

1). Create a function that finds the maximum range of a triangle's third edge, where the side lengths are all integers.

ANS:

```
<!DOCTYPE html>
<html lang="en">
<head>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-scale=1.0">
<title>Maximum Range of Third Edge</title>
<script>
    function findMaxThirdEdge(side1, side2) {
        // Calculate the maximum possible length of the third side
        const maxThirdEdge = side1 + side2 - 1;
        return maxThirdEdge;
    }

    function calculate() {
        const side1 = parseInt(document.getElementById('side1').value);
        const side2 = parseInt(document.getElementById('side2').value);

        if (!isNaN(side1) && !isNaN(side2)) {
            const maxThirdEdge = findMaxThirdEdge(side1, side2);
            document.getElementById('result').innerHTML = `Maximum range of the third edge: ${maxThirdEdge}`;
        } else {
            document.getElementById('result').innerHTML = 'Please enter valid side lengths.';
        }
    }
</script>
</head>
<body>
    <h2>Maximum Range of Third Edge</h2>
    <label for="side1">Enter side 1:</label>
    <input type="number" id="side1"><br><br>
    <label for="side2">Enter side 2:</label>
    <input type="number" id="side2"><br><br>
```

```
<button onclick="calculate()">Calculate</button>
<div id="result"></div>
</body>
</html>
```

OUTPUT

Maximum Range of Third Edge

Enter side 1:

Enter side 2:

Maximum range of the third edge: 57

2). The right shift operation is similar to floor division by powers of two. Write a function that mimics (without the use of `>>`) the right shift operator and returns the result from the two given integers. Try to solve this challenge by recursion.

ANS:

```
<!DOCTYPE html>
<html lang="en">
<head>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-scale=1.0">
<title>Right Shift Mimic</title>
<script>
    function rightShift(num, shift) {
        // Base case: if shift is 0, return num
        if (shift === 0) {
            return num;
        }
        // Base case: if num is 0 or negative, return 0
```

```

    if (num <= 0) {
        return 0;
    }

    // Recursive case: recursively divide num by 2 and decrement shift
    return rightShift(Math.floor(num / 2), shift - 1);
}

function calculateShift() {
    const num = parseInt(document.getElementById('num').value);
    const shift = parseInt(document.getElementById('shift').value);

    if (!isNaN(num) && !isNaN(shift)) {
        const result = rightShift(num, shift);
        document.getElementById('result').innerHTML = `Result: ${result}`;
    } else {
        document.getElementById('result').innerHTML = 'Please enter valid numbers.';
    }
}
</script>
</head>
<body>
    <h2>Right Shift Mimic</h2>
    <label for="num">Enter an integer:</label>
    <input type="number" id="num"><br><br>
    <label for="shift">Enter the shift amount:</label>
    <input type="number" id="shift"><br><br>
    <button onclick="calculateShift()">Calculate Shift</button>
    <div id="result"></div>
</body>
</html>

```

OUTPUT

Right Shift Mimic

Enter an integer:

Enter the shift amount:

Result: 1

3). Create a function that takes numbers b and m as arguments and returns the second derivative of the function $f(x) = x^b + x^m (e^{b \cdot m})$ with respect to x evaluated at $x=m$, where b and m are constants.

ANS:

```
<!DOCTYPE html>
<html lang="en">
<head>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-scale=1.0">
<title>Second Derivative Calculator</title>
</head>
<body>
<h2>Second Derivative Calculator</h2>
<p>Enter the values of b and m:</p>
<input type="number" id="inputB" placeholder="Enter value of b">
<input type="number" id="inputM" placeholder="Enter value of m">
<button onclick="calculateSecondDerivative()">Calculate</button>
<p id="result"></p>

<script>
function calculateSecondDerivative() {
    // Get values of b and m from input fields
    var b = parseFloat(document.getElementById("inputB").value);
    var m = parseFloat(document.getElementById("inputM").value);

    // Calculate the second derivative
```

```

var secondDerivative = calculateSecondDerivativeValue(b, m);

// Display the result
document.getElementById("result").innerHTML = "Second Derivative at x = m: " + secondDerivative;
}

function calculateSecondDerivativeValue(b, m) {
    // First derivative of f(x)
    var firstDerivative = 2 * Math.pow(m, b - 1) + Math.pow(Math.E, b * m);

    // Second derivative of f(x)
    var secondDerivative = (b - 1) * (b * Math.pow(m, b - 2)) + b * b * Math.pow(Math.E, b * m);

    return secondDerivative;
}
</script>
</body>
</html>
OUTPUT

