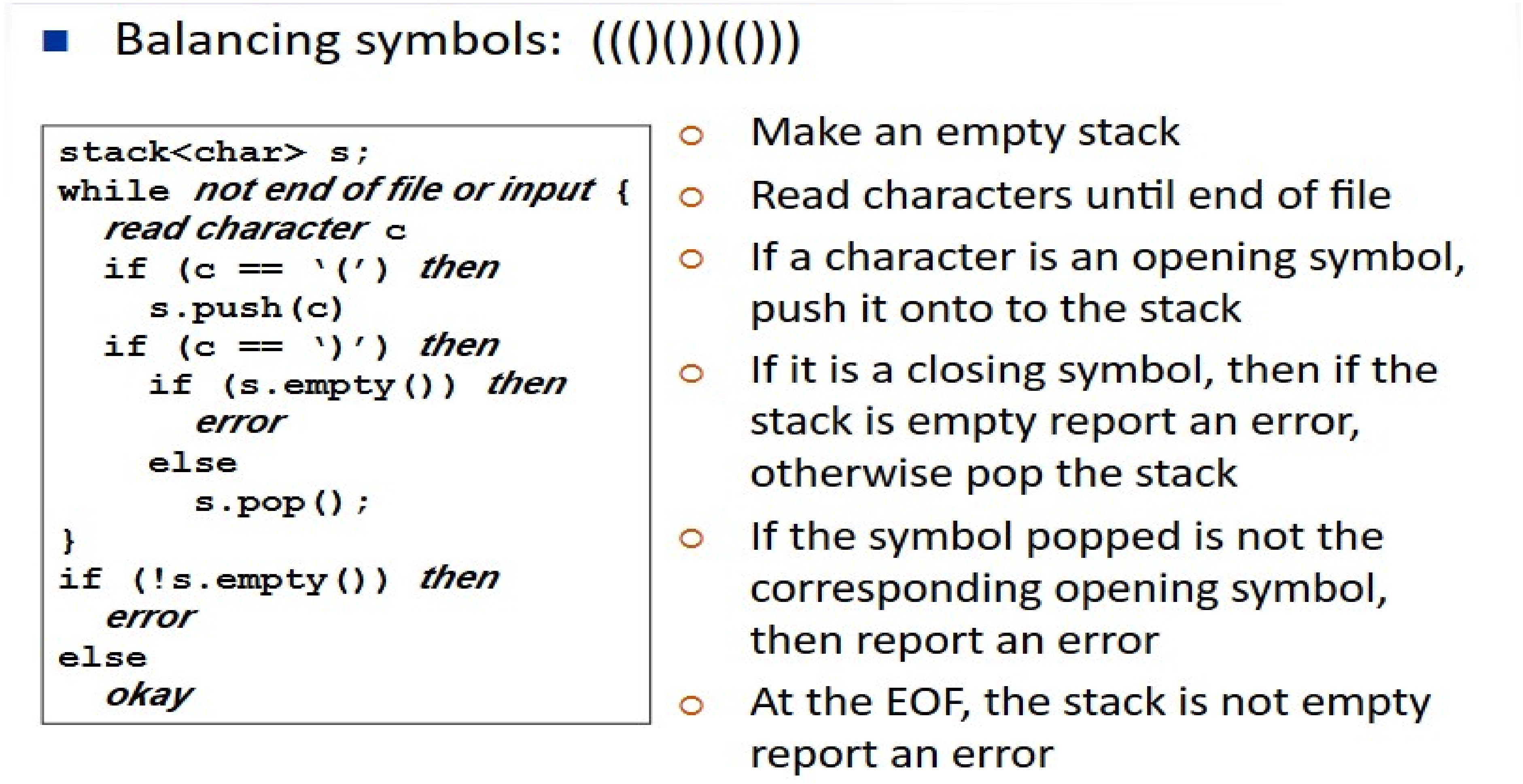


15.	)	(+(-	ABC*DEF^/	Pop from top on Stack , that's why '^' Come first
16.	*	(+(-*	ABC*DEF^/	
17.	G	(+(-*	ABC*DEF^/G	
18.	)	(+	ABC*DEF^/G*-	Pop from top on Stack , that's why '^' Come first
19.	*	(+*	ABC*DEF^/G*-	
20.	H	(+*	ABC*DEF^/G*-H	
21.	)	Empty	ABC*DEF^/G*-H*+	END

