

Responsive Web Design



Fundamental Web Programming

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Outline

- What is Responsive Web Design?
- Fundamental Techniques
- Scaling & Sizing Fonts



What is Responsive Web Design?



Responsive Web Design is a process of designing and building websites to provide better accessibility and optimal viewing experience to the user by optimizing it for different devices.



With the growing trend of smart phones and tablets, it has become almost unavoidable to ignore the optimization of sites for mobile devices. Responsive web design is a preferable alternative and an efficient way to target a wide range of devices with much less efforts.



What is Responsive Web Design?

- Website design approach that aims to optimize the viewing experience across a wide range of devices.
- One website for all devices: desktop, tablets, smartphones.
- Reformats the page layout per screen resolution.
- Ideal for sites with less complex functionality and high volume of content.



Advantages of RWD

- One single HTML document to be maintained
- One single CSS file to be maintained
- Easier than maintaining several website for different devices.
- The site is easily accessible on any type of device.
- Users will have a similar experience using the site when they access the site from different devices.
- Responsive Web is flexible and adaptable



What is needed for RWD ?

- An understanding of the various devices and pixel density.
- How user experience and user needs are different for mobile users.
- How Web browsers vary in rendering Web pages.
- HTML expertise.
- Extensive use of CSS required.



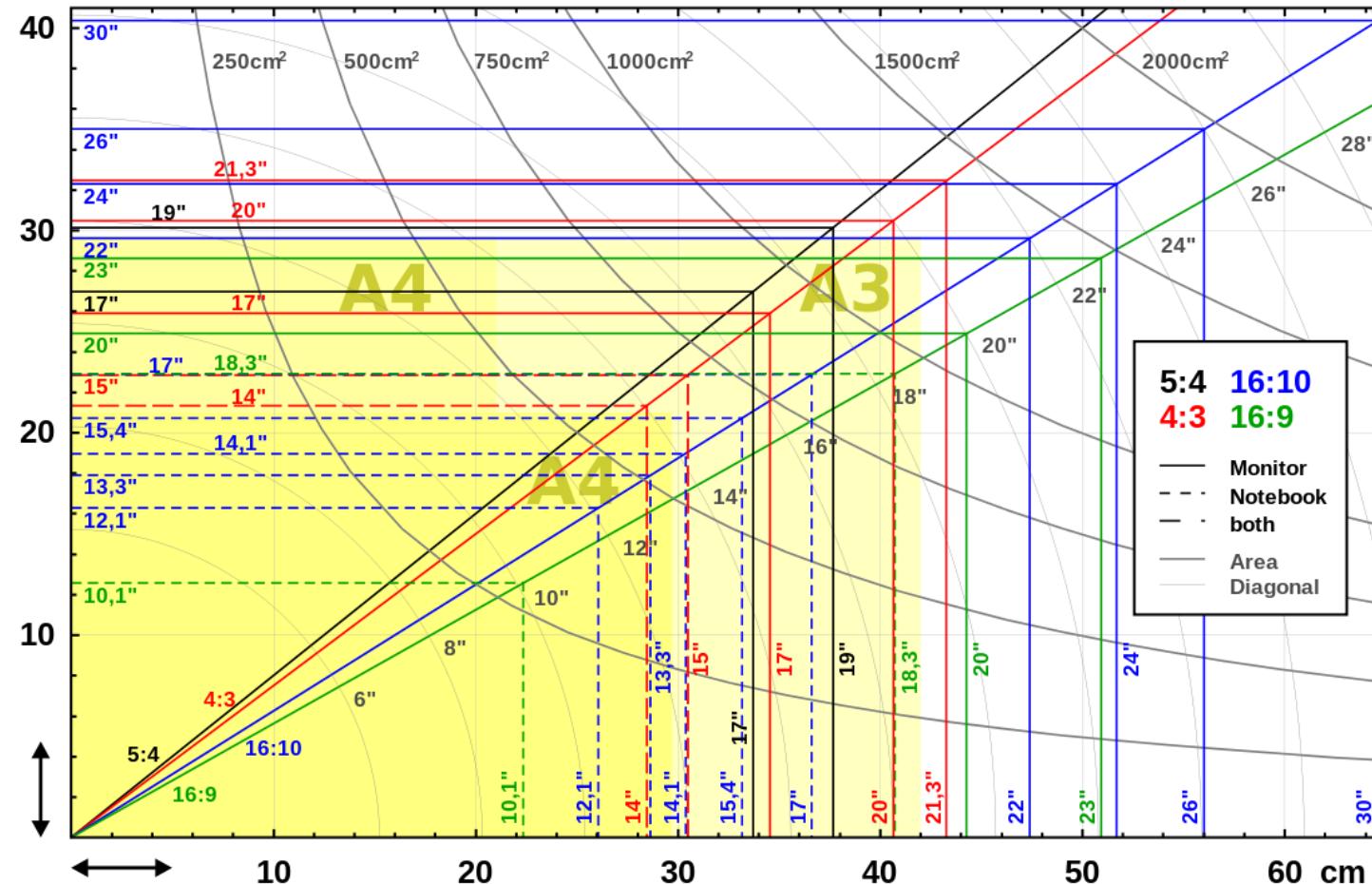
Screen size

- Many of these devices use touch interfaces and come in a wide variety of screen resolutions and screen sizes.
- The size of a pixel varies according to the device.
- Mobile networks can be slower, and most users have fixed data plans.
- Limited memory, processor power and battery.
- A wide variety of browsers are used on mobile devices.



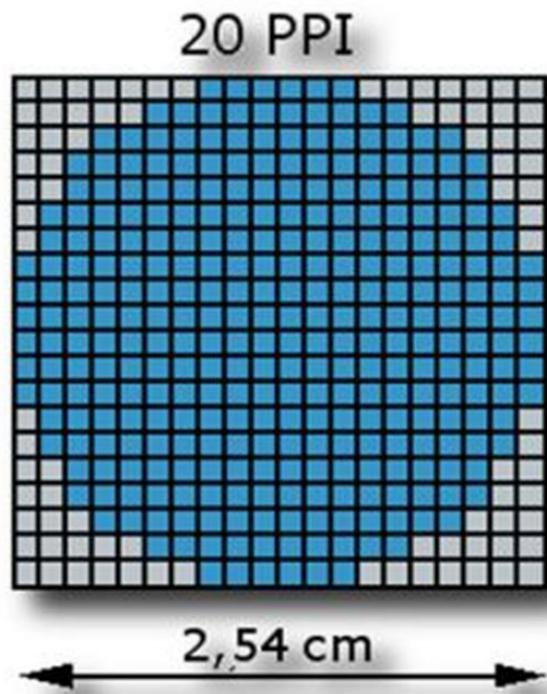
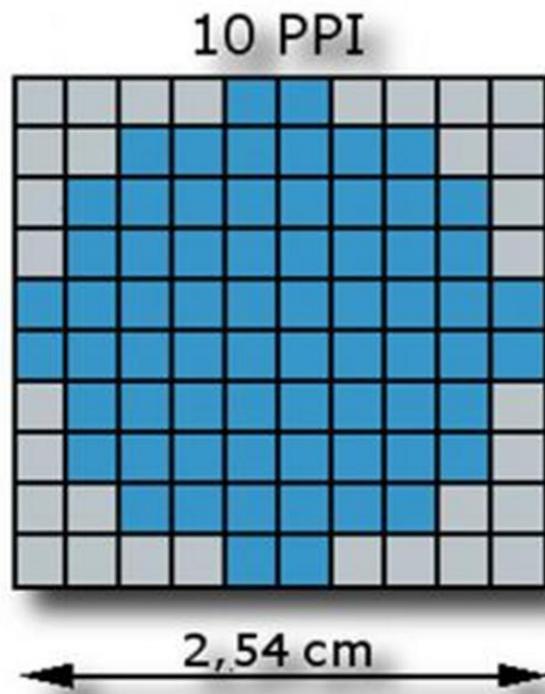
Screen size and Resolution

Resolution is a simple count of the number of pixels across the entire width and height of a device.



Size of pixels

Pixel density refers to the number of device pixels on a physical surface. It is often measured in pixels per inch (PPI). Pixel density is a good indication of how clear the device display will be.



There are three parts in RWD:

1. Flexible, grid-based layouts

A grid that is flexible, which automatically resizes itself according to the size of the window.

2. Media query and Viewport

Media queries allow the browser to use different styling. This functionality is used to modify the layout at specific widths in the browser.

3. Flexible media & images

Flexible images allow the browser to scale images depending on the size of the browser.



