Problem Solving - Loop

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List of Problems Involved

- Minimum and Maximum Element
- Prime Numbers
- Loops with break and continue statement
- Single Digit Sum
- Maximum Profit Stock
- Reverse Pyramid

Minimum and Maximum Element

Problem – Given an array of numbers. Your task is to find the minimum and maximum element. For example –

Input – [2,3,15,6]

Output –
Minimum element - 1
Maximum element - 15

Approach – We can use linear search technique in this.

Steps -

1) Initialize min and max to minimum and maximum of first 2 elements
2) Iterate through array from index 3rd and update min and max respectively after comparison
3) We are using separate Pair class in this which will have 2 attributes to store minimum and maximum value
4) Return the output

Minimum and Maximum Element

Code Link - https://jsfiddle.net/kr8twejz/

```
function getMinMax(arr, n) {
  minmax = new Array();
  var i;
  var min;
  var max;


  if (n == 1) {
    minmax.max = arr[0];
    minmax.min = arr[0];
    return minmax;
  }


  if (arr[0] > arr[1]) {
    minmax.max = arr[0];
    minmax.min = arr[1];
  } else {
    minmax.max = arr[1];
    minmax.min = arr[0];
  }

  for (i = 2; i < n; i++) {
    if (arr[i] > minmax.max) {
      minmax.max = arr[i];
    } else if (arr[i] < minmax.min) {
      minmax.min = arr[i];
    }
  }

  return minmax;
}


var arr = [100, 121, 425, 11, 30, 3000];
var arr_size = 6;
minmax = getMinMax(arr, arr_size);
console.log("Minimum element is ", minmax.min);
console.log("Maximum element is ", minmax.max);
```

Prime Numbers

Problem – Given a number N. You need to find all prime numbers less than or equal to N. For example –

Input – 7

Output – 2,3,5,7

Approach – We can traverse through the numbers starting from 2 to N and check if the number is prime number. We can use Loops to iterate through the numbers.

Steps -

1) Iterate through 1 to N
2) Check if number is prime number
3) If yes, print prime number

Prime Numbers

Code Link - https://jsfiddle.net/2s7dhxqr/

```
function isPrime(n)
{

  if (n <= 1)
    return false;


  for (let i = 2; i < n; i++)
    if (n % i == 0)
      return false;

  return true;
}

function printPrime(n)
{
  for (let i = 2; i <= n; i++) {
    if (isPrime(i))
      console.log(i +" ");
  }
}


  let n = 5;
  printPrime(n);
```

Loops with Break and Continue Statement

Problem – Write a program demonstrating break and continue functionality

Steps -

1) For loop to iterate through 0 to 9
2) Break statement when i = 5;
3) Step2 will terminate the loop when i = 5
4) For loop to iterate through 0 to 9
5) Continue statement when i = 5;
6) Step4 will skip printing 5

Loops with Break and Continue Statement

Code Link - https://jsfiddle.net/grhokqef/

```
//break statement
for ( i = 0; i < 10; i++) {
  // Terminate the loop when i is 5
  if (i == 5)
    break;
  console.log("i: " + i);
}
console.log("break functionality terminated the loop after printing 4");

//continue statement
for ( i = 0; i < 10; i++) {
  if (i == 5)
    continue;
  console.log("i: " + i);
}
console.log("continue functionality skipped 5 while executing the loop");
```

Single Digit Sum

Problem – Given a number N. You need to find the sum of digits of N until we get a single digit sum. For example –

Input – 12345

Output – 15 (1+2+3+4+5)

Approach – We can traverse through the sum until the sum value is less than or equal to 9. We can use Loops to iterate through the sum. Here we will use while loop for iteration

Steps -

1) Initialize sum = 0;
2) Verify if sum is less than 9 or n > 0 in loop condition
3) Fetch last digit of n and add to the sum
4) Remove last digit of n
5) Repeat step 2 till condition is satisfied
6) Return final value of sum

Single Digit Sum

Code Link - https://jsfiddle.net/9pk8tvay/

```
let n = 1234;

function getSum(n) {
  let sum = 0;
  while (n > 0 || sum > 9) {
    if(n == 0) {
      n = sum;
      sum = 0;
    }
    sum = sum + n % 10;
    n = Math.floor(n / 10);
  }
  return sum;
}

console.log(getSum(n));
```

Maximum Profit Stock

Problem – Given an array denoting the cost of stock on different days. Your task is to find the maximum profit which can be earned after buying or selling the stock on that particular day. For example –

Input – {100, 180, 260, 310, 40, 535, 695}

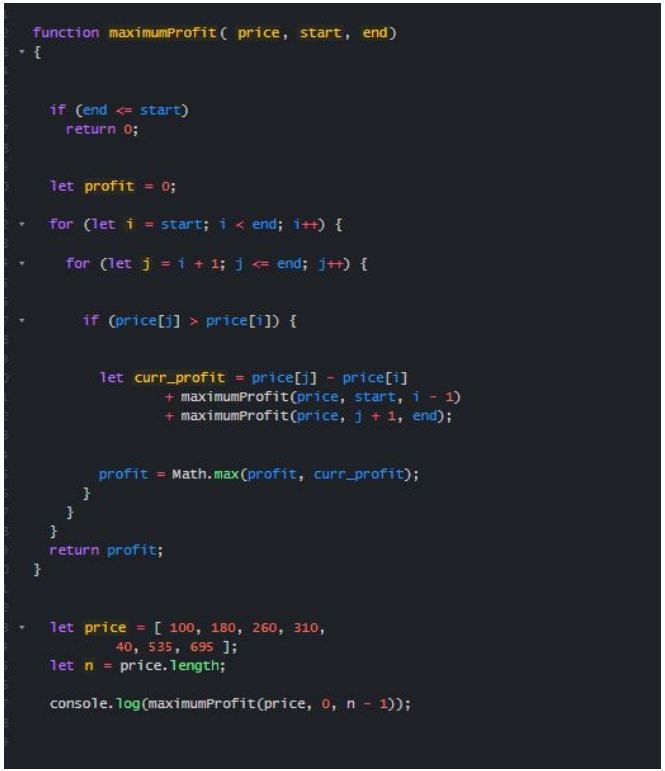
Output – 865 (Buy stock on Day 0 and sell it on Day 3 and again buy on Day 4 and sell on Day 6)