Assessment -1

1.Convert the expression into Postfix A+B*C/D

Applications of Stack-Balancing the Symbols

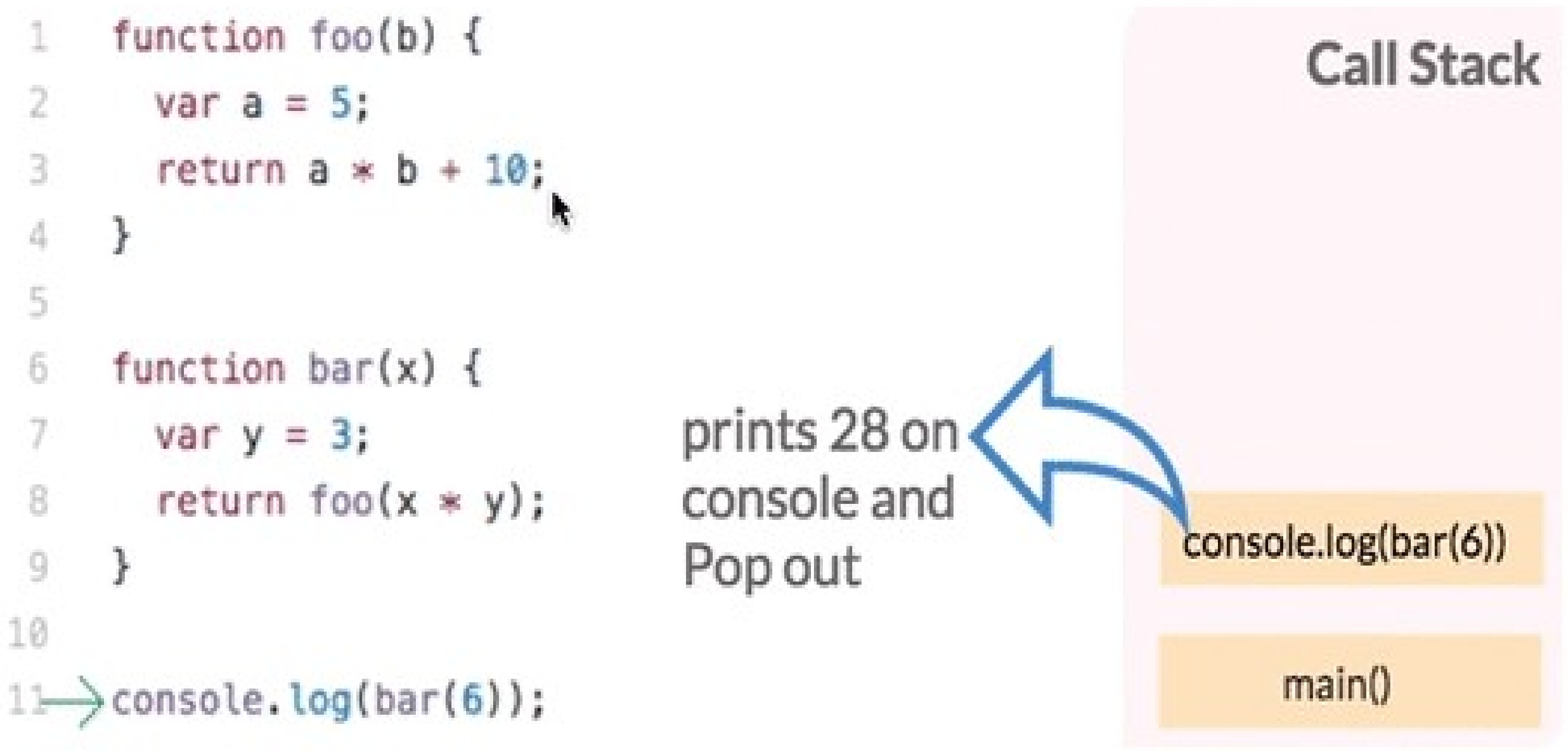


- Balancing symbols: ((()())(()))

```
stack<char> s;
while *not end of file or input* {
    *read character* c
    if (c == '(') *then*
        s.push(c)
    if (c == ')') *then*
        if (s.empty()) *then*
            *error*
        else
            s.pop();
}
if (!s.empty()) *then*
    *error*
else
    *okay*
```

