CSS AND JAVASCRIPT UPDATE

OVERVIEW

- A quick look back
- CSS: Flexbox
- JavaScript: ES6

A QUICK LOOK BACK

HTML AND CSS

From WEB1 you already know:

- Structuring content with HTML
- Document structure, lists, forms, tables, media
- Semantic markup
- CSS2 and CSS3 selectors
- Styling text and boxes
- Box model, positioning elements, floating boxes

If necessary consult:

- WEB1 slides and related material
- Learn to Code HTML & CSS

HTML AND CSS

You probably also know:

- Front-end frameworks like Foundation or Bootstrap
- CSS preprocessors like Less or Sass

HTML AND CSS

- CSS3 has a Flexible Box Layout Module, short: *Flexbox*
- Currently a *W3C Last Call Working Draft*
- This has not been addressed in WEB1

More on CSS3 *Flexbox* in a moment...

JAVASCRIPT

From WEB2 you know:

- JavaScript basics: statements, expressions, variables
- Values and types: numbers, strings, boolean, undefined, ...
- Functions, closures, this, scoping
- Objects, methods, constructors, prototypes
- Arrays, Math-object, regular expressions
- Strict mode

If necessary consult:

- WEB2 slides and related material
- Speaking JavaScript, Chapter 1: Basic JavaScript

JAVASCRIPT: FUNCTIONS

```
// Function declaration
function add (a, b) { return a+b; }

// Function expression
var add = function (a, b) { return a+b; };

// Named function expression
// Name fact is used here for recursive call
// It's scope is limited to the function
var factorial = function fact (n) {
    if (n <= 1) return 1;
    else return n * fact(n-1);
};
```

JAVASCRIPT: CLOSURES, CALLBACKS

```
// Fade the background color of an element
var fade = function (node) {
    var level = 1;
    var step = function () {
        var hex = level.toString(16);
        node.style.backgroundColor = '#FFFF' + hex + hex;
        if (level < 15) {
            level += 1;
            setTimeout(step, 100);
        }
    };
    setTimeout(step, 100);
};

// Sample call
window.onload = function() {
    fade(document.querySelector(".newitem"));
};
```

JAVASCRIPT: OBJECTS AND CONSTRUCTORS

```
var Person = function (name) {
    this.name = name;
    this.greet = function () {
        return "Hello, my name is " + this.name;
    };
};

var eva = new Person("Eva");
console.log(eva.greet());   // Hello, my name is Eva
```

JAVASCRIPT: INHERITANCE

```
// User extends Person
var User = function (name, uid) {
    Person.call(this, name);
    this.uid = uid;
};

// Dummy Person object for the inheritance chain
User.prototype = new Person;
User.prototype.constructor = User;
```

JQUERY

```
// example from the exercise
readNotes : function () {
    $.getJSON( this.SERVER_URL + "notes", function(data) {

        //delete all notes
        $('#notes').empty();

        //now iterate over our notes (template preferred...)
        $.each(data.notes, function(i, note) {
          $('<li class="note" data-note-id="'+note.id+'">')
            .append('<span class="subject">'+note.subject+'</span>')
            .append('<span class="message">'+note.message+'</span>')
            .append('<a class="delete" href="#">delete</a>')
            .appendTo('#notes');
        });
    });
}
```

JQUERY

```
addHandler : function () {
    var url = this.SERVER_URL;

    $('#notes').on('click', '.delete', function (e) {
        var note = $(this).parents('.note'),
            noteid = note.data('note-id');

        $.getJSON(url + "deleteNote?id=" + noteid, function(data) {
          //check the server answer
          if (data.message == 'ok') {
            //if successful, reload the list
            NOTE_CLIENT.readNotes();
          }
          else {
            //if not successful, show an error message
            alert('Note could not be deleted');
          }
        });
        e.preventDefault();
    });
}
```

JAVASCRIPT: CURRENT DEVELOPMENT

- ECMAScript 6 (2015), more in a moment...
- Node.js, Io.js merged again
- jQuery 3 in development, status: alpha
- Web Components, in another lesson...

