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Question:

Create a website of three pages.

The first page must contain brief introduction of matrix and vector, with links to go to the corresponding operation pages.

The page corresponding to the matrix operation page will contain two text areas taking two matrices as inputs respectively, and three buttons to perform addition, subtraction and multiplication of the input matrices.

If certain operation is invalid on the input, show the corresponding message in red color below the corresponding button.

Otherwise make another text area visible to show the result of the operation.

The similar design must be done for the vector page, where the three operations will be addition, subtraction and dot product.

Solution:

file.html

```
<html>
  <head>
    <title>Introduction</title>
    <style>
      body {
        background-color: #fdcbc0;
        padding: 2%;
        font-family: Helvetica Neue,Helvetica,Arial,sans-serif;
      }
      #top {
        display: block;
        width: 100%;
        height: 30%;
        margin: 0px auto;
      }
      .top-class1 {
        display: block;
        float: left;
        width: 50%;
```

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```
}
.top-class2 {
  display: block;
  float: right;
  width: 50%;
}
.center {
  display: block;
  text-align: center;
  margin-top: 15%;
  margin-right: auto;
  margin-left: auto;
}
.image1 {
  width: 50%;
  float: left;
  height: 60%;
}
#image {
  display: block;
  width: 50%;
  margin: 0px auto;
}
.operations {
  float: right;
  width: 50%;
  height: 60%;
}
</style>
</head>
<body>
<div class="top-class1">
</img>
</div>
<div class="top-class2">
</img>
</div>
<div class="center">
<h1>Matrix and Vectors</h1>
</div>
```

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```
<div>
```

```
<h2><u>Matrix:</u></h2>
```

<p>In mathematics, a matrix (plural matrices) is a rectangular array of numbers, symbols, or expressions, arranged in rows and columns. For example, the dimension of the matrix below is 2 x 3 (read "two by three"), because there are two rows and three columns:</p>

```
</div>
```

```
<div class="image1">
```

```
</img>
```

```
</div>
```

```
<div class="operations">
```

```
<h3><a href="matrix.html" target="_blank">Matrix operations:</a></h3>
```

```
<p>There are a number of basic operations that can be applied to modify matrices.</p>
```

```
<un>
```

```
<li>Addition of two matrices</li>
```

```
<li>Subtraction of two matrices</li>
```

```
<li>Multiplication of two matrices</li>
```

```
</un>
```

```
</div>
```

```
<div>
```

```
<h2><u>Vectors:</u></h2>
```

<p>Vector, in physics, a quantity that has both magnitude and direction. It is typically represented by an arrow whose direction is the same as that of the quantity and whose length is proportional to the quantity's magnitude. Although a vector has magnitude and direction, it does not have position. That is, as long as its length is not changed, a vector is not altered if it is displaced parallel to itself. </p>

```
</div>
```

```
<div class="image1">
```

```
</img>
```

```
</div>
```

```
<div class="operations">
```

```
<h3><a href="vector.html" target="_blank">Vector operations:</a></h3>
```

```
<p>Few basic Vector operations are:</p>
```

```
<un>
```

```
<li>Addition of two vectors</li>
```

```
<li>Subtraction of two vectors</li>
```

```
<li>Dot product of two matrices</li>
```

```
</un>
```

```
</div>
```

```
</body>
```

```
</html>
```

matrix.html

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```
<html>
<head>
  <title>Matrix Operations</title>
  <script type="text/javascript" src="logic.js">

</script>
<style>
  body {
    background-color: #fdcbc0;
    padding: 2%;
    font-family: Helvetica Neue,Helvetica,Arial,sans-serif;
  }
  #top {
    display: block;
    width: 100%;
    height: 30%;
    margin: 0px auto;
  }
  .top-class1 {
    display: block;
    float: left;
    width: 50%;
  }
  .top-class2 {
    display: block;
    float: right;
    width: 50%;
  }
  .center {
    display: block;
    text-align: center;
    margin-top: 15%;
    margin-right: auto;
    margin-left: auto;
  }
  #m1, #m2 {
    display: block;
    text-align: center;
    margin-right: auto;
    margin-left: auto;
  }
```

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```
width: 50%;
border-radius: 20px;
border: none;
}
#res {
display: none;
text-align: center;
margin-right: auto;
margin-left: auto;
margin-top: 40px;
width: 50%;
border-radius: 20px;
border: none;
}
#top-box {
display: block;
border-radius: 20px;
background-color: white;
}
.button {
border: none;
text-align: center;
font-size: 15px;
padding: 10px 20px;
width: 10%;
}
.button1 {
border: none;
text-align: center;
font-size: 15px;
padding: 10px 20px;
width: 30.7%;
}
</style>
</head>
<body>
<div id="top-box">
<div class="top-class1">
</img>
```

