

# CSS Positioning, Display Properties Flexbox and Grid

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## 1. Positioning in CSS

CSS positioning determines how elements are placed on the page. Here are the main positioning values:

### 1.1 static (Default Positioning)

- The default behavior of elements.
- Elements flow naturally in the document.

```
{ position: static; }
```

### 1.2 relative

- The element is positioned relative to its normal position.
- Use top, right, bottom, and left to offset.

```
.relative-box {  
  position: relative;  
  top: 10px;  
  left: 20px;  
}
```

Use relative positioning as a reference for positioning child elements.

## 1.3 absolute

- The element is positioned relative to the nearest positioned (non-static) ancestor.
- Removed from the normal document flow.

```
.parent {  
  position: relative;  
}  
.child {  
  position: absolute;  
  top: 10px;  
  left: 15px;  
}
```

If no ancestor is positioned, the element positions itself relative to the html (root element).

## 1.4 fixed

- The element is positioned relative to the viewport.
- Stays in place even during scrolling.

```
.fixed-header {  
  position: fixed;  
  top: 0;  
  width: 100%;  
  background-color: #333;  
  color: white;  
}
```

Use fixed positioning for fixed headers, footers.

## 1.5 sticky

- A hybrid of relative and fixed.

- Behaves as relative until a specific scroll point is reached, then acts like fixed.

```
.sticky-nav {  
  position: sticky;  
  top: 0;  
  background-color: yellow;  
}
```

Use sticky for slides like table headers or navigation bars.

## 1.6 z-index

- Controls the stacking order of elements.
- Higher values appear on top of lower values.

```
.header {  
  position: fixed;  
  top: 0;  
  z-index: 1000;  
}  
.modal {  
  position: fixed;  
  top: 50%;  
  left: 50%;  
  z-index: 2000;  
}
```

Use z-index to control the stacking order of elements like modals, dropdowns.

## 2. Display Properties

The `display` property controls the box type of an element and its behavior in the document flow.

## 2.1 block

- The element takes up the full width of its parent container.
- Starts on a new line.

```
div { display: block; }
```

## 2.2 inline

- The element takes up only as much width as its content.
- Doesn't start on a new line.

```
span { display: inline; }
```

## 2.3 inline-block

- Behaves like inline, but allows setting width and height.

```
.menu-item {  
  display: inline-block;  
  padding: 10px;  
  background-color: #ddd;  
}
```

## 2.4 none

- Hides the element entirely.

```
.hidden {
```

```
display: none;
}
```

- Combine inline-block for horizontal layouts without float.
- Use none for toggling visibility dynamically via JavaScript.

## 3. Flexbox (Flexible Box Layout)

Flexbox is a powerful CSS layout model for distributing space and aligning items.

### 3.1 Setting Up Flexbox

```
.container {
  display: flex;
}
```

### 3.2 Key Flexbox Properties

```
.container {
  flex-direction: row;
  justify-content: center;
  align-items: center;
  flex-wrap: wrap;
  gap: 10px;
}
```

#### flex-direction

*Controls the direction of the items in the container.*

- row (default): Items are placed horizontally.
- column: Items are placed vertically.

```
.container {  
  flex-direction: row; /* Horizontal */  
}
```

## justify-content

*Aligns items horizontally in the container.*

- flex-start (default), center, space-between, space-around, flex-end

```
.container {  
  justify-content: center; /* Center items */  
}
```

## align-items

*Aligns items vertically in the container.*

- stretch (default), center, flex-start, flex-end

```
.container {  
  align-items: center; /* Center items vertically */  
}
```

## flex-wrap

*Allows items to wrap onto multiple lines.*

```
.container {  
  flex-wrap: wrap;  
}
```

## gap

*Adds spacing between flex items.*

```
.container {  
  gap: 10px;  
}
```

## 3.3 Child Flex Properties

```
.item {  
  flex: 1;  
  align-self: flex-end;  
}
```

## flex

*Specifies the flex-grow, flex-shrink, and flex-basis values.*

```
.item {
```

```
flex: 1 1 150px;  
}
```

Card 1

Card 2

Card 3

## align-self

*Overrides align-items for individual items.*

```
.item {  
  align-self: flex-end;  
}
```

## Practical Example

Item 1

Item 2

Item 3

### Flex Box Best Practices

Fallbacks: Provide fallbacks for older browsers that don't support Flexbox.

Avoid Overuse: Use Flexbox for layout structure, not for small alignments where simpler CSS would suffice.

Combine Flexbox and Grid: Use Flexbox for one-dimensional layouts and CSS Grid for two-dimensional layouts.

Debugging Tools: Use browser developer tools to visualize flex containers and properties.



## 4. Grid Layout : (Two Dimensional Box Layout)

*CSS Grid Layout is a two-dimensional layout system in CSS that allows you to design web layouts in rows and columns. It offers control over alignment, spacing, and positioning of items.*

### Grid Basics

#### 1. Grid Container

- To use Grid, set the display property to grid or inline-grid on a container.

```
.container {  
  display: grid;  
}
```

#### 2. Grid Properties

- Define columns and rows using the grid-template-columns and grid-template-rows properties.

```
.container {  
  display: grid;  
  grid-template-columns: 100px 200px 1fr;  
  grid-template-rows: 50px auto 100px;  
}
```

- 100px, 200px: Fixed sizes.
- 1fr: Fractional unit that divides remaining space.
- auto: Adjusts size based on content.

Item 1

Item 2

Item 3

### 3. Grid Gap

- Control spacing between rows and columns.

```
.container {  
  gap: 10px; /* Equal gap between rows and columns */  
  row-gap: 15px; /* Row-specific spacing */  
  column-gap: 20px; /* Column-specific spacing */  
}
```

### Spanning Items: grid-column and grid-row

- Position and stretch items across specific rows or columns.

```
.item {  
  grid-column: 1 / 3; /* Span columns 1 to 3 */  
  grid-row: 1 / 2; /* Span rows 1 to 2 */  
}
```

Spanning 2 Columns

Item 2

Item 3

## Grid Advanced

### 1. repeat() Function

- Repeat a pattern of columns or rows.

```
.container {  
  display: grid;  
  grid-template-columns: repeat(3, 1fr);  
  grid-template-rows: repeat(2, 100px);  
}
```

### 2. Auto Sizing Tracks

*Automatically fit items into available space.*

- auto-fit: Adjusts items to fill available space.
- auto-fill: Creates empty tracks if items don't fill the space.

```
.container {  
  display: grid;  
  grid-template-columns: repeat(auto-fit, minmax(100px, 1fr));  
}
```

Item 1

Item 2

Item 3

### 3. Grid Areas

*Define named grid areas for layout.*

- Use grid-template-areas to define areas.
- Assign areas to items using grid-area.

```
.container {  
  grid-template-areas:  
    "header header"  
    "sidebar content";  
}  
.item1 { grid-area: header; }  
.item2 { grid-area: sidebar; }  
.item3 { grid-area: content; }
```

Header

Sidebar

Content

## 4. Grid Auto Placement

*Automatically place items in the grid.*

- grid-auto-flow: Controls the direction of auto-placement.

```
.container {  
  display: grid;  
  grid-auto-flow: column;  
}
```

Item 1

Item 2

Item 3

## Aligning Items

### *Control alignment of items in the grid.*

- `justify-items`: Aligns items horizontally.
- `align-items`: Aligns items vertically.

```
.container {  
  display: grid;  
  justify-items: center;  
  align-items: center;  
}
```

Item 1

Item 2

Item 3

## Practical Example

Header

Navigation

Content

Footer

### Grid Best Practices

Use `minmax()` for Responsive Design: Combines minimum and maximum sizes to create flexible grids. Example: `grid-template-columns: repeat(3, minmax(100px, 1fr));`

Avoid Overlapping Items Accidentally: Use explicit grid definitions like `grid-area` to manage layout.

Named Grid Areas for Readability: Simplify layout debugging by using `grid-template-areas`.

Leverage `auto-fit` for Responsive Layouts: Automatically adjust item placement without fixed column counts.

Experiment with DevTools: Use browser DevTools to visualize grid structure for debugging.