JAVASCRIPT APPLICATION FRAMEWORKS

- Backbone, Ember, Angular, Meteor, React
- These can prove useful for mobile applications, too
- We will have a look into React.js in another lesson
- React Native for building native apps using the React way

CSS FLEXBOX

CSS FLEXBOX

- Page layout is difficult with traditional CSS
- Hence the various grid frameworks like Bootstrap
- Flexbox aims to facilitate typical layout problems

CSS FLEXBOX

- Efficient way to lay out, align and distribute items in a container
- Option to re-order items helps making responsive designs
- Used in React Native for laying out native apps
- Will optionally be used by Bootstrap (V4, currently alpha)

CSS Flexible Box Layout Module Level 1

BROWSER SUPPORT

caniuse.com/#search=flexbox

- Overall good support of current browsers
- Problems with Internet Explorer, good support by Edge
- Safari up to version 8: Use -webkit prefix

The examples on the following slides are from http://flexbox.io/

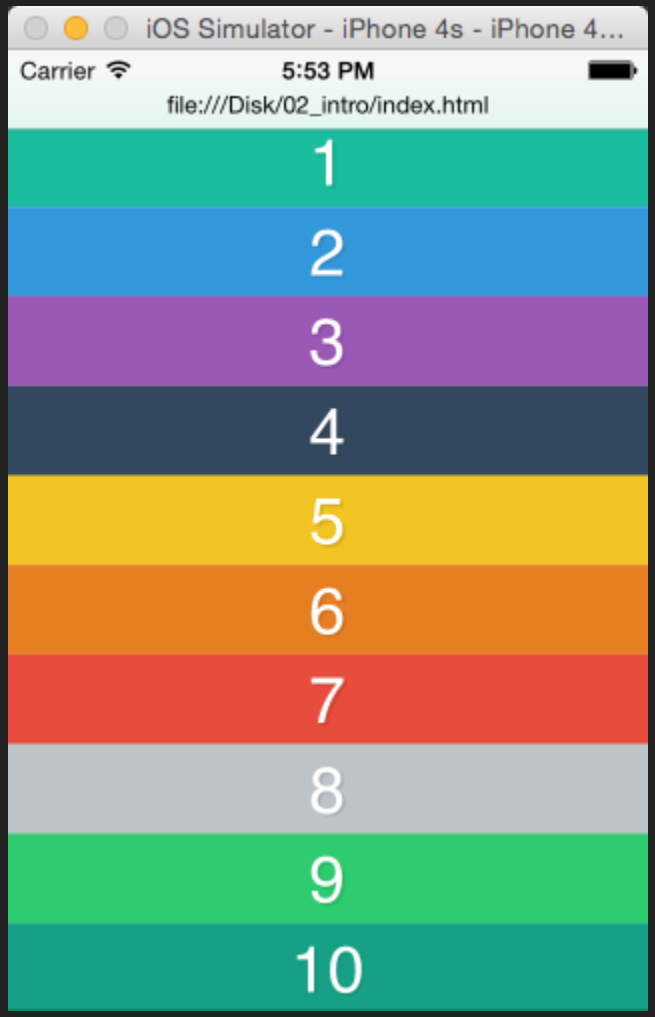
EXAMPLE

```html
<!-- HTML -->
<div class="container">
    <div class="box box1">1</div>
    <div class="box box2">2</div>
    ...
    <div class="box box10">10</div>
</div>
```

```css
/* CSS */
.box {
    padding:10px;
    text-align: center;
    color:white;
    text-shadow:4px 4px 0 rgba(0,0,0,0.1);
    font-size: 100px;
}
.box1 { background:#1abc9c;}
...
```

