

# A pixel is not a pixel

Peter-Paul Koch

<http://quirksmode.org>

<http://twitter.com/ppk>

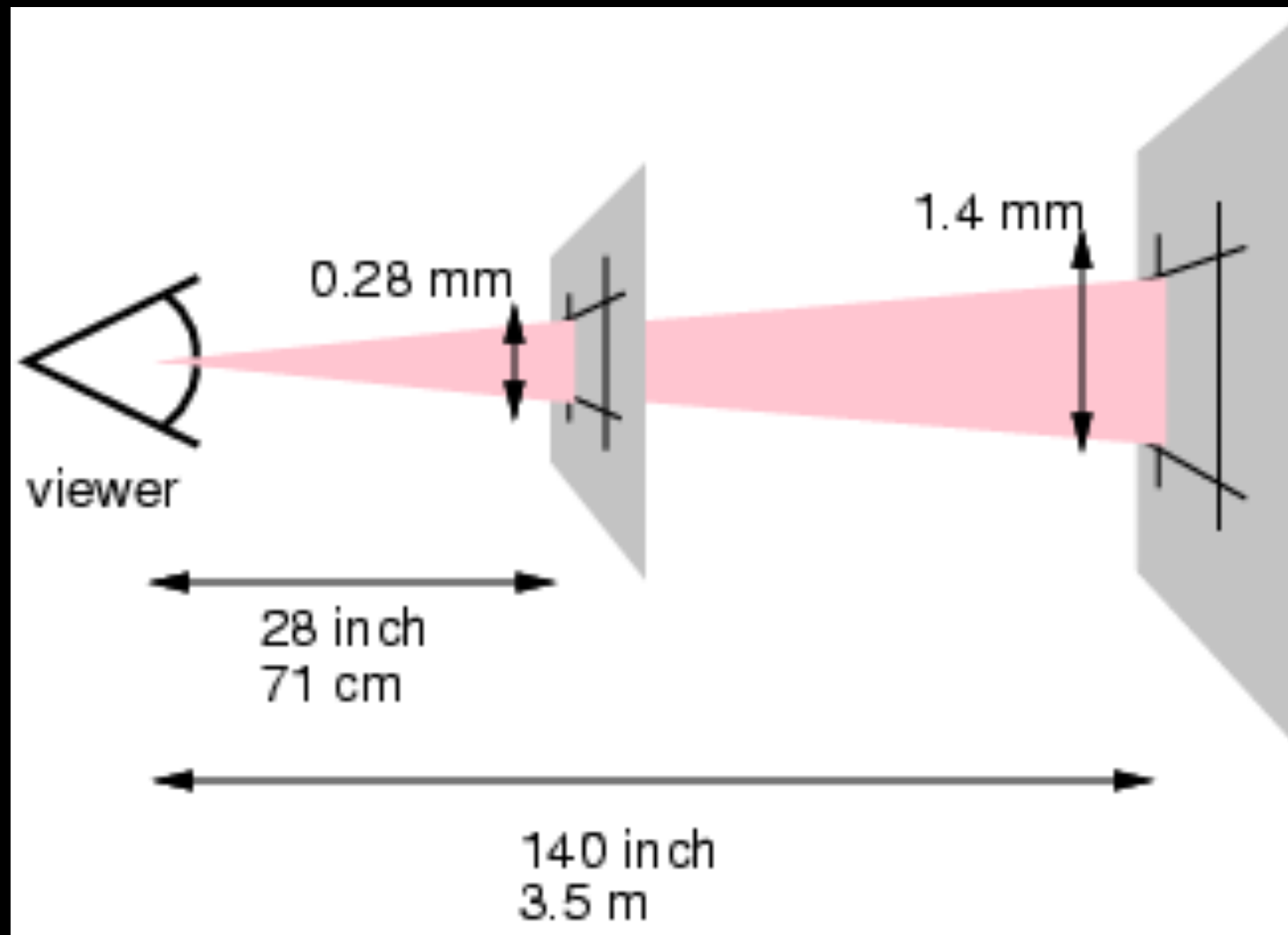
BlackBerry Jam, 6 February 2012

# I. Pixels

# Pixels according to W3C

“The reference pixel is the visual angle of one pixel on a device with a pixel density of 96dpi and a distance from the reader of an arm's length. For a nominal arm's length of 28 inches, the visual angle is therefore about 0.0213 degrees. For reading at arm's length, 1px thus corresponds to about 0.26 mm (1/96 inch).”