Naive Approach – We can iterate through the array and buy and sell stock everyday to check if we are getting maximum profit or not. If we get more profit, we can update our maximum profit so far.

We can use nested loop in this case to get the desired value

Maximum Profit Stock

Code Link - https://jsfiddle.net/tdqkh1rv/



```
function maximumProfit( price, start, end)
{


  if (end <= start)
    return 0;


  let profit = 0;

  for (let i = start; i < end; i++) {

    for (let j = i + 1; j <= end; j++) {


      if (price[j] > price[i]) {


        let curr_profit = price[j] - price[i]
                + maximumProfit(price, start, i - 1)
                + maximumProfit(price, j + 1, end);


        profit = Math.max(profit, curr_profit);
      }
    }
  }
  return profit;
}


  let price = [ 100, 180, 260, 310,
          40, 535, 695 ];
  let n = price.length;

  console.log(maximumProfit(price, 0, n - 1));
```

Maximum Profit Stock

Efficient Approach –Instead of using nested loops, we will use a single loop here.

STEPS - {100, 180, 260, 310, 40, 535, 695}

1) Initialize maximumProfit = 0;
2) Iterate from 1 to length of array
3) Check if current stock price is greater than previous price
4) If yes, save difference of current and previous to the maximum Profit

Maximum Profit Stock

Code Link - https://jsfiddle.net/etropv1h/

```
function maximumProfit(prices , size) {

  var maxProfit = 0;


  for (i = 1; i < size; i++)
    if (prices[i] > prices[i - 1])
      maxProfit += prices[i] - prices[i - 1];
  return maxProfit;
}


  var price = [ 100, 180, 260, 310, 40, 535, 695 ];
  var n = price.length;

  // function call
  console.log(maximumProfit(price, n));
```

Reverse Pyramid

Problem – Given a number N. You need to print a reverse pyramid having N rows using numbers 1 to N. For example –

Input – 6

Output –

```
1 2 3 4 5 6
 2 3 4 5 6
  3 4 5 6
   4 5 6
    5 6
     6
```

Approach –

Intuition - Since, it is printing numbers N times, it's obvious that we need to use the loop concept here. Now, based on the pattern in the problem, we need to decide the pattern of calling loops.

Steps -

1) Outer loop - iterate from 1 to N - variable i
2) Inner loop 1 - print space (Iterate from 1 to i) - variable j
3) Inner loop 2 - print number(Iterate from i to N) - variable j
4) Print new line

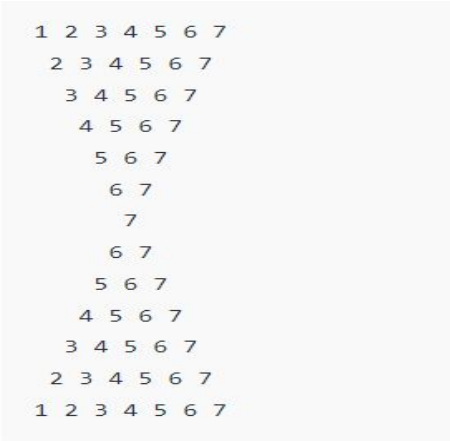
Reverse Pyramid

Code Link -> https://jsfiddle.net/h8qsz7pk/

```
var rows = 6;    // Number N

    //Print the pattern
    for ( i = 1; i <= rows; i++)    // outer loop
    {

          for ( j = 1; j < i; j++)    // inner loop 1
          {

             document.write(" ");
          }
          for ( j = i; j <= rows; j++)     // inner loop 2
                    {

              document.write(j +  " ");

          }
         document.write("<br>");

      }
```

Practice Questions

1) Write a java program to print below pattern having numbers in pyramid form along with its mirror image



2) Write a program to find the second smallest number from array using loops concept

Input -> [11,34,54,22,13,78]

Output -> 13

MCQ Questions

1) Which operations are performed inside a for loop?

A) Initialization
B) Updation
C) Testing
D) All of the above [Correct Answer]

2) What is the functionality of a continue statement in a loop?

A) Restarts the loop
B) End the loop
C) Skips the rest of the code in the loop iteration [Correct Answer]
D) None

3) Which of the following executes the block once before evaluating the conditional statement?

A) Do while Loop [Correct Answer]
B) While loop
C) For loop
D) None

MCQ Questions

4) Which of the following are examples of loops?

A) For loop
B) While Loop
C) Do While Loop
D) All of the above [Correct Answer]

5) What is the functionality of the break statement?

A) Jumps over to the next iteration
B) Jumps out from the loop [Correct Answer]
C) Skips the rest of the code inside the loop iteration
D) None

THANK YOU