↓ preview ↓

EXAMPLE


iOS Simulator - iPhone 4s - iPhone 4...
Carrier
5:53 PM
file:///Disk/02_intro/index.html
1
2
3
4
5
6
7
8
9
10

EXAMPLE: FLEX CONTAINER

```
.container {
    display: flex;
    border: 10px solid goldenrod;
    height: 100vh;
}
```

- Flexbox consists of flex containers and flex items
- A flex container is declared with the *display* property
- Container is now a *flex container*
- Alternative: *display: inline-flex* results in an inline element

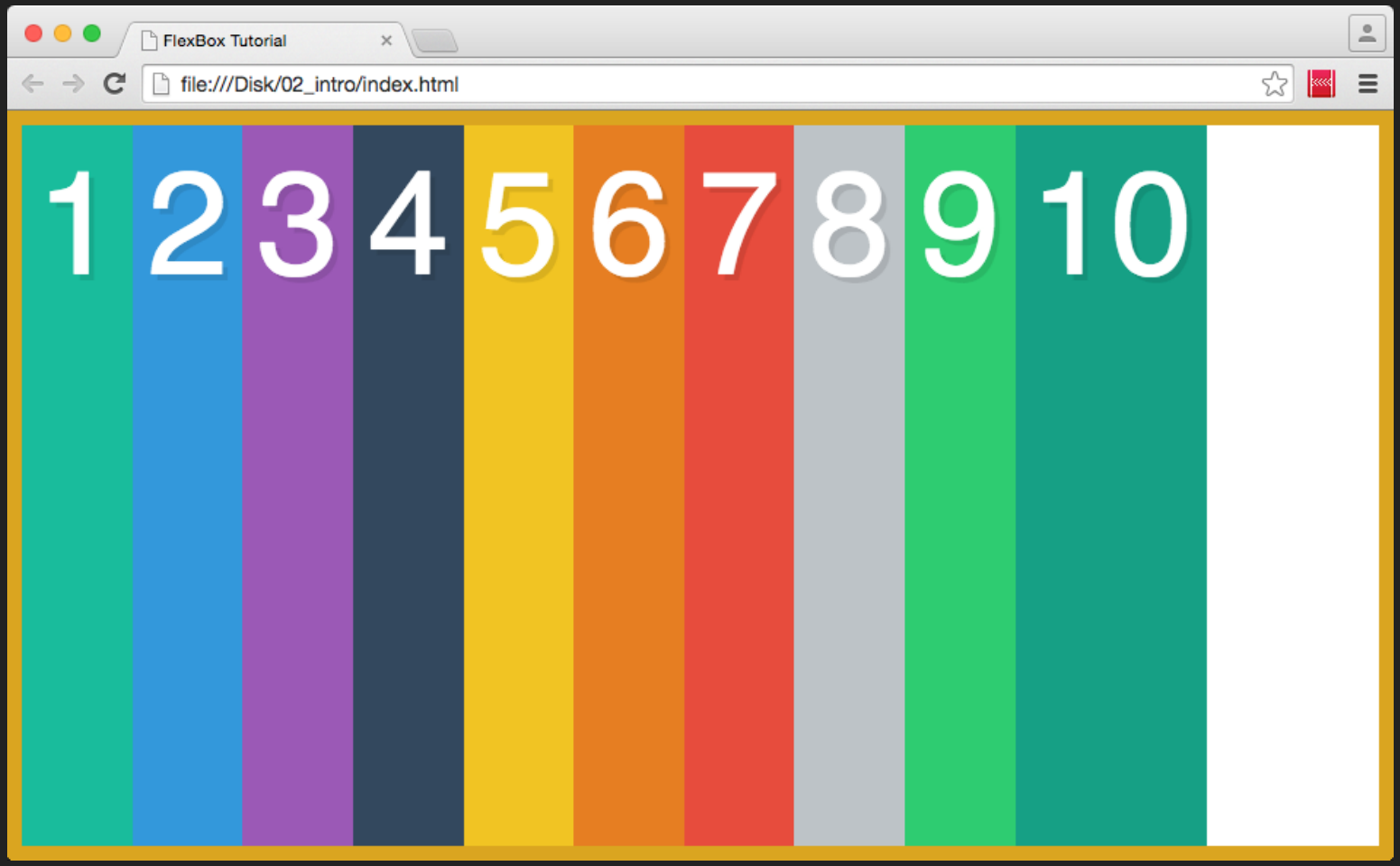
EXAMPLE: FLEX CONTAINER

```
.container {
    display: flex;
    border: 10px solid goldenrod;
    height: 100vh;
}
```