# Pixels according to W3C



Source: <http://www.w3.org/TR/css3-values/#reference-pixel>

# Pixels according to W3C

- So the pixel is a certain angle in your view
- which means you cannot zoom it
- Some say you shouldn't take it too literally, and zooming is allowed
- but if that's so, why bother with this definition in the first place?

# A pixel is not a pixel

- CSS pixels
- Density-independent pixels
- Device pixels

None of these have anything to do with W3C's definition.

And you already know what CSS and device pixels are. You just don't realise it.

# CSS pixels

- CSS pixels are the ones we use in declarations such as `width: 190px` or `padding-left: 20px`
- They are an abstract construct
- Their size may be increased or decreased



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padding-left: 34%

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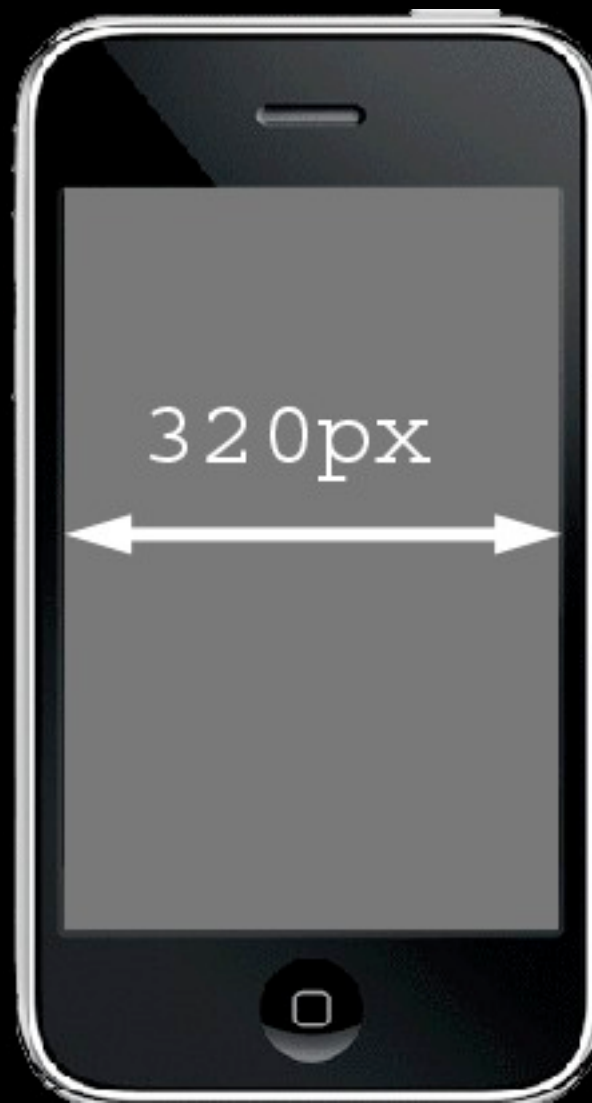
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# Device pixels

- Device pixels are the physical pixels on the device
- There's a fixed amount of them that depends on the device

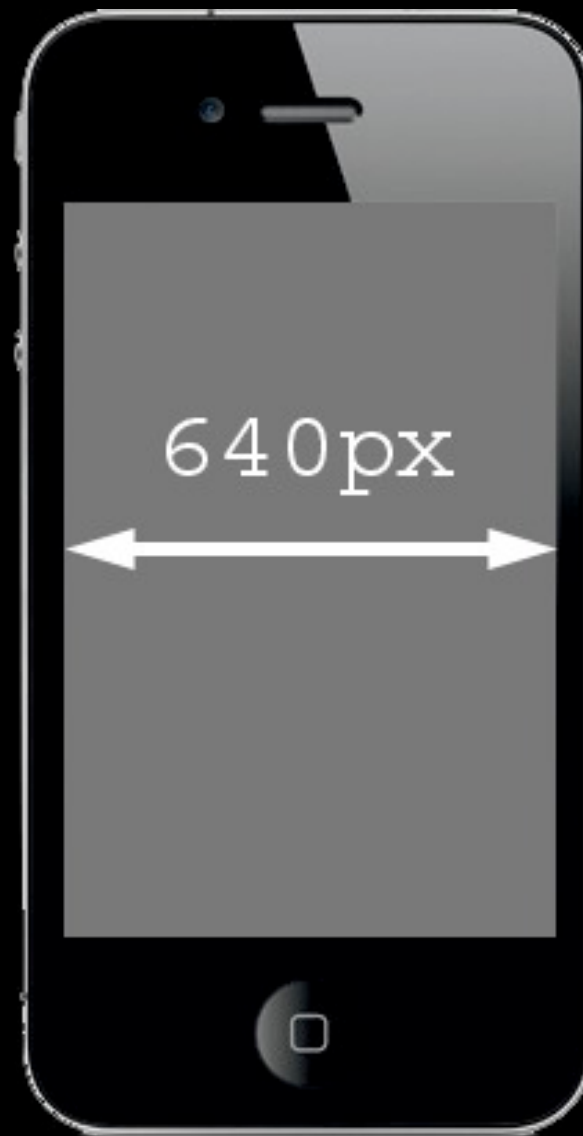
# Device pixels



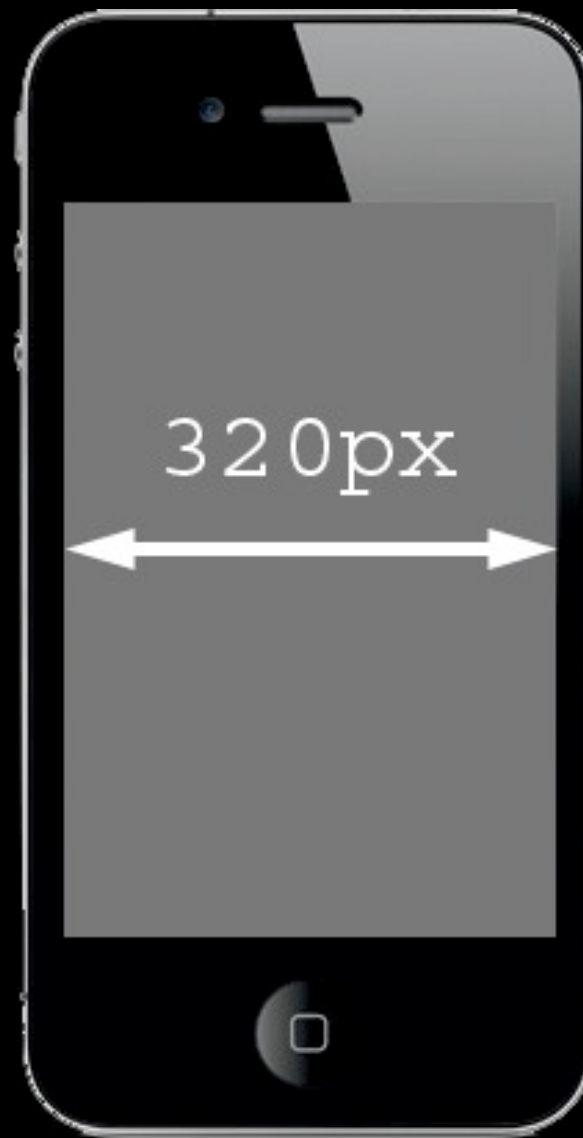
# Device pixels

- But ...
- Devices get higher and higher pixel densities
- The number of device pixels also increases
- But that would break sites

# Device pixels



# Density-independent pixels



# Density-independent pixels

- Thus device vendors created density-independent pixels (dips)
- They are another abstraction layer
- The number of dips is equal to the number of CSS pixels that is optimal for viewing a website on the device.
- What does that mean? I'll explain later

# What kind of pixels?

If a certain JavaScript property is expressed in pixels

always ask yourself what kind of pixels.