```

Second Derivative Calculator

Enter the values of b and m:

2	3	Calculate
---	---	-----------

Second Derivative at x = m: 1615.71517397094

4). This Triangular Number Sequence is generated from a pattern of dots that form a triangle. The first 5 numbers of the sequence, or dots, are:
1, 3, 6, 10, 15

ANS:

<!DOCTYPE html>

```
<html lang="en">
<head>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-scale=1.0">
<title>Triangular Number Sequence</title>
</head>
<body>
<h2>Triangular Number Sequence</h2>
<p>Enter the triangle number:</p>
<input type="number" id="triangleNumber" placeholder="Enter triangle number">
<button onclick="calculateCumulativeSum()">Calculate Cumulative Sum</button>
<p id="result"></p>

<script>
function calculateCumulativeSum() {
    // Get the triangle number from the input field
    var triangleNumber = parseInt(document.getElementById("triangleNumber").value);

    // Validate input
    if (isNaN(triangleNumber) || triangleNumber <= 0) {
        document.getElementById("result").innerHTML = "Please enter a valid positive integer.";
        return;
    }

    // Calculate the cumulative sum
    var cumulativeSum = calculateCumulativeDots(triangleNumber);

    // Display the result
    document.getElementById("result").innerHTML = "Cumulative Sum: " + cumulativeSum;
}

function calculateCumulativeDots(n) {
    // Calculate the cumulative sum using the formula for triangular numbers
    return (n * (n + 1)) / 2;
}
</script>
```

```
</body>
</html>
```

OUTPUT

Triangular Number Sequence

Enter the triangle number:

Cumulative Sum: 21

5). Given a total due and an array representing the amount of change in your pocket, determine whether or not you are able to pay for the item. Change will always be represented in the following order: quarters, dimes, nickels, pennies.

ANS

```
<!DOCTYPE html>
<html lang="en">
<head>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-scale=1.0">
<title>Change Calculator</title>
</head>
<body>
<h2>Change Calculator</h2>
<p>Enter the total due:</p>
<input type="number" id="totalDue" placeholder="Total due">
<p>Enter the amount of change:</p>
<input type="text" id="changeArray" placeholder="Change array (e.g., '2,0,1,5')">
<button onclick="checkPayment()">Check Payment</button>
<p id="result"></p>

<script>
function checkPayment() {
    // Get the total due from the input field
    var totalDue = parseFloat(document.getElementById("totalDue").value);

    // Get the change array from the input field and convert it to an array of integers
    var changeArrayInput = document.getElementById("changeArray").value;
```

```

var changeArray = changeArrayInput.split(",").map(Number);

// Validate input
if (isNaN(totalDue) || totalDue <= 0) {
    document.getElementById("result").innerHTML = "Please enter a valid
positive number for total due.";
    return;
}

if (changeArray.length !== 4 || changeArray.some(isNaN) ||
changeArray.some(x => x < 0)) {
    document.getElementById("result").innerHTML = "Please enter a valid
change array in the format 'quarters, dimes, nickels, pennies.'";
    return;
}

// Calculate the total amount of change
var changeTotal = (changeArray[0] * 0.25) + (changeArray[1] * 0.10) +
(changeArray[2] * 0.05) + (changeArray[3] * 0.01);

// Check if the total change is enough to cover the total due
if (changeTotal >= totalDue) {
    document.getElementById("result").innerHTML = "You can pay for the
item.";
} else {
    document.getElementById("result").innerHTML = "You cannot pay for the
item.";
}
}
</script>
</body>
</html>

```

Output

Change Calculator

Enter the total due:

Enter the amount of change:

You cannot pay for the item.