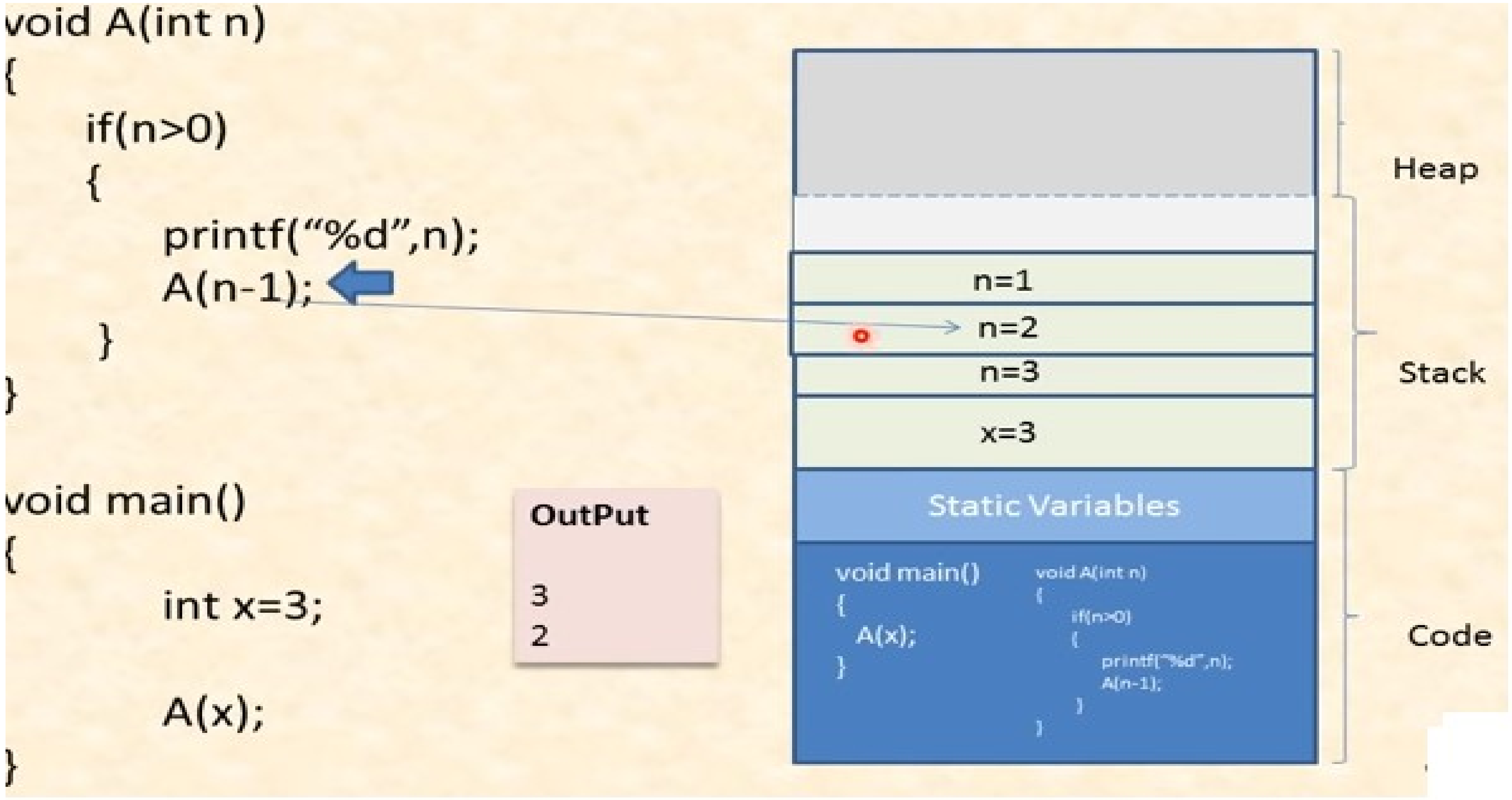
- Make an empty stack
- Read characters until end of file
- If a character is an opening symbol, push it onto to the stack
- If it is a closing symbol, then if the stack is empty report an error, otherwise pop the stack
- If the symbol popped is not the corresponding opening symbol, then report an error
- At the EOF, the stack is not empty report an error

Applications of Stack-Function Calls



```
function foo(b) {
  var a = 5;
  return a * b + 10;
}

function bar(x) {
  var y = 3;
  return foo(x * y);
}

console.log(bar(6));
```