- 100vh – what's that ??
- It's the viewport height

↓ preview ↓

EXAMPLE: FLEX CONTAINER



FLEX ITEMS

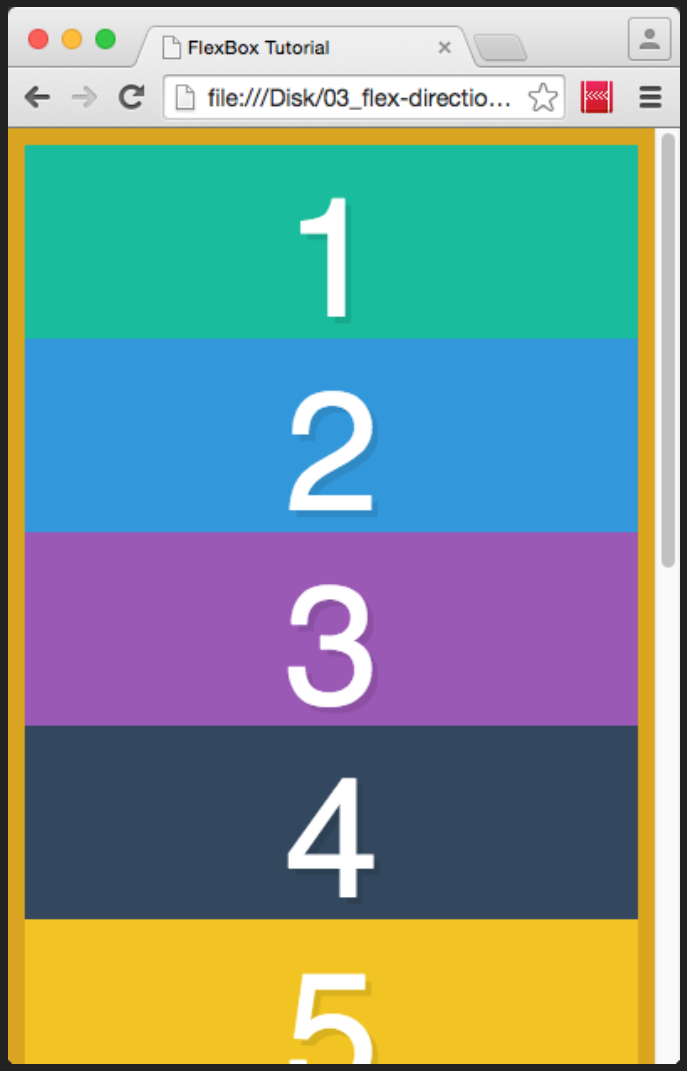
- Every child of a *flex container* is a *flex item*
- There can be any number of flex items
- Flexbox defines how flex items are laid out inside of flex containers

FLEX DIRECTION

```
.container {
    display:flex;
    border:10px solid goldenrod;
    min-height:100vh;
    flex-direction: column;
}
```

↓ preview ↓

FLEX DIRECTION



FLEX DIRECTION

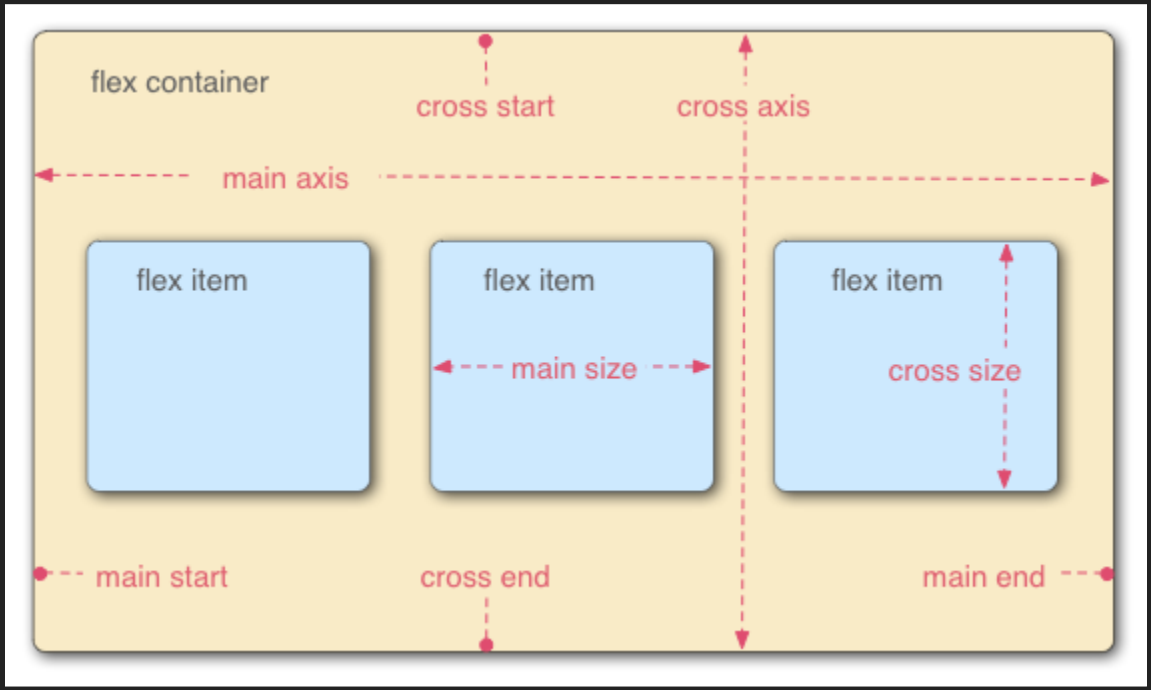
- CSS attribute: *flex-direction*
- Possible values: *row* | *row-reverse* | *column* | *column-reverse*
- Default: *row*
  (items are laid out in the direction of the writing-mode)
- Terminology:
  - Main direction (sometimes called the flow direction)
  - Main start and main end
  - Cross direction
  - Cross start and cross end

FLEX DIRECTION

```
body {
    direction: rtl;    /* main direction right to left */
}
.container {
  display:flex;
  border:10px solid goldenrod;
  min-height:100vh;
  flex-direction: row-reverse;  /* left to right again */
}
```

↓ preview ↓

FLEX DIRECTION



(Source: MDN)

FLEXBOX ORDERING

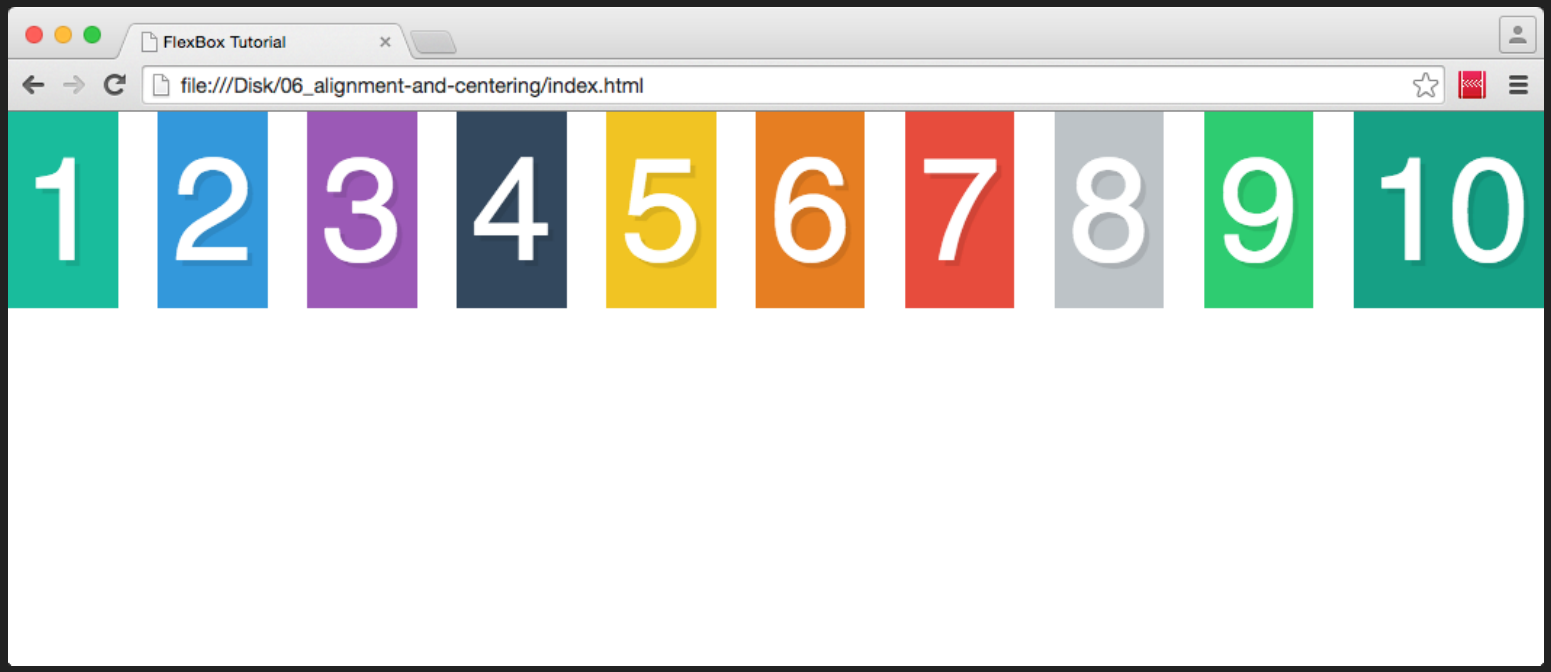
```
.container {
  display:flex;
}
.box {
  flex:1;
  order:1;
}
.box3 {
  order:3;
}
.box7 {
  order:-2;
}
```

FLEXBOX ORDERING

- Flex items can be re-ordered with the `order` property
- Initial value: 0
- Problems likely when selecting text over multiple items

FLEXBOX ALIGNMENT

```
.container {
  display:flex;
  justify-content:space-between;
}
```



FLEXBOX ALIGNMENT

- Property: *justify-content*
- Defines the alignment along the *main* axis
- Remember: with *flex-direction:column* the main axis is from top to bottom
- Possible values: *flex-start* | *flex-end* | *center* | *space-between* | *space-around*
- Default: *flex-start*

FLEXBOX ALIGNMENT

- Another property : *align-items*
- This one defines the alignment along the *cross* axis
- Possible values: *flex-start* | *flex-end* | *center* | *baseline* | *stretch*
- Default: *stretch*

FLEXBOX ALIGNMENT

```
.container {
  display:flex;
  border:10px solid goldenrod;
  min-height:100vh;
  align-items:baseline;
}
.box2 {
  font-size: 150px;
}
.box3 {
  font-size: 200px;
}
.box6 {
  padding-bottom: 50px;
  padding-top: 75px;
}
```

↓ preview ↓

FLEXBOX ALIGNMENT

FLEXBOX ALIGNMENT