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```
</div>
<div class="top-class2">
  </img>
</div>
</div>
<div class="center">
  <h1>Matrix Operations</h1>
</div>
<div style="display: flex; width: 100%">
<div style="width:33.33%; text-align:center">
  <p>Input data of 1st matrix:</p>
  <textarea rows="10" cols="50" id="m1"></textarea>
</div>
<div style="width: 33.33%; text-align:center">
  <p>Input data of 2nd matrix:</p>
  <textarea rows="10" cols="50" id="m2"></textarea>
</div>
<div style="width: 33.33%; text-align:center">
  <textarea rows="10" cols="50" id="res" ></textarea>
</div>
</div>
<div style="display: block; width: 100%; margin-top: 2%">
  <button onclick="process1()" value="process1" class="button">Addition</button>
  <button onclick="process2()" value="process2" class="button">Subtraction</button>
  <button onclick="process3()" value="process3" class="button">Multiplacation</button><br><br>
  <a href="vector.html"><button class="button1"><b>Vectors</b></button></a>
  <p id="error" style="display:none"></p>
</div>
</body>
</html>
```

vector.html

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```
<html>
  <head>
    <title>Vector Operations</title>
    <script type="text/javascript" src="logic_vec.js">

  </script>
  <style>
    body {
      background-color: #fdcbc0;
      padding: 2%;
      font-family: Helvetica Neue,Helvetica,Arial,sans-serif;
    }
    #top {
      display: block;
      width: 100%;
      height: 30%;
      margin: 0px auto;
    }
    .top-class1 {
      display: block;
      float: left;
      width: 50%;
    }
    .top-class2 {
      display: block;
      float: right;
      width: 50%;
    }
    .center {
      display: block;
      text-align: center;
      margin-top: 15%;
      margin-right: auto;
      margin-left: auto;
    }
    #v1, #v2 {
      display: block;
      text-align: center;
      margin-right: auto;
      margin-left: auto;
    }
  </style>
</html>
```

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```
width: 50%;
border-radius: 20px;
border: none;
height: 30px;
}
#res {
display: none;
text-align: center;
margin-right: auto;
margin-left: auto;
margin-top: 40px;
width: 50%;
border-radius: 20px;
border: none;
height: 30px;
}
#top-box {
display: block;
border-radius: 20px;
background-color: white;
}
.button {
border: none;
text-align: center;
font-size: 15px;
padding: 10px 20px;
width: 10%;
}
.button1 {
border: none;
text-align: center;
font-size: 15px;
padding: 10px 20px;
width: 30.7%;
}

</style>
</head>
<body>
<div id="top-box">
```


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```
<div class="top-class1">
  </img>
</div>
<div class="top-class2">
  </img>
</div>
</div>
<div class="center">
  <h1>Vector Operations</h1>
</div>
<div style="display: flex; width: 100%">
  <div style="width:33.33%; text-align:center">
    <p>Input data of 1st Vector:</p>
    <textarea rows="1" cols="50" id="v1"></textarea>
  </div>
  <div style="width: 33.33%; text-align:center">
    <p>Input data of 2nd Vector:</p>
    <textarea rows="1" cols="50" id="v2"></textarea>
  </div>
  <div style="width: 33.33%; text-align:center">
    <textarea rows="1" cols="50" id="res" ></textarea>
  </div>
</div>
<div style="display: block; width: 100%; margin-top: 2%">
  <button onclick="process1()" value="process1" class="button">Addition</button>
  <button onclick="process2()" value="process2" class="button">Subtraction</button>
  <button onclick="process3()" value="process3" class="button">Dot Product</button><br><br>
  <a href="matrix.html"><button class="button1"><b>Matrices</b></button></a>
  <p id="error" style="display:none"></p>
</div>
</body>
</html>
```