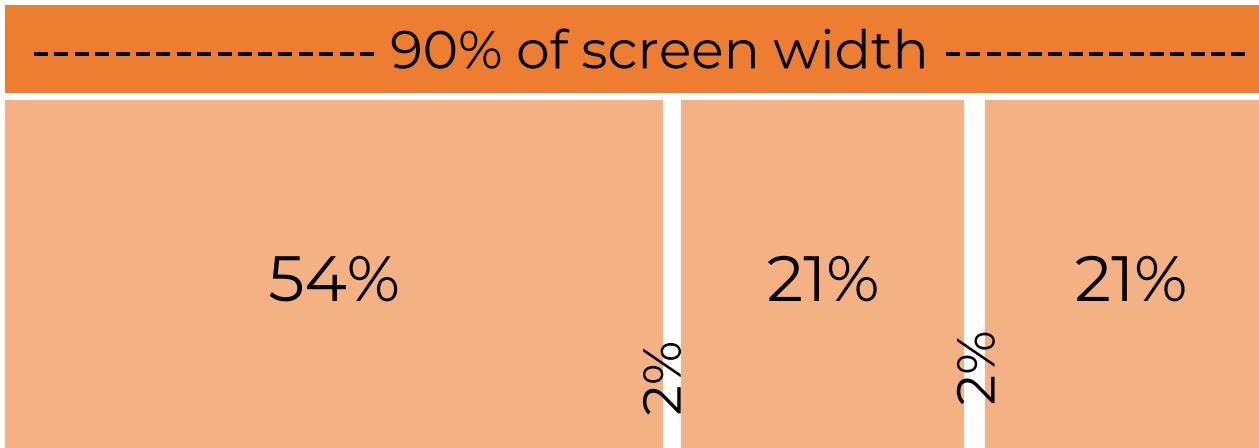
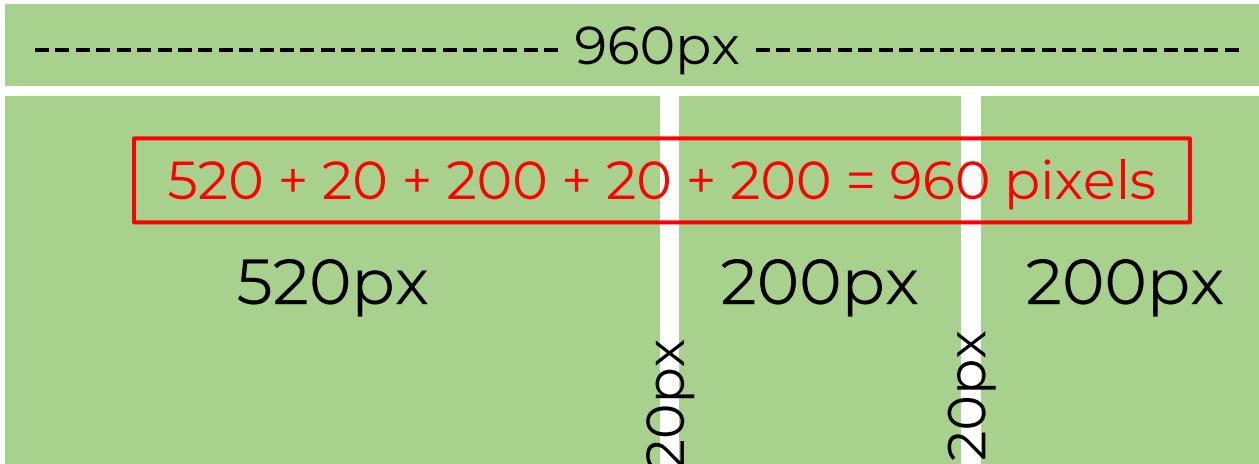
1. Flexible, grid-based, Layout

Liquid layout (*sometimes called fluid layout*) uses relative units instead of fixed units. Typically, a liquid layout will use percentages instead of pixels, but any relative unit of measurement will work. Idea behind liquid layout, it's more carefully designed in terms of proportion to use percentage.

Proportion of each page element is the target element divided by the context.

1. Flexible, grid-based, Layout

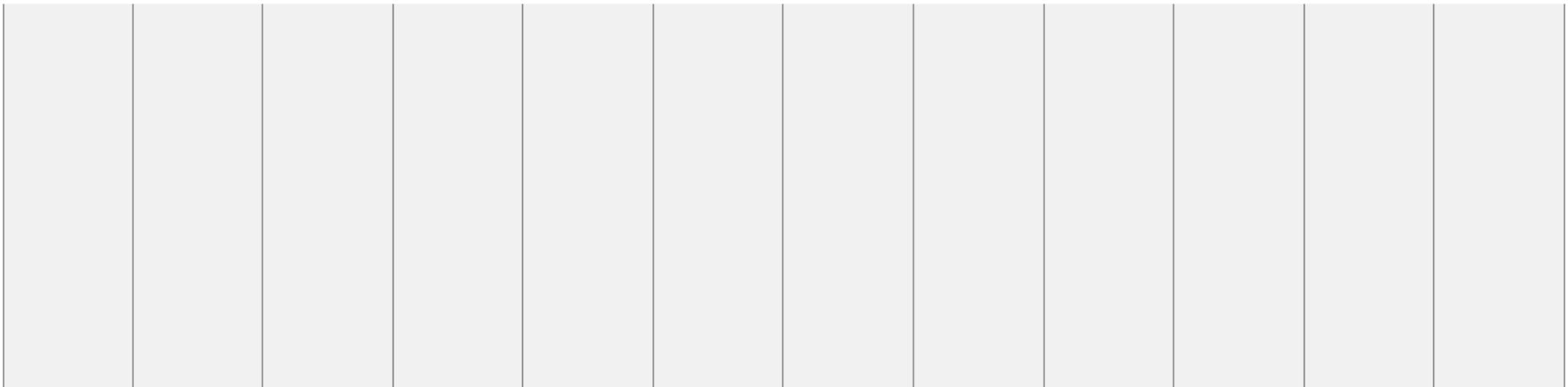
Figure : use percentages instead of pixels



Creating a Flexible Grid

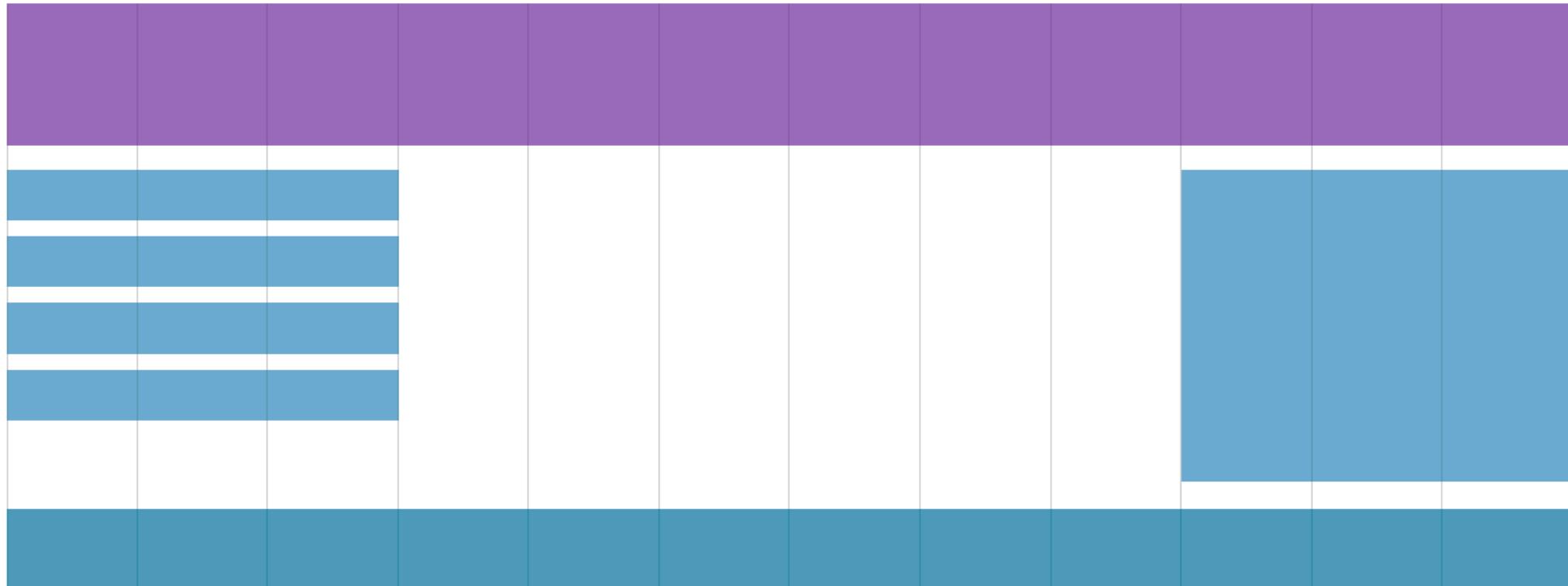
Many web pages are based on a grid-view, which means that the page is divided into columns.

A responsive grid-view often has 12 columns, and has a total width of 100%, and will shrink and expand as you resize the browser window.



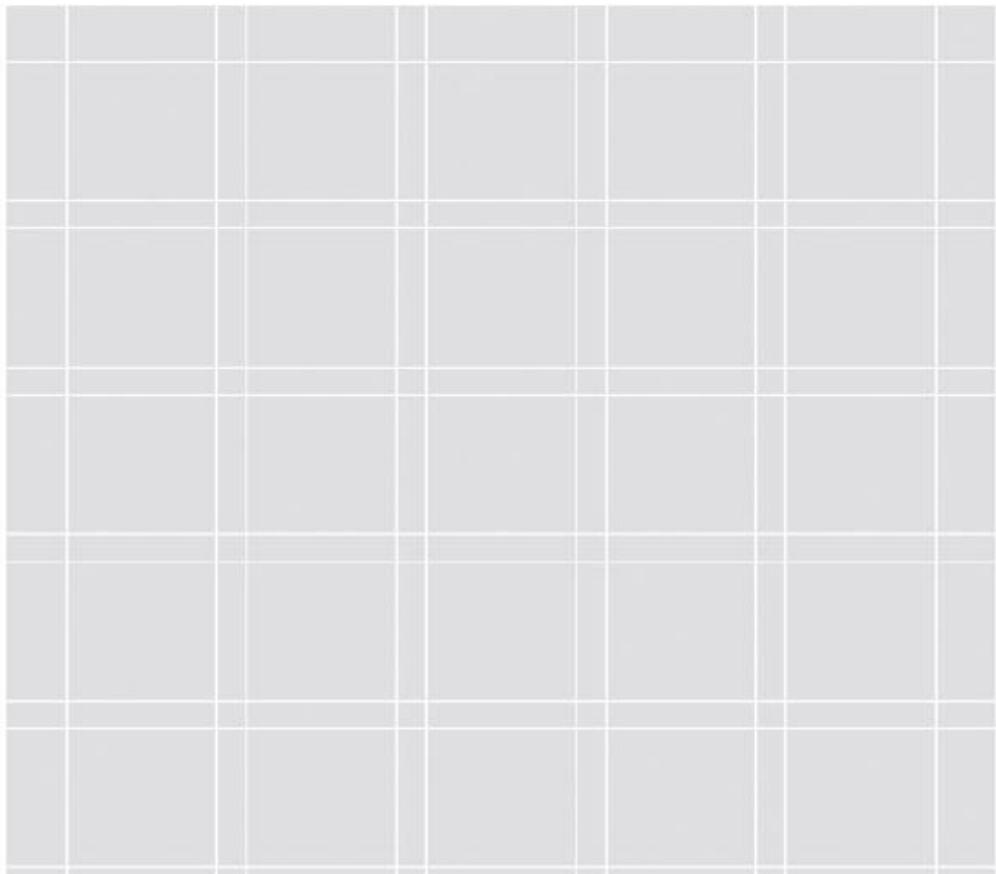
Creating a Flexible Grid

Using a grid-view is very helpful when designing web pages. It makes it easier to place elements on the page.



Creating a Flexible Grid

Figure : Topographic grid



Vermont Symphony Orchestra

Winter
2007
Season

Aaron Copland
The Tender Land
January 2007

Eric Satie
Gymnopédie 1, 2
February 2007

01/12/07
Middlebury College
Center for the Arts
8:00 pm

02/03/07
Johnson State College
Dibden Center for the Arts
8:00 pm

1. Flexible, grid-based, Layout

Pros :

- Can be more user-friendly, because it adjusts to the user's set up.
- The amount of extra white space is similar between all browsers and screen resolutions, which can be more visually appealing.
- If designed well, a fluid layout can eliminate horizontal scroll bars in smaller screen resolutions.

1. Flexible, grid-based, Layout

Cons :

- Less control over what the user sees
- May overlook problems because the layout looks fine on their specific screen resolution.
- Images, video and other types of content with set widths may need to be set at multiple widths to accommodate different screen resolutions.
- With incredibly large screen resolutions, a lack of content may create excess white space that can diminish aesthetic appeal.

2: Media Query and Viewport

What is The Viewport?

The viewport is the user's visible area of a web page. The viewport varies with the device and will be smaller on a mobile phone than on a computer screen.

What is a Media Query?

Media query is a CSS technique introduced in CSS. The main purpose of a media query is to apply different CSS rules in order to obtain different layouts, depending on the width of the display window afforded to your content.

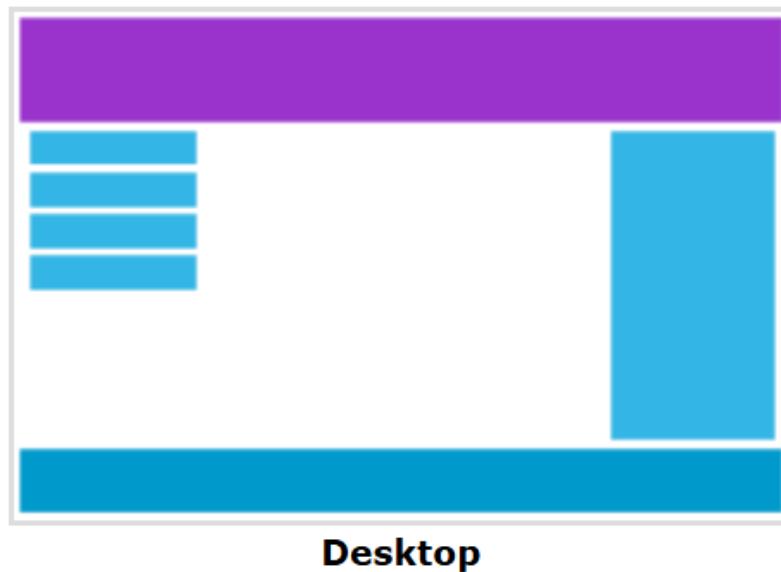
2: Media Query and Viewport

Media query is a CSS technique. It uses the **@media** rule to include a block of CSS properties only if a certain condition is true.

1. The values in the media queries are expressed in percentages and not pixels.
2. Media queries provide the ability to
 - o Specify different styles for individual browser device circumstances.
 - o Specify the width of the viewport or device orientation.

2: Media Query and Viewport

3. Using Media queries in the CSS file to change the styling of the HTML elements is based on **certain “breakpoints”**.



Desktop



Tablet



Phone

Media Query

The following code will display the font-size at 100% if the width is at least 1024 px

```
@media screen and (min-width: 1024px) {  
  body { font-size: 100%; }  
}
```

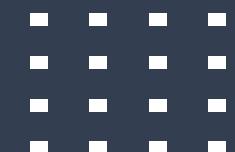
The following code tests the orientation and the device-width

```
@media screen and (min-device-width: 480px) and  
(orientation: landscape) {  
  body { font-size: 100%; }  
}
```

Media Query

The following code renders a page that the body background color will change to blue only between 500px and 700px.

```
@media screen (min-width:500px) and (Max-width:700px)
{
  body {background: blue;}
  /* some CSS here */
}
```



Media Query - Typical Device Breakpoints

There are tons of screens and devices with different heights and widths, so it is hard to create an exact breakpoint for each device.

Breakpoint	Class infix	Dimensions
Extra Small	None	<576px
Small	sm	>=576px
Medium	md	>=768px
Large	lg	>=992px
Extra Large	xl	>=1200px
Extra extra large	xxl	>=1400px

2: Media Query and Viewport

Viewport:

- Tells the browser how to behave when rendering the page – you tell the browser how big the viewport will be.
- Use the viewport meta tag in the **<head>** section.
- If we are using RWD, it's good to have the **<meta>** tag name="viewport" as

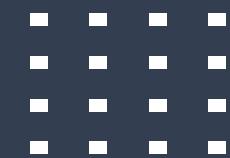
```
<meta name="viewport" content="width=device-width,  
initial-scale=1">
```



3: Flexible Media & Images

Responsive web design means that not only can layouts change based on device characteristics, but content can change as well.

- An image is 50% width may work just fine when the browser is 800px wide but uses too much real estate on a narrow phone and requires the same bandwidth overhead when scaled down to fit a smaller screen.



3: Flexible Media & Images

Art direction

Other times the image may need to be changed more drastically: changing the proportions, cropping, and even replacing the entire image. In this case, changing the image is usually referred to as art direction.



3: Flexible Media & Images

Use relative sizes for images

Use relative units when specifying widths for images to prevent them from accidentally overflowing the viewport.

- width: 50%; causes the image width to be 50% of the containing element (not 50% of the viewport or 50% of actual pixel size).
- may need to use max-width: 100% to prevent images and other content from overflowing.

```
Img, video {  
    max-width: 100%;  
}
```

3: Flexible Media & Images

Example

```
<div class="figure">  
    
  <b class="figcaption">the robot walks</b>  
</div>
```

```
.figure {  
  float: right;  
  margin-bottom: 0.5em;  
  margin-left: 2.5%;  
  width: 50%;  
}
```

Scaling & Sizing Fonts



The font-size property sets the size of the text. Being able to manage the text size is important in web design. The font-size value can be an **absolute** or **relative**. If you do not specify a font size, the default size for normal text, like paragraphs, is **16px**.

CSS Font size units

- px and pt
- percent(%)
- em and rem
- vh and vw



Pixels (px) Unit

- Pixels are fixed-size units that are used in screen media. One pixel is equal to one dot on the computer screen.
- Many web designers use pixel units in web documents in order to produce a pixel-perfect representation of their site as it is rendered in the browser.
- One problem with the pixel unit is that it does not scale upward for visually-impaired readers or downward to fit mobile devices.



Fonts : Scale & Size

Points (pt) Unit

- Points are traditionally used in print media (anything that is to be printed on paper, etc.).
- One point is equal to 1/72 of an inch. Points are much like pixels, in that they are fixed-size units and cannot scale in size.



Fonts : Scale & Size

Percent (%) Unit

- Relative to the parent element.
- the current font-size is equal to 100% (i.e. 16px = 100%). While using the percent unit, your text remains fully scalable for mobile devices and for accessibility.

```
body {  
    font-size:16px;  
}  
  
div {  
    font-size: 150%;  
}
```

```
<div>  
The font-size of this div element is  
150%.  
</div>
```



Fonts : Scale & Size

REM Unit

- The **REM** unit depends on the root element (the HTML element).
- The default font-size of the root element [in HTML] is 16px. So, **3 REM = 48px**.
- If we **change** the root element font size, the REM unit changes.

```
html {  
    font-size:16px;  
}  
  
div {  
    font-size: 3rem;  
}
```

<div>The font-size of this div element is 3rem. It also shows that it does not inherit from its parent element font size.</div>

Fonts : Scale & Size

EM Unit

- Relative to the font-size of the element (2em means 2 times the size of the current font)
- An **em** is equal to the current font-size, for instance, if the font-size of the document is 30px, **0.5 em is equal to 15px.**

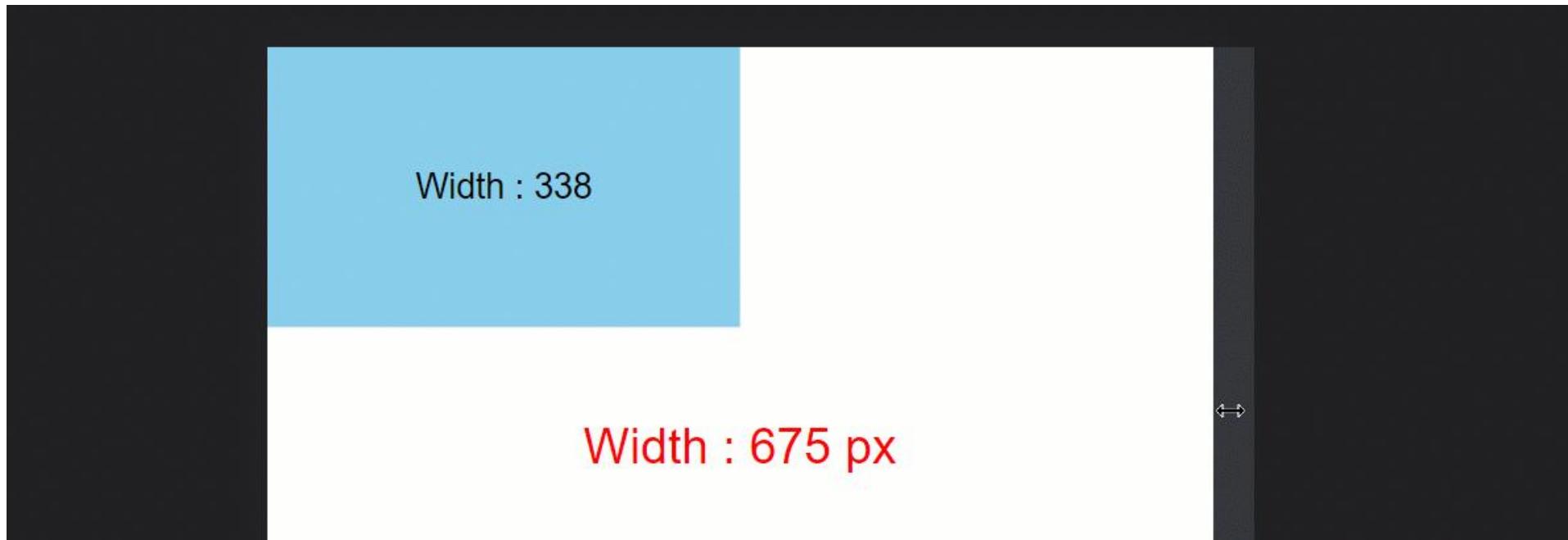
```
div {  
    font-size: 30px;  
}  
span {  
    font-size: 0.5em;  
}
```

<div>The font-size of the div element is set to 30px. The span element inside the div element has a font-size of 0.5em, which equals to $0.5 \times 30 = 15\text{px}$.</div>

Fonts : Scale & Size

VH & VW Unit

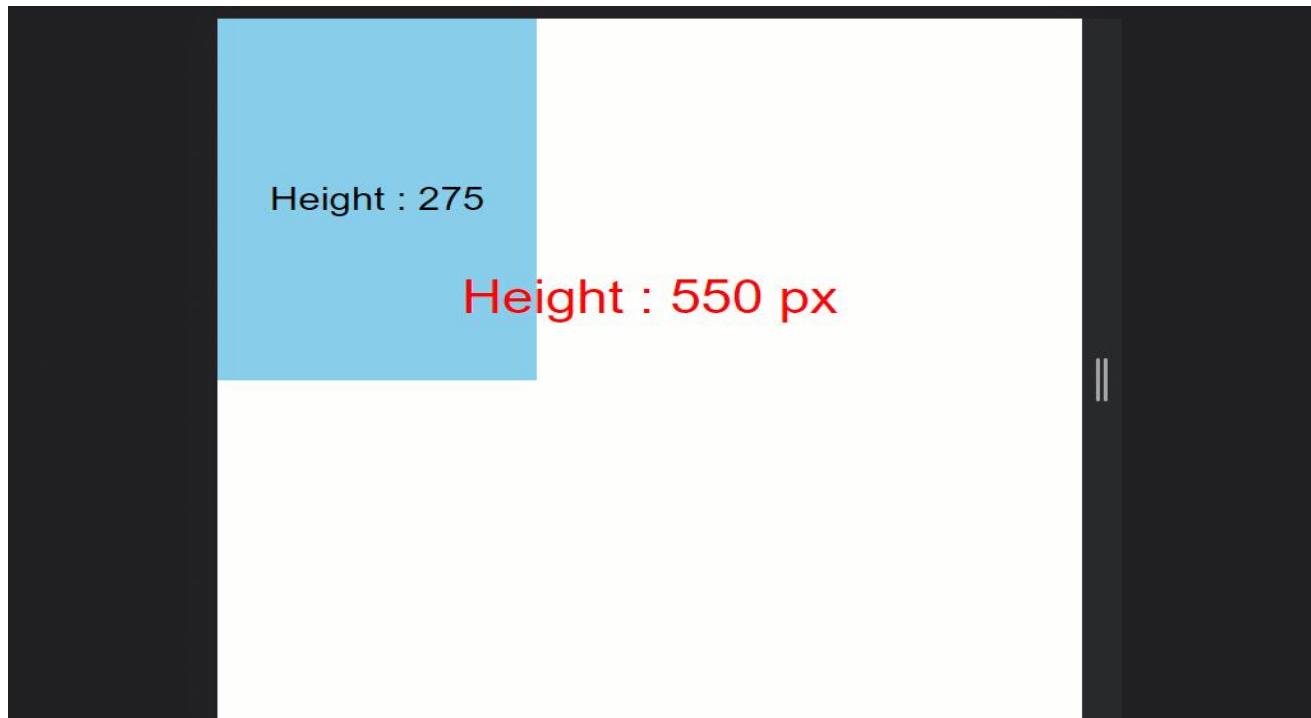
VW is viewport width. It works like the percentage unit. Specifying **10vw** is equivalent to occupying 10% of entire visible screen width.



Fonts : Scale & Size

VH & VW Unit

VH is viewport height. It works like the percentage unit as well. Specifying 10vh is equivalent to occupying 10% of entire visible screen height.



More Information

- HTML Responsive Web Design
https://www.w3schools.com/html/html_responsive.asp
- Introduction to Bootstrap
<https://getbootstrap.com/docs/4.0/getting-started/introduction/>
- Bootstrap 4 Examples
<https://www.tutorialrepublic.com/twitter-bootstrap-examples.php>
- 7 responsive design best practices you need to know in 2020
<https://www.impactbnd.com/blog/responsive-design-best-practices>