Applications of Stack-Function Calls



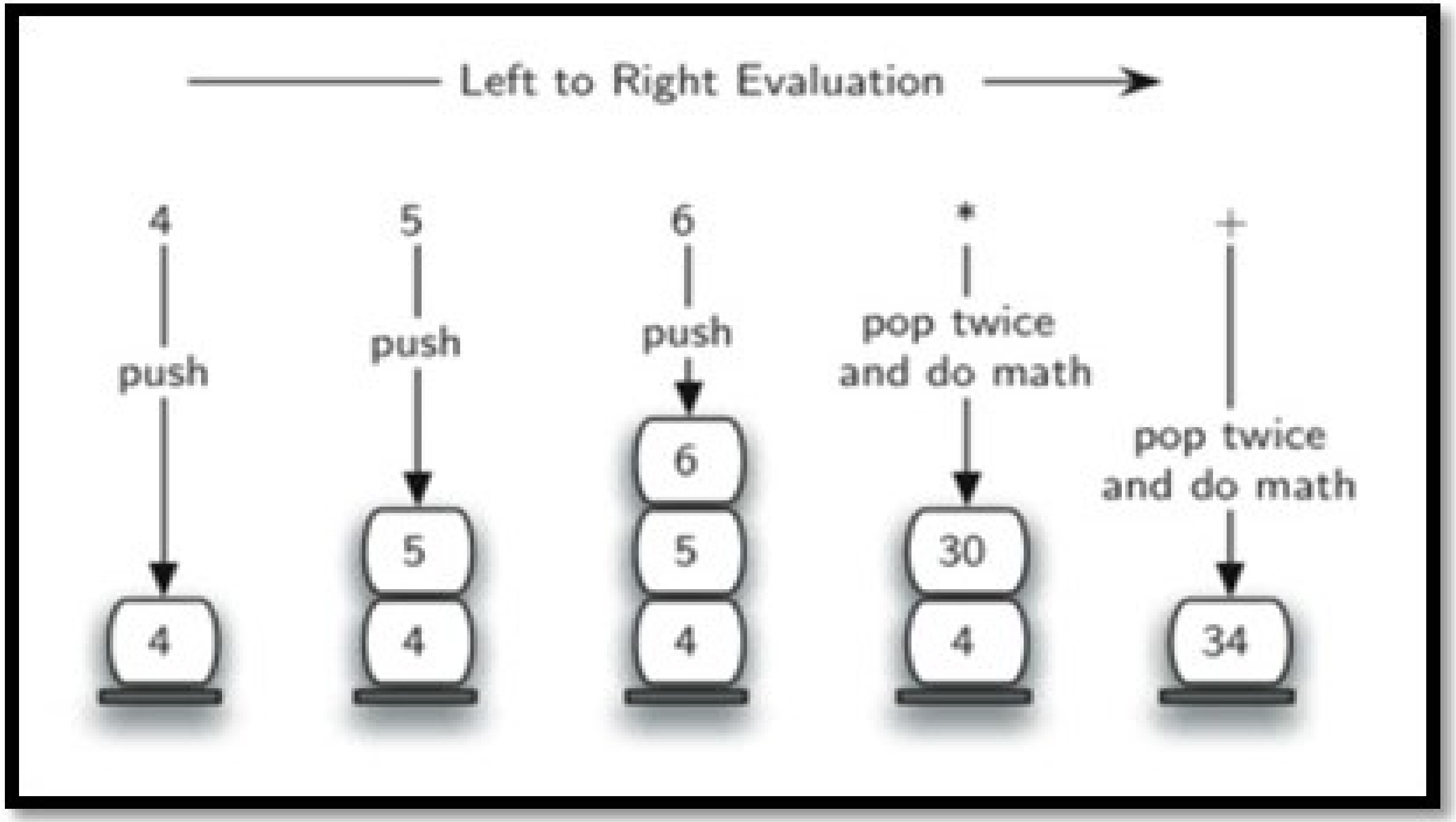
```
void A(int n)
{
     if(n>0)
     {
          printf("%d",n);
          A(n-1);
     }
}

void main()
{
          int x=3;

          A(x);
}
```

```
OutPut

3
2
```

```
void main()
{
  A(x);
}

void A(int n)
{
     if(n>0)
     {
          printf("%d",n);
          A(n-1);
     }
}
```

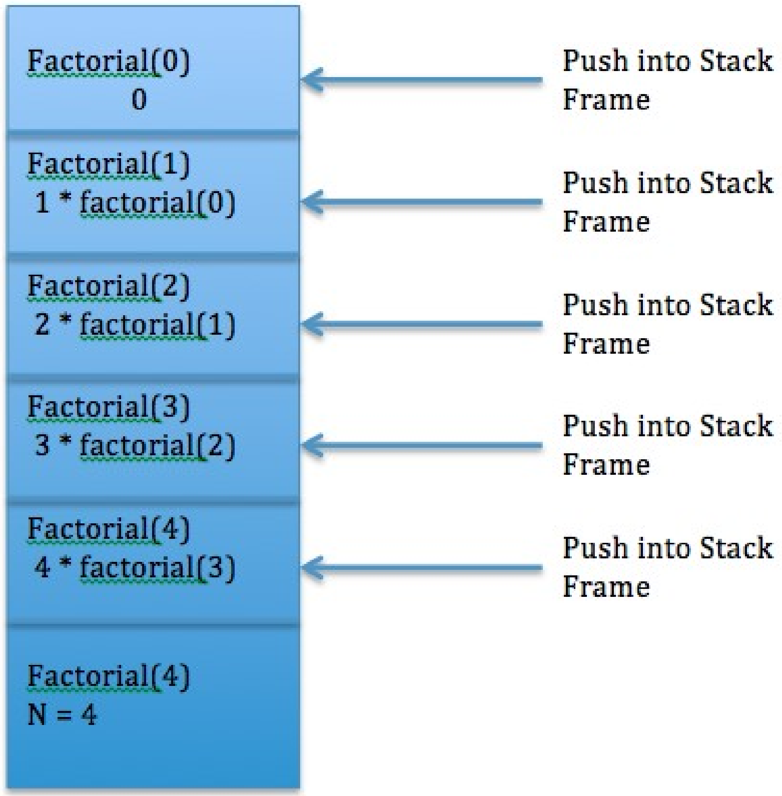
Applications of Stack- Evaluation of Postfix Expression

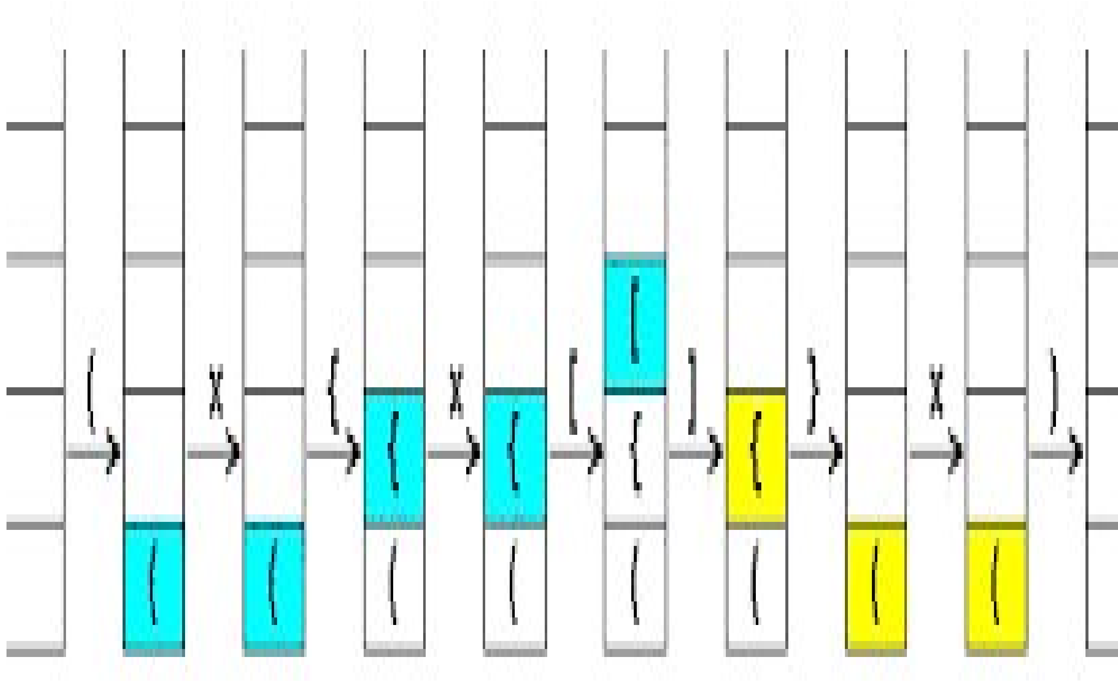
- **Expression: 456*+**



ASSESMENT 2

Guess this Application where the concept of stack is used.





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2. A. V. Aho, J. E. Hopcroft and J. D. Ullman, “Data Structures and Algorithms”, Pearson Education, 2nd Edition, 2007
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Thank You