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logic.js

```
function get_matrix(text) {
    var rows = text.split("\n");
    var col=0;
    var matrix = new Array(rows.length);
    for(var i=0; i<rows.length; i++) {
        matrix[i] = rows[i].split(" ");
        if(col==0)
            col = matrix[i].length;
        else if (col!=matrix[i].length)
            return null;
    }
    return {
        m: matrix,
        c: matrix[0].length,
        r: matrix.length,
    };
}
/*
Addition
*/
function process1() {
    var mat1 = get_matrix(document.getElementById("m1").value);
    var mat2 = get_matrix(document.getElementById("m2").value);
    console.log(mat1);
    if(mat1.r != mat2.r || mat1.c != mat2.c) {
        document.getElementById("error").style="display:block; color:red";
        document.getElementById("error").innerHTML="Sum isn't possible!! Rows or columns doesn't match!";
    }
    else {
        var out = new Array(mat1.r);
        var result = new Array(mat1.r);
        for(var i=0; i<mat1.r; i++) {
            result[i] = new Array(mat1.c);
            for(var j=0; j<mat1.c; j++) {
                result[i][j] = parseInt(mat1.m[i][j]) + parseInt(mat2.m[i][j]);
            }
        }
    }
}
```

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```
    out[i] = result[i].join(" ");
  }
  document.getElementById("res").style="display:block";
  document.getElementById("res").value=out.join("\n");
}
}
/*
Subtraction
*/
function process2() {
  var mat1 = get_matrix(document.getElementById("m1").value);
  var mat2 = get_matrix(document.getElementById("m2").value);
  if(mat1.r != mat2.r || mat1.c != mat2.c) {
    document.getElementById("error").style="display:block; color:red";
    document.getElementById("error").innerHTML="Subtraction isn't possible!! Rows or columns
dosen't match!";
  }
  else {
    var out = new Array(mat1.r);
    var result = new Array(mat1.r);
    for(var i=0; i<mat1.r; i++) {
      result[i] = new Array(mat1.c);
      for(var j=0; j<mat1.c; j++) {
        result[i][j] = mat1.m[i][j] - mat2.m[i][j];
      }
      out[i] = result[i].join(" ");
    }
    document.getElementById("res").value=out.join("\n");
    document.getElementById("res").style="display:block";
  }
}
/*
```

Multiplacation

```
*/
function process3() {
  var mat1 = get_matrix(document.getElementById("m1").value);
  var mat2 = get_matrix(document.getElementById("m2").value);
  if(mat1.c != mat2.r) {
    document.getElementById("error").style="display:block; color:red";
```

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```
document.getElementById("error").innerHTML="Multiplacation isn't possible!! Coloumns of 1st matrix dosen't matches Rows of 2nd matrix!";
```

```
}  
else {  
    var out = new Array(mat1.r);  
    var result = new Array(mat1.r);  
    for(var i=0; i<mat1.r; i++) {  
        result[i] = new Array(mat2.c);  
        for(var j=0; j<mat2.c; j++) {  
            result[i][j] = 0;  
            for(var k=0; k<mat1.c; k++){  
                result[i][j] += parseInt(mat1.m[i][k]) * parseInt(mat2.m[k][j]);  
            }  
        }  
        out[i] = result[i].join(" ");  
    }  
    document.getElementById("res").value=out.join("\n");  
    document.getElementById("res").style="display:block";  
}  
}
```

logic_vec.js

```
function get_vector(text) {  
    var vec = text.split(" ");  
    if(vec.length != 3) {  
        document.getElementById("error").style="display:block; color:red";  
        document.getElementById("error").innerHTML="Error! Vector components aren't 3!! (Tip: Enter '0'  
for non-existing components)";  
        return null;  
    }  
    return vec;  
}  
/*  
Addition  
*/  
function process1() {  
    var vec1 = get_vector(document.getElementById("v1").value);
```

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```
var vec2 = get_vector(document.getElementById("v2").value);
var res = new Array(3);
for(var i=0; i<3; i++) {
    res[i] = parseInt(vec1[i]) + parseInt(vec2[i]);
}
document.getElementById("res").style="display:block";
document.getElementById("res").innerHTML=res[0]+"i + "+res[1]+"j + "+res[2]+"k";
document.getElementById("error").style="display:none";
```