Usually it's CSS pixels, especially for anything related to CSS

Sometimes it's device pixels or dips, for anything related to screen size



# II.Viewports

# Viewports

- The viewport is the total amount of space available for CSS layouts
- On the desktop it's equal to the browser window
- The `<html>` element has an implicit width: 100% and spans the entire viewport



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# Viewports

- On mobile it's quite a bit more complicated
- If the (narrow) browser window were to be the viewport, many sites would be squeezed to death
- And mobile browsers must render all sites correctly, even if they haven't been mobile-optimized



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# Viewports

- That's why the mobile browser vendors have split the viewport into two:
- The layout viewport, the viewport that CSS declarations such as padding-left: 34% use,



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# Viewports

- That's why the mobile browser vendors have split the viewport into two:
- The layout viewport, the viewport that CSS declarations such as padding-left: 34% use,
- and the visual viewport, which is the part of the page the user is currently seeing
- Both are measured in CSS pixels



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# Viewports

- Initially most browsers make the visual viewport equal to the layout viewport
- by zooming the page out as much as possible

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# JavaScript properties

`window.innerWidth` and `window.innerHeight`

- The width and height of the visual viewport in CSS pixels
- Works everywhere, except on Android 2, Firefox, and IE9.

# III. Zooming

# Zooming

- On the desktop the viewport becomes less wide and the CSS pixels become larger.
- The same amount of device pixels now contains less CSS pixels, after all.
- So padding-left: 34% is recalculated,
- and width: 190px now covers more device pixels





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# Zooming

- On mobile the visual viewport becomes smaller, but the layout viewport remains static. Thus CSS declarations are not re-computed.
- The visual viewport now contains less CSS pixels.
- The user sees less of the complete site.





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IV. position:  
fixed

# position: fixed

“The box's position is calculated according to the 'absolute' model, but in addition, the box is fixed with respect to some reference. In the case of handheld, projection, screen, tty, and tv media types, the box is fixed with respect to the viewport and does not move when scrolled.”

# position: fixed

“The box's position is calculated according to the 'absolute' model, but in addition, the box is fixed with respect to some reference. In the case of handheld, projection, screen, tty, and tv media types, the box is fixed with respect to the **viewport** and does not move when scrolled.”



# position: fixed

## But which viewport? Visual? Layout?

media types, the box is fixed with respect to the **viewport** and does not move when scrolled.”

# position: fixed

- Browser-dependent
- Most browsers use the visual viewport (Android 3, Chrome, BlackBerry, IE10, Safari iOS 6)
- others the layout viewport (Tizen, MeeGo, UC, IE9)
- Opera “hops”

# Demo time

- <http://quirksmode.org/m/tests/positionfixed.html>

V. Media  
queries

# Media queries

```
@media all and (max-width: 600px) {  
  .sidebar {  
    float: none;  
  }  
}
```

# Media queries

- There are two important media queries:
- width (min-width and max-width)
- device-width (min-device-width and max-device-width)
- width is the one you want

# Media queries - device-width

- device-width gives the width of the device screen
- in device pixels
- Equal to screen.width



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# Media queries - width

- width gives the width of the viewport
- in CSS pixels
- (There are a few zooming problems on desktop, though)
- Equal to  
`document.documentElement.clientWidth`



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# Media queries

- width is the media query you want
- but at first sight it seems to be totally useless on mobile
- Usually we don't care about the width of the layout viewport
- but with responsive design we care a lot
- We need to treat one more element

# VI. Meta viewport

# Meta viewport

```
<meta name="viewport"  
content="width=device-width">
```

# Meta viewport

```
@viewport {  
    width: device-width;  
}
```

Only Opera for now



# Meta viewport

```
<meta name="viewport"
```

```
content="width = device-width">
```

- The meta viewport tag tells the browser to set the size of the layout viewport
- You can give a pixel value
- or device-width, which means the screen size in dips (or device pixels)



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# Meta viewport

```
<meta name="viewport"  
      content="width = device-width">
```

- There is little reason to use other values than device-width
- And because you tell the layout viewport to become as wide as the device
- the width media query now contains useful data

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# Responsive design

- So the trick for creating a responsive design
- is using `<meta name="viewport" content="width=device-width" />`
- in combination with width media queries
- You probably already knew that
- but now you also understand **why**

# Thank you

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