```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8" />
  <meta name="viewport" content="width=device-width, initial-scale=1" />
  <title>JavaScript Concepts Demo</title>
  <style>
    body { font-family: Arial, sans-serif; margin: 20px; }
    button { margin: 5px 0; padding: 8px 15px; }
    pre { background: #f4f4f4; padding: 10px; border-radius: 5px; }
  </style>
</head>
<body>

  <h1>JavaScript Concepts Demo</h1>

  <h2>1. Variables and Data Types</h2>
  <pre id="variables"></pre>

  <h2>2. Operators</h2>
  <pre id="operators"></pre>

  <h2>3. Conditions</h2>
  <pre id="conditions"></pre>

  <h2>4. Loops</h2>
  <pre id="loops"></pre>

  <h2>5. Functions</h2>
  <pre id="functions"></pre>

  <h2>6. Events</h2>
  <button id="eventBtn">Click me</button>
  <pre id="events"></pre>

  <h2>7. Classes and Objects</h2>
  <pre id="classes"></pre>

  <h2>8. Error Handling and Validations</h2>
  <pre id="errors"></pre>

  <h2>9. Arrays</h2>
  <pre id="arrays"></pre>

  <h2>10. Strings</h2>
  <pre id="strings"></pre>

  <h2>11. Mixed Data</h2>
  <pre id="data"></pre>

<script>
  // 1. Variables and Data Types
  let numberVar = 42;
  const stringVar = "Hello, world!";
  let booleanVar = true;
  let undefinedVar;
  let nullVar = null;
  let objectVar = { name: "Alice", age: 30 };

  document.getElementById('variables').textContent =
    `Number: ${numberVar}
String: ${stringVar}
Boolean: ${booleanVar}
Undefined: ${undefinedVar}
```

```
Null: ${nullVar}
Object: ${JSON.stringify(objectVar)}`;

  // 2. Operators
  let a = 10;
  let b = 3;
  document.getElementById('operators').textContent =
    `Addition: ${a + b}
Subtraction: ${a - b}
Multiplication: ${a * b}
Division: ${a / b}
Modulus: ${a % b}
Exponentiation: ${a ** b}`;

  // 3. Conditions
  let conditionText = '';
  if (a > b) {
    conditionText = `${a} is greater than ${b}`;
  } else if (a === b) {
    conditionText = `${a} is equal to ${b}`;
  } else {
    conditionText = `${a} is less than ${b}`;
  }
  document.getElementById('conditions').textContent = conditionText;

  // 4. Loops
  let loopsText = "For loop counting 1 to 5:\n";
  for (let i = 1; i <= 5; i++) {
    loopsText += i + "\n";
  }
  loopsText += "\nWhile loop counting down from 5:\n";
  let count = 5;
  while (count > 0) {
    loopsText += count + "\n";
    count--;
  }
  document.getElementById('loops').textContent = loopsText;

  // 5. Functions
  function greet(name) {
    return `Hello, ${name}!`;
  }
  document.getElementById('functions').textContent = greet("Bob");

  // 6. Events
  const eventBtn = document.getElementById('eventBtn');
  const eventsOutput = document.getElementById('events');
  eventBtn.addEventListener('click', () => {
    eventsOutput.textContent += "Button clicked!\n";
  });

  // 7. Classes and Objects
  class Person {
    constructor(name, age) {
      this.name = name;
      this.age = age;
    }
    describe() {
      return `${this.name} is ${this.age} years old.`;
    }
  }
  const person1 = new Person("John", 25);
  document.getElementById('classes').textContent = person1.describe();
```

```
  // 8. Error Handling and Validations
  function divide(x, y) {
    try {
      if (typeof x !== "number" || typeof y !== "number") {
        throw new TypeError("Both arguments must be numbers");
      }
      if (y === 0) {
        throw new Error("Cannot divide by zero");
      }
      return x / y;
    } catch (error) {
      return `Error: ${error.message}`;
    }
  }
  let errorsText = '';
  errorsText += `divide(10, 2) = ${divide(10, 2)}\n`;
  errorsText += `divide(10, 0) = ${divide(10, 0)}\n`;
  errorsText += `divide(10, "a") = ${divide(10, "a")}\n`;
  document.getElementById('errors').textContent = errorsText;

  // 9. Arrays
  let fruits = ["Apple", "Banana", "Cherry"];
  fruits.push("Date");
  fruits.pop();
  let arraysText = "Fruits array:\n";
  fruits.forEach((fruit, index) => {
    arraysText += `Fruit ${index + 1}: ${fruit}\n`;
  });
  document.getElementById('arrays').textContent = arraysText;

  // 10. Strings
  let sampleString = "JavaScript Programming";
  let stringsText = '';
  stringsText += `Length: ${sampleString.length}\n`;
  stringsText += `Uppercase: ${sampleString.toUpperCase()}\n`;
  stringsText += `Includes 'Script': ${sampleString.includes("Script")}\n`;
  stringsText += `Substring (0,10): ${sampleString.substring(0, 10)}\n`;
  document.getElementById('strings').textContent = stringsText;

  // 11. Mixed Data
  let mixedArray = [numberVar, stringVar, booleanVar, nullVar, person1];
  let dataText = '';
  mixedArray.forEach((item, idx) => {
    if (typeof item === 'object' && item !== null) {
      dataText += `Item ${idx}: ${JSON.stringify(item)}\n`;
    } else {
      dataText += `Item ${idx}: ${item}\n`;
    }
  });
  document.getElementById('data').textContent = dataText;

</script>

</body>
</html>
```

JavaScript Concepts Demo

1. Variables and Data Types

```
Number: 42
String: Hello, world!
Boolean: true
Undefined: undefined
Null: null
Object: {"name":"Alice","age":30}
```

2. Operators

```
Addition: 13
Subtraction: 7
Multiplication: 30
Division: 3.3333333333333335
Modulus: 1
Exponentiation: 1000
```

3. Conditions

```
10 is greater than 3
```

4. Loops

```
For loop counting 1 to 5:
1
2
3
4
5

While loop counting down from 5:
5
4
3
2
1
```

5. Functions

```
Hello, Bob!
```

6. Events

Click me

7. Classes and Objects

```
John is 25 years old.
```

8. Error Handling and Validations

```
divide(10, 2) = 5
divide(10, 0) = Error: Cannot divide by zero
divide(10, "a") = Error: Both arguments must be numbers
```

9. Arrays

```
Fruits array:
Fruit 1: Apple
Fruit 2: Banana
Fruit 3: Cherry
```

10. Strings

```
Length: 22
Uppercase: JAVASCRIPT PROGRAMMING
Includes 'Script': true
Substring (0,10): JavaScript
```

11. Mixed Data

```
Item 0: 42
Item 1: Hello, world!
Item 2: true
Item 3: null
Item 4: {"name":"John","age":25}
```