```
}
/*
```

Subtraction

```
*/
```

```
function process2() {
    var vec1 = get_vector(document.getElementById("v1").value);
    var vec2 = get_vector(document.getElementById("v2").value);
    var res = new Array(3);
    for(var i=0; i<3; i++) {
        res[i] = parseInt(vec1[i]) - parseInt(vec2[i]);
    }
    document.getElementById("res").style="display:block";
    document.getElementById("res").innerHTML=res[0]+"i + "+res[1]+"j + "+res[2]+"k";
    document.getElementById("error").style="display:none";
```

```
}
/*
```

Dot Product

```
*/
```

```
function process3() {
    var vec1 = get_vector(document.getElementById("v1").value);
    var vec2 = get_vector(document.getElementById("v2").value);
    var res = 0;
    for(var i=0; i<3; i++) {
        res += parseInt(vec1[i]) * parseInt(vec2[i]);
    }
    document.getElementById("res").style="display:block";
    document.getElementById("res").innerHTML=res;
    document.getElementById("error").style="display:none";
```

```
}
```

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Output:

$$\begin{matrix} & \xrightarrow{3} \\ 2 \downarrow & \begin{bmatrix} 2 & 4 & 1 \\ 9 & 3 & 8 \end{bmatrix} \\ & \end{matrix} = A$$

A
2 × 3

The matrix has 2 rows and 3 columns

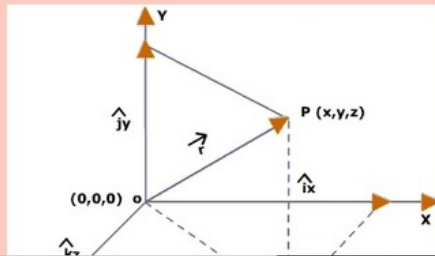
Matrix operations:

There are a number of basic operations that can be applied

- Addition of two matrices
- Subtraction of two matrices
- Multiplication of two matrices

Vectors:

Vector, in physics, a quantity that has both magnitude and direction. It is typically represented by an arrow whose direction is the same as that of the quantity and whose length is proportional to its magnitude. Although a vector has magnitude and direction, it does not have position. That is, as long as its length is not changed, a vector is not altered if it is displaced parallel to its original position.



Vector operations:

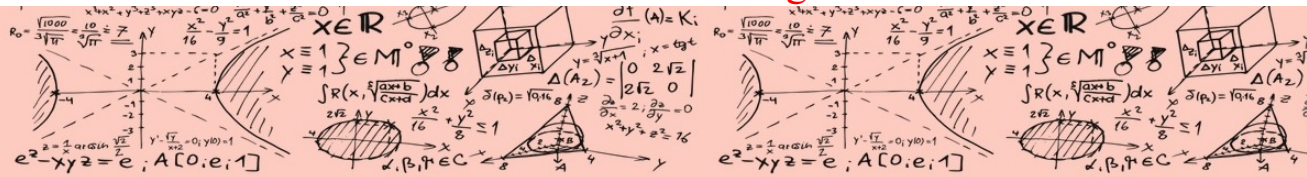
Few basic Vector operations are:

- Addition of two vectors
- Subtraction of two vectors
- Dot product of two matrices

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Matrix Operations

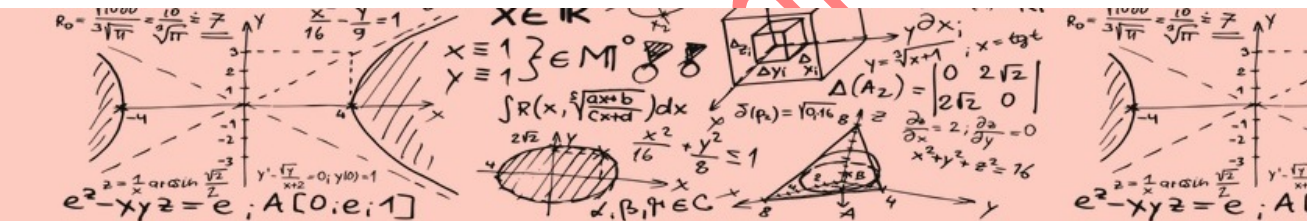
Input data of 1st matrix:

1	2	3
4	5	6

Input data of 2nd matrix:

1	2	3
4	5	6

2	4	6
8	10	12



Vector Operations

Input data of 1st Vector:

Input data of 2nd Vector: