REM vs EM – The Great Debate

One of the best practices to typography on the web is to use relative units like `rem` and `em`.

The question is, which should you use? There's been a longstanding debate between `rem` supporters and `em` supporters, believing that you should use one over the other.

In this article, you're going to find my take on `rem` vs `em`. You're also going to learn exactly what `rem` and `em` are, and how to use them to build modular components.

What is EM?

An EM is a unit of typography, equal to the currently specified point-size *Wikipedia*

This statement doesn't make sense on the web since we don't use `point-size`. It makes complete sense if we substituted `point-size` with `font-size` though.

What it means is: `1em = 20px` if a selector has a `font-size` of `20px`.

```
h1 { font-size: 20px } /* 1em = 20px */
p { font-size: 16px } /* 1em = 16px */
```

The `em` unit can be used to declare font-sizes. In fact, it's a best practice to use relative units like `em` for `font-size`.

Consider the following:

```
h1 { font-size: 2em } /* What does this even mean?! */
```

What's the actual size of the `h1` selector here?

We have to look at the parent element in order to compute the `<h1>`'s `font-size`. Let's say the parent element is `<html>`, and its `font-size` is set to ``16px`.

When put this way, we can see that the computed value of `<h1>` is

`32px`, or `2 * 16px`.

```
html { font-size: 16px }
h1 { font-size: 2em } /* 16px * 2 = 32px */
```

Although this is possible, it's often a bad idea to set `font-size` in the `<html>` to a pixel value because it overrides the user's browser settings.

Instead, you can either choose to use a `percentage` value, or leave out the `font-size` declaration entirely.

Note: `font-size` will be set to `100%` if you left it out entirely.

```
html { font-size: 100% } /* This means 16px by default*/
```

For most users (and browsers), a `font-size` of `100%` would default to `16px` unless they change the default `font-size` through their browser settings. It's rare that anyone would do that though.

Okay so far? Let's come back to `em`.

`em` can also be used to specify values for other properties in addition to `font-size`. `margin` and `padding` are two of such properties that are commonly sized in `em`s.

This is where many people start to get confused with `em` values.

Consider the following code. What should the `margin-bottom` value be for both the `<h1>` and `<p>` elements? (Assume `font-size` of `<html>` is set to `100%`).

```
h1 {
  font-size: 2em; /* 1em = 16px */
  margin-bottom: 1em; /* 1em = 32px */
}

p {
  font-size: 1em; /* 1em = 16px */
  margin-bottom: 1em; /* 1em = 16px */
}
```

Are you surprised that the computed value of `1em` on `margin-bottom` is different in these two scenarios`?

This phenomenon occurs because `1em` is equal to its current `font-size`. Since the `font-size` in `<h1>` is now set to `2em`. Other properties computed with `em` in `<h1>` would see that `1em = 32px`.

What throws people off is that `1em` can take on different values in different parts of the code. It can be confusing if you're just starting out with `em`s.

Anyway, that's `em`. Let's find out what `rem` is next.

What is REM?

`rem` means Root EM. It's built to provide some relief the `em` computational problem that many faced.

It is a unit of typography equal to the root `font-size`. This means `1rem` is always equal to the `font-size` defined in `<html>`.

Consider the same code above, written in `rem` s instead. What are the computed `margin-bottom` values now?

```
h1 {
  font-size: 2rem;
  margin-bottom: 1rem; /* 1rem = 16px */
}

p {
  font-size: 1rem;
  margin-bottom: 1rem; /* 1rem = 16px */
}
```

As you can see, `1rem` would always take on the value of `16px` no matter where you set it (unless you changed the `font-size` of `<html>`).

It's dependable. It's simple to understand.

That's `rem`. Pretty easy to get once you know what `em` is, don't you agree?

Now, let's get into the meat of this article. `rem` or `em`?

REMs or EMs?

It's highly debatable.

Some developers avoid `rem` entirely, claiming that using `rem` makes their components less modular. Others use `rem` for everything, preferring the simplicity that `rem` provides.

Oddly, I fell into the trap of strictly only `rem` or `em` at different points in my development career. I loved how `em` helped me make modular components, but I loathed the complexity it brought to my code. I also loved how `rem` made calculations simple, but I hated the hacks I used to make my components modular.

Turns out, `rem` and `em` have their strengths and weaknesses. They should be used differently, depending on the circumstances.

How? I have two simple rules:

1. Size in `em` if the property scales according to its `font-size`
2. Size everything else in `rem`.

A tad too simple? Well, let's consider writing a simple component (a header element) either using `rem` or `em`, and you'll see how these two rules play out nicely.

Using Only REMs to Make a Header Element

Say you have a header element (`<h2>`) that looks like this:

I'm a header!

The header's styles should be similar to the following if you sized everything in `rem`:

```
.header {
  font-size: 1rem;
  padding: 0.5rem 0.75rem;
  background: #7F7CFF;
}
```

So far so good.

Next, let's create a slightly bigger header element since it's common to have differently-sized elements on the same website. While doing so, let's try to inherit as many styles as possible.

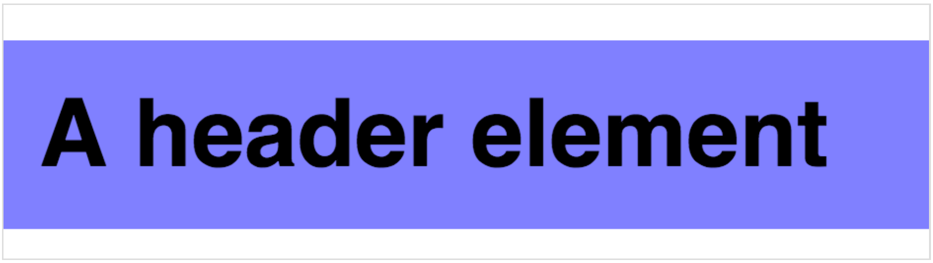
The markup of the bigger header element might be something like this:

```
<a href="#" class="header header--large">header!</a>
```

The CSS would be:

```
.header {
  font-size: 1rem;
  padding: 0.5rem 0.75rem;
  background: #7F7CFF;
}

.header--large {
  font-size: 2rem;
}
```

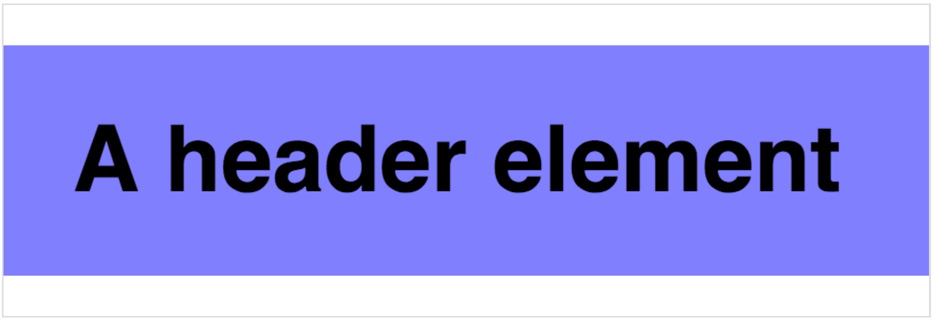
Unfortunately, the code doesn't turn out well. You can see that there's too little breathing space between the edge and text of `.header--large` .



Not enough breathing space between edge and text on this large header

If you insist on using only `rem` s, the only way to fix this problem is to redeclare the `padding` on the large header:

```
.header {
  font-size: 1rem;
  padding: 0.5rem 0.75rem;
  background: #7F7CFF;
}

.header--large {
  font-size: 2rem;
  padding: 1rem 1.5rem;
}
```



More padding the large header now!

Notice the pattern here? `.header--large` 's `font-size` is twice as large as `.header` 's. Consequently, `padding` on `.header--large` is twice as large as `padding` on `.header` .

What would happen if we have more headers of different sizes, or if the headers have to change in size? You can already see how coding the entire site in `rem` can cause duplication and super complex code.

We can simplify the code such that there's no need to redeclare `padding` on `.header--large` if we don't mind using both `em` and `rem` :

```
.header {
  font-size: 1rem;
  padding: 0.5em 0.75em;
  background: #7F7CFF;
}

.header--large {
  font-size: 2rem;
}
```

As you can see, `em` can be incredibly helpful when you have a property that needs to scale with it's font size. This is where the first rule was born.

Next, let's take a look at what happens if you use an `em` only approach for the same header.

Using Only EMs to Make a Header Element

An `em` implementation isn't far from the `rem` code we left off. All we have to do is change `rem` to `em`.

```
.header {
  font-size: 1em;
  padding: 0.5em 0.75em;
  background: #7F7CFF;
}

.header--large {
  font-size: 2em;
}
```

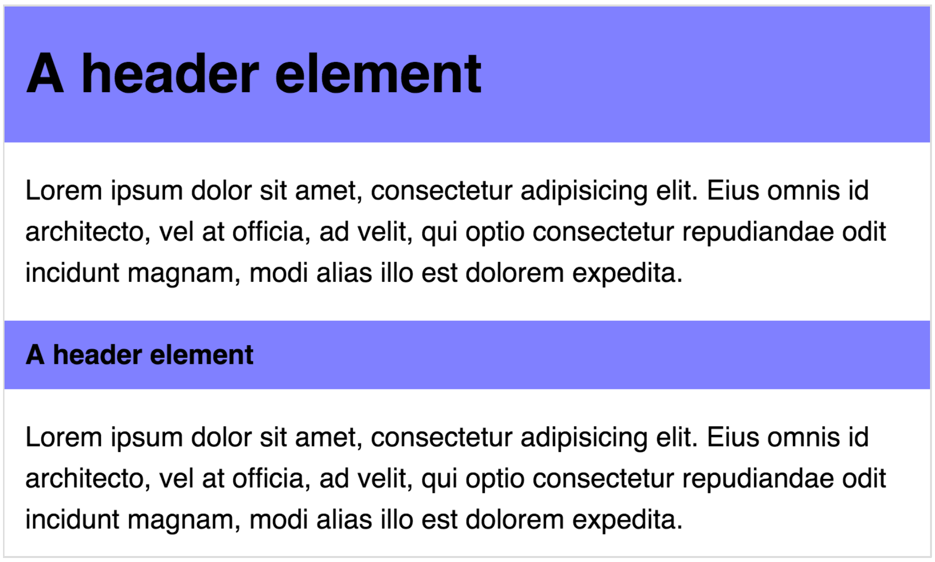
Both `.header` and `.header--large` will look exactly the same as their `rem` counterparts.

Is that it?

Nope!

It's highly unlikely that your website contains only one header element. We have to consider how this header interacts with other elements on your page.

It's common to see other elements before or after the header, like this:

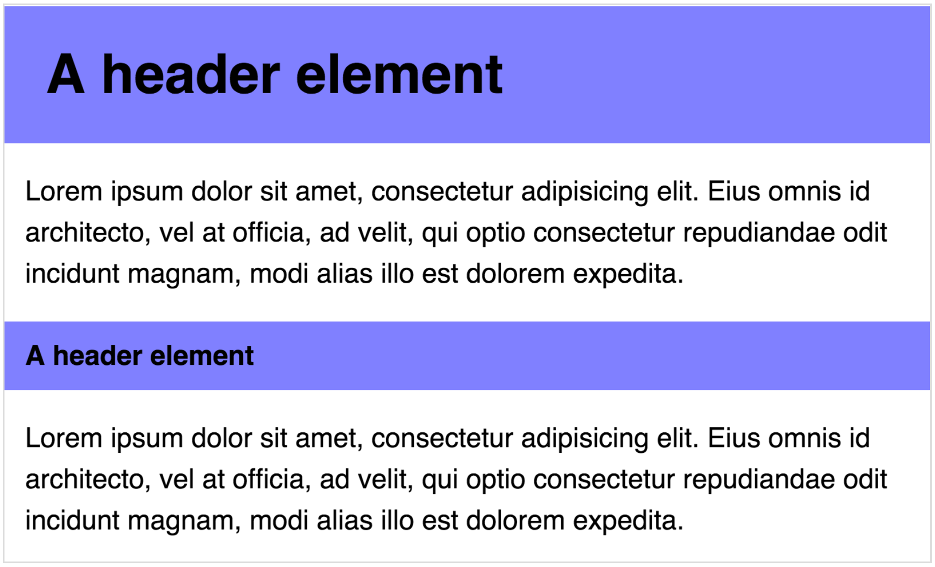

A header element
Lorem ipsum dolor sit amet, consectetur adipisicing elit. Eius omnis id architecto, vel at officia, ad velit, qui optio consectetur repudiandae odit incidunt magnam, modi alias illo est dolorem expedita.
A header element
Lorem ipsum dolor sit amet, consectetur adipisicing elit. Eius omnis id architecto, vel at officia, ad velit, qui optio consectetur repudiandae odit incidunt magnam, modi alias illo est dolorem expedita.
Header elements have other relationships surrounding it

The markup for this set of elements is:

```html
<div class="header header--large">A Header Element</div>
<p>A paragraph of text</p>
<div class="header">A Header Element</div>
<p>A paragraph of text</p>
```

For the styles, we need to add some `margin` s to the left and right of the `<p>` tags.

```css
p {
  margin-left: 0.75em;
  margin-right: 0.75em;
}
```



A header element

Lorem ipsum dolor sit amet, consectetur adipisicing elit. Eius omnis id architecto, vel at officia, ad velit, qui optio consectetur repudiandae odit incidunt magnam, modi alias illo est dolorem expedita.

A header element

Lorem ipsum dolor sit amet, consectetur adipisicing elit. Eius omnis id architecto, vel at officia, ad velit, qui optio consectetur repudiandae odit incidunt magnam, modi alias illo est dolorem expedita.

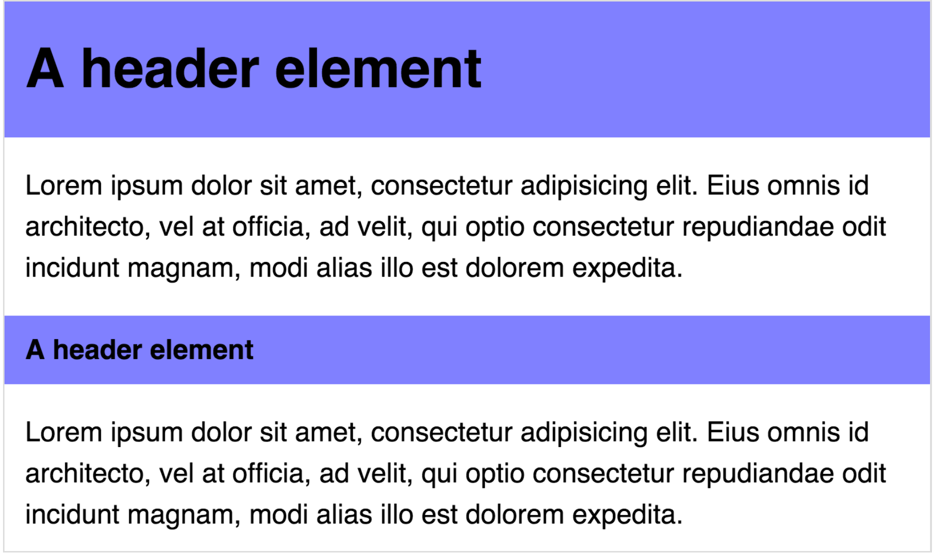
Uh oh. `padding` on the large header are doesn't align with the text

Nooo! :(

The `padding` on the left and right of `.header--large` is too big!

If you insist on using only `em` , the only way to fix this problem is to redeclare the `padding-left` and `padding-right` properties on the large header:

```css
.header {
  font-size: 1em;
  padding: 0.5em 0.75em;
  /* Other styles */
}

.header--large {
  font-size: 2em;
  padding-left: 0.375em;
  padding-right: 0.375em;
  margin: 0.75em 0;
}
```


A header element

Lorem ipsum dolor sit amet, consectetur adipisicing elit. Eius omnis id architecto, vel at officia, ad velit, qui optio consectetur repudiandae odit incidunt magnam, modi alias illo est dolorem expedita.

A header element

Lorem ipsum dolor sit amet, consectetur adipisicing elit. Eius omnis id architecto, vel at officia, ad velit, qui optio consectetur repudiandae odit incidunt magnam, modi alias illo est dolorem expedita.

Left and right paddings are now aligned!

Notice the pattern here? The `font-size` of `.header--large` is twice the size of the `font-size` of `.header`. Yet, the `padding-left` and `padding-right` of `.header--large` are half the `padding-left` and `padding-right` of `.header`!

Like in the above case, we can simplify the code if you are open to using a combination of `rem` and `em` in your code. Specifically, `rem` for left and right `padding`s and `em` for top and bottom `padding`s:

```css
.header {
  padding: 0.5em 0.75rem;
  font-size: 1em;
  background: #7F7CFF;
}

.header--large {
  font-size: 2em;
}
```

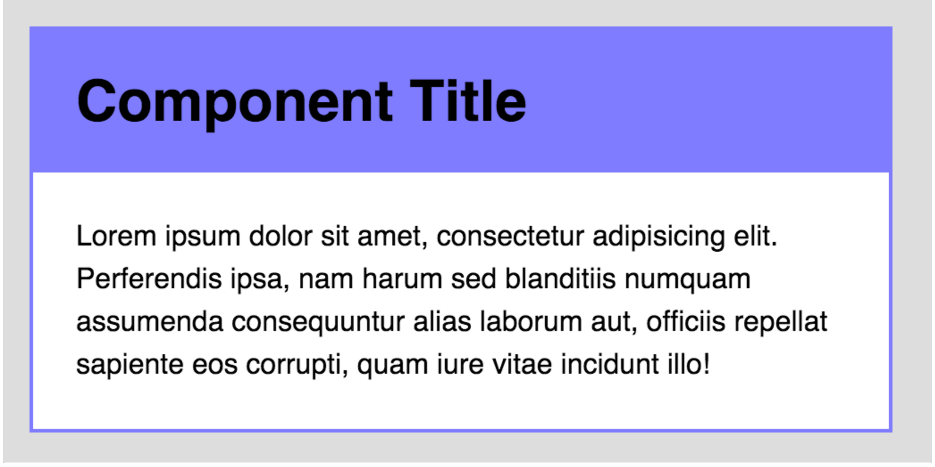
As you can see, the `em` unit is useful when you need to scale a property with it's `font-size`. However, you'll run into problems if you need to size the property accordingly to the root `font-size`.

It's much clearer to see how `rem` and `em` can work together in a component now, isn't it?

Now, let's take it a notch further and see how the header and paragraph interacts with a grid.

Components on a Grid

Before we move on, let's combine the header and paragraph elements together into a component:


Component Title

Lorem ipsum dolor sit amet, consectetur adipisicing elit. Perferendis ipsa, nam harum sed blanditiis numquam assumenda consequuntur alias laborum aut, officiis repellat sapiente eos corrupti, quam iure vitae incidunt illo!

```html
<div class="component">
  <div class="component__header">A header element</div>
  <p>Some paragraph text</p>
</div>
```

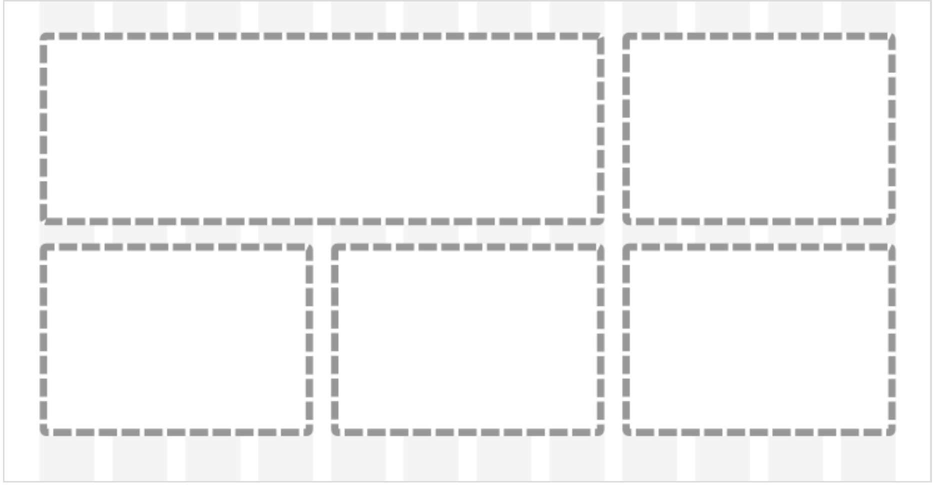
The basic styles for this component are:

```css
.component {
  background: white;
  border: 2px solid #7F7CFF;
}

.component__header {
  font-size: 2em;
  padding: 0.5em 1.5rem;
  background: #7F7CFF;
  margin: 0;
}

.component p {
  padding-left: 1.5rem;
  padding-right: 1.5rem;
  margin: 1.5rem 0;
}
```

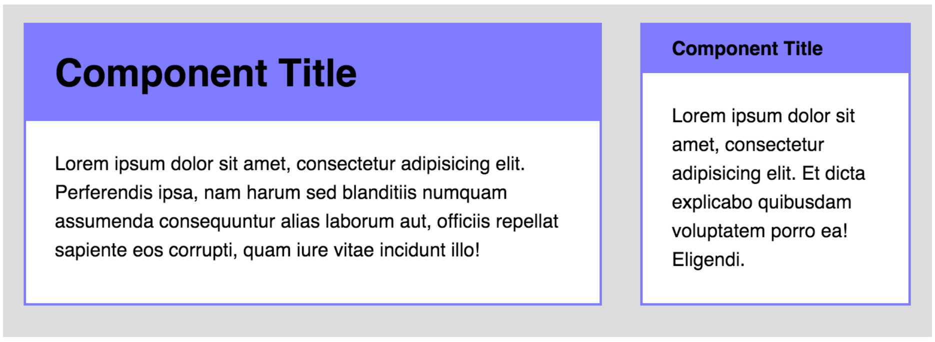
So far so good. This was everything we covered in the earlier sections.

Moving on, this component can be found in differents of a website. Potential areas include:

1. The main content area
2. The sidebar
3. In a 1/3 grid layout
4. ...


Possible locations of the component

The header element might be rendered with a smaller `font-size` when the component is placed in a narrow location, like the sidebar.


Component Title
Lorem ipsum dolor sit amet, consectetur adipisicing elit. Perferendis ipsa, nam harum sed blanditiis numquam assumenda consequuntur alias laborum aut, officiis repellat sapiente eos corrupti, quam iure vitae incidunt illo!
Component Title
Lorem ipsum dolor sit amet, consectetur adipisicing elit. Et dicta explicabo quibusdam voluptatem porro ea! Eligendi.
Header components on a grid.

We can create a variant for this by modifying the component's class. The markup would look like this:

```
<div class="component component--small">
  <!-- Contents of the component. -->
</div>
```

And the style for this variant is:

```
.component--small .component__header {
  font-size: 1em;
}
```

Now, on to the component's styles. The same two rules still apply:

1. Size in `em` if property should scale according to it's `font-size`
2. Size everything else in `rem`.

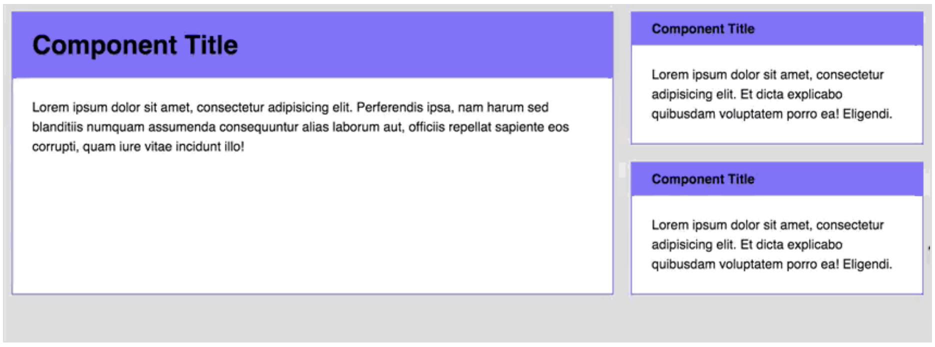
As with the header element, you can identify which properties to size in `em` by seeing if they interact with the rest of the page. There are two different ways to think about building this component:

1. Properties of all inner elements scale with the component's `font-size`.
2. Properties of some inner elements scale with the component's `font-size`.

Let’s build the component in both ways and you’ll see what I mean.

Case 1: Properties of all Elements Scale With The Component’s Font-Size

Let’s begin with an example of what such a component looks like:


Component Title

Lorem ipsum dolor sit amet, consectetur adipisicing elit. Perferendis ipsa, nam harum sed blanditiis numquam assumenda consequuntur alias laborum aut, officiis repellat sapiente eos corrupti, quam iure vitae incidunt illo!

Component Title

Lorem ipsum dolor sit amet, consectetur adipisicing elit. Et dicta explicabo quibusdam voluptatem porro ea! Eligendi.

Component Title

Lorem ipsum dolor sit amet, consectetur adipisicing elit. Et dicta explicabo quibusdam voluptatem porro ea! Eligendi.

How component resizes (Case 1)

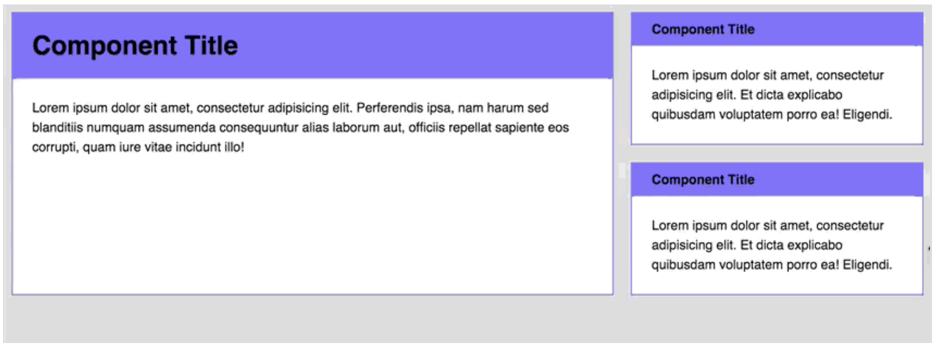
Notice how the `font-size`, `margin` and `padding` of all elements within the component change at the same time?

If your component behaves in this manner when resized, you need to size everything in `em` s. The code then becomes:

```css
.component {
  background: white;
  border: 2px solid #7F7CFF;
}

.component__header {
  font-size: 2em;
  padding: 0.5em 0.75em; /* Changed padding into em */
  background: #7F7CFF;
  margin: 0;
}

.component p {
  padding-left: 1.5em; /* Changed padding into em */
  padding-right: 1.5em; /* Changed padding into em */
  margin: 1.5em 0; /* Changed margin into em */
}

// Small variant
.component--small .component__header {
  font-size: 1em;
  padding-left: 1.5em; /* Added em-sized padding */
  padding-right: 1.5em; /* Added em-sized padding */
}
```

Then, to activate the change in sizes, all you have to do is to change the component’s `font-size` property.

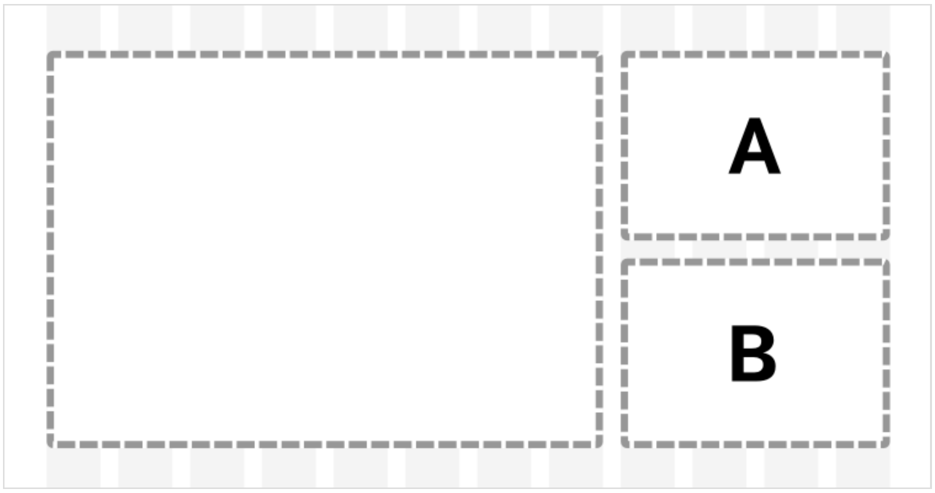
```css
.component {
  // Other styles
  @media (min-width: 800px) {
    font-size: 1.5em;
  }
}
```


Component Title
Lorem ipsum dolor sit amet, consectetur adipisicing elit. Perferendis ipsa, nam harum sed blanditiis numquam assumenda consequuntur alias laborum aut, officiis repellat sapiente eos corrupti, quam iure vitae incidunt illo!
Component Title
Lorem ipsum dolor sit amet, consectetur adipisicing elit. Et dicta explicabo quibusdam voluptatem porro ea! Eligendi.
Component Title
Lorem ipsum dolor sit amet, consectetur adipisicing elit. Et dicta explicabo quibusdam voluptatem porro ea! Eligendi.

So far so good.

Now, let's bring the complexity up a bit.

Imagine if you had a grid like this. The vertical and horizontal spaces between each grid item needs to remain the same across all devices (for good aesthetics).



Equal margins on a 1 + 2 grid!

The markup for this grid is:

```
<div class="grid">
  <div class="grid-item">
    <div class="component"> <!-- component --> </div>
  </div>

  <div class="grid-item">
    <div class="component component--small"> <!-- A --> </div>
    <div class="component component--small"> <!-- B --> </div>
  </div>
</div>
```

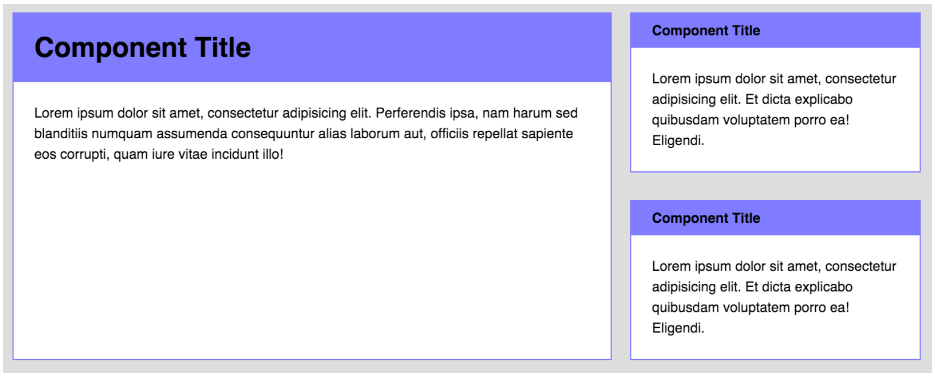
I've set the gutter width between each grid item to be `2em` at a root `font-size` of `16px`. In order words, the computed width of the gutter is `32px`.

The challenge in this grid is to separate small component A and small component B with a margin of `32px`. We can try setting a `margin-top` of component B to be `2em` for start.

```
.component {
  /* Other styles */
```

```
    @media (min-width: 800px) {
      font-size: 1.25em;
    }
  }

  .component + .component {
    margin-top: 2em;
  }
```

Unfortunately, this doesn't turn out well. The `margin` between small component A and small component B is larger than the gutter width at a viewport above 800px.



Component Title

Lorem ipsum dolor sit amet, consectetur adipisicing elit. Perferendis ipsa, nam harum sed blanditiis numquam assumenda consequuntur alias laborum aut, officiis repellat sapiente eos corrupti, quam iure vitae incidunt illo!

Component Title

Lorem ipsum dolor sit amet, consectetur adipisicing elit. Et dicta explicabo quibusdam voluptatem porro ea! Eligendi.

Component Title

Lorem ipsum dolor sit amet, consectetur adipisicing elit. Et dicta explicabo quibusdam voluptatem porro ea! Eligendi.

Space between the two smaller components isn't equal to the gutters when the screen is wider than 800px

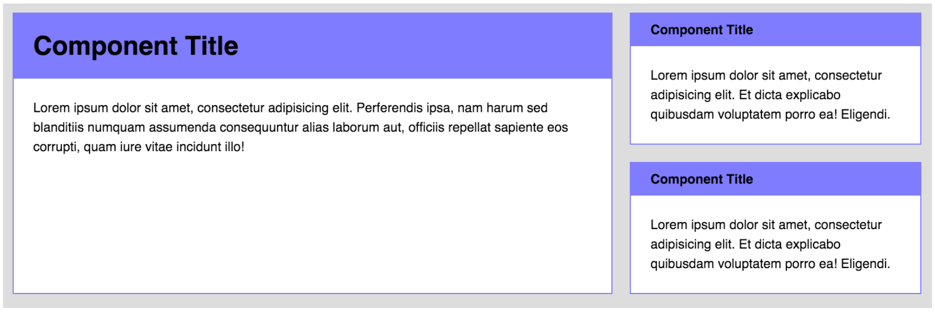
Boo :(

This happens because the `font-size` of the component is `1.5em` (or `24px`) when the viewport is larger than `800px`. Since the `font-size` is `24px`, the computed value of `2em` becomes `48px`, which is different from the `32px` we were looking for.

Grrrrr! (╯°□°）╯︵ ┻━┻

Thankfully, we can solve this issue simply by sizing in `rem` since we know where the gutter width needs to be sized according to the root `font-size`.

```
.component + .component {
  margin-top: 2rem;
}
```



Component Title

Lorem ipsum dolor sit amet, consectetur adipisicing elit. Perferendis ipsa, nam harum sed blanditiis numquam assumenda consequuntur alias laborum aut, officiis repellat sapiente eos corrupti, quam iure vitae incidunt illo!

Component Title

Lorem ipsum dolor sit amet, consectetur adipisicing elit. Et dicta explicabo quibusdam voluptatem porro ea! Eligendi.

Component Title

Lorem ipsum dolor sit amet, consectetur adipisicing elit. Et dicta explicabo quibusdam voluptatem porro ea! Eligendi.

Vertical space is now equal! :)

Tada! Problem solved :) Here's a Codepen for you to play with.

Note: You need to use Flexbox to build this grid. I won't explain how I built it since it's way out of scope. Check out this article if you're interested in finding out more about Flexbox

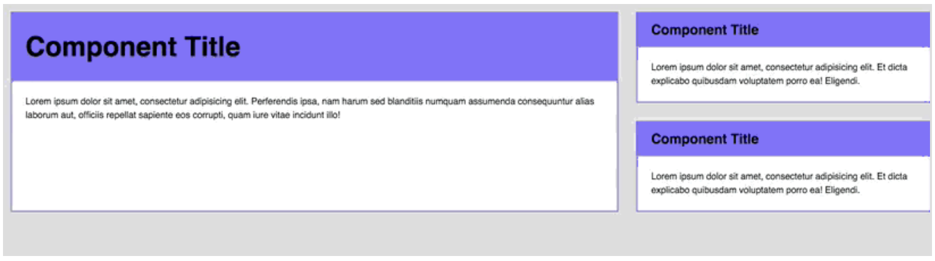
Oh by the way, I didn't come up with this technique. Chris Coyier wrote about it a year ago. (He's a genius).

Anyway, are we good so far? If yes, let's move on to case 2. If not, feel free to leave a comment and I'll figure a way to explain this further.

Case 2: Properties of Some Elements Scale With The Component's Font-Size

Case 1 is easy to understand. The downsides though, are that it's tough for you to stay true to your modular scale, maintain good vertical rhythms and ensure that every component is sized well AT the same time (especially when building responsive websites).

Sometimes you just need to tune a small section of your component instead of resizing everything at once. For example, you might want to change only the header `font-size` at a larger viewport.


Component Title

Lorem ipsum dolor sit amet, consectetur adipisicing elit. Perferendis ipsa, nam harum sed blanditiis numquam assumenda consequuntur alias laborum aut, officiis repellat sapiente eos corrupti, quam iure vitae incidunt illo!

Component Title

Lorem ipsum dolor sit amet, consectetur adipisicing elit. Et dicta explicabo quibusdam voluptatem porro ea! Eligendi.

Component Title

Lorem ipsum dolor sit amet, consectetur adipisicing elit. Et dicta explicabo quibusdam voluptatem porro ea! Eligendi.

Only the headers change in size when the viewport changes

Let's start styling this case by taking a look at the basic styles we wrote above:

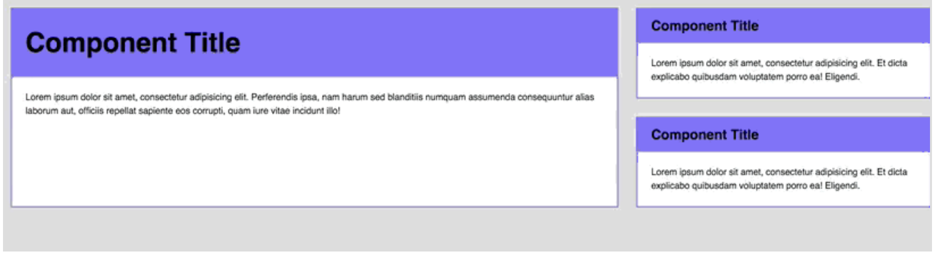
```css
.component {
  background: white;
  border: 2px solid #7F7CFF;
}

.component__header {
  font-size: 2em;
  padding: 0.5em 1.5rem;
  background: #7F7CFF;
  margin: 0;
}

.component p {
  padding-left: 1.5rem;
  padding-right: 1.5rem;
  margin: 1.5rem 0;
}

.component--small .component__header {
  font-size: 1em;
}
```

Since we're only changing the header's `font-size` s at `1200px` , we can safely size every property in `rem` (with the exception of the header's `padding-top` and `padding-bottom` properties)

```css
.component {
  background: white;
  border: 2px solid #7F7CFF;
}

.component__header {
  font-size: 2rem; /* Sized in rem instead */
  padding: 0.5em 1.5rem; /* Sized in rem instead */
  background: #7F7CFF;
}

.component p {
  padding-left: 1.5rem; /* Sized in rem instead */
  padding-right: 1.5rem; /* Sized in rem instead */
  margin: 1.5rem 0; /* Sized in rem instead */
}

.component--small .component__header {
  font-size: 1rem; /* Sized in rem instead */
}
```

You can then change the header's `font-size` at different viewports by simply adding a media query on them:

```css
.component__header {
  font-size: 2rem;
  @media (min-width: 1200px) {
    font-size: 3rem
  }
}

.component--small .component__header {
  font-size: 1rem;
  @media (min-width: 1200px) {
    font-size: 1.5rem
  }
}
```


Component Title

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Component Title

Lorem ipsum dolor sit amet, consectetur adipisicing elit. Et dicta explicabo quibusdam voluptatem porro ea! Eligendi.

Tada! Notice how only the header `font-size` changes as we resize the browser now? That's how you build for case 2 :)

One more thing.

Since it's a best practice to use only a handful of typography sizes, I often abstract the `font-size` property away from the component. This way, it becomes easy to ensure that your typography remains consistent across all components.

```
h2 {
  font-size: 2rem;
  @media (min-width: 1200px) {
    font-size: 3rem
  }
}

h3 {
  font-size: 1rem;
  @media (min-width: 1200px) {
    font-size: 1.5rem
  }
}

.component__header { @extend h2; }
.component--small .component__header { @extend h3; }
```

That's it for case 2! Here's a Codepen for you to play with:

Here's a question you'll probably ask, so I thought I'll answer it first: Which method should you use?

I'll say it depends on your design.

Personally, I find myself working with Case 2 more often than Case 1 since I prefer abstracting away typography into a file of it's own.

Wrapping Up

So, should you use `rem` or `em` ? I think that's not the right question to ask. Both `rem` and `em` has their strengths and weaknesses, and they can be used together to help you make simple, modular components!

On to you now! What's your take on this debate? I'd love to hear what you think in the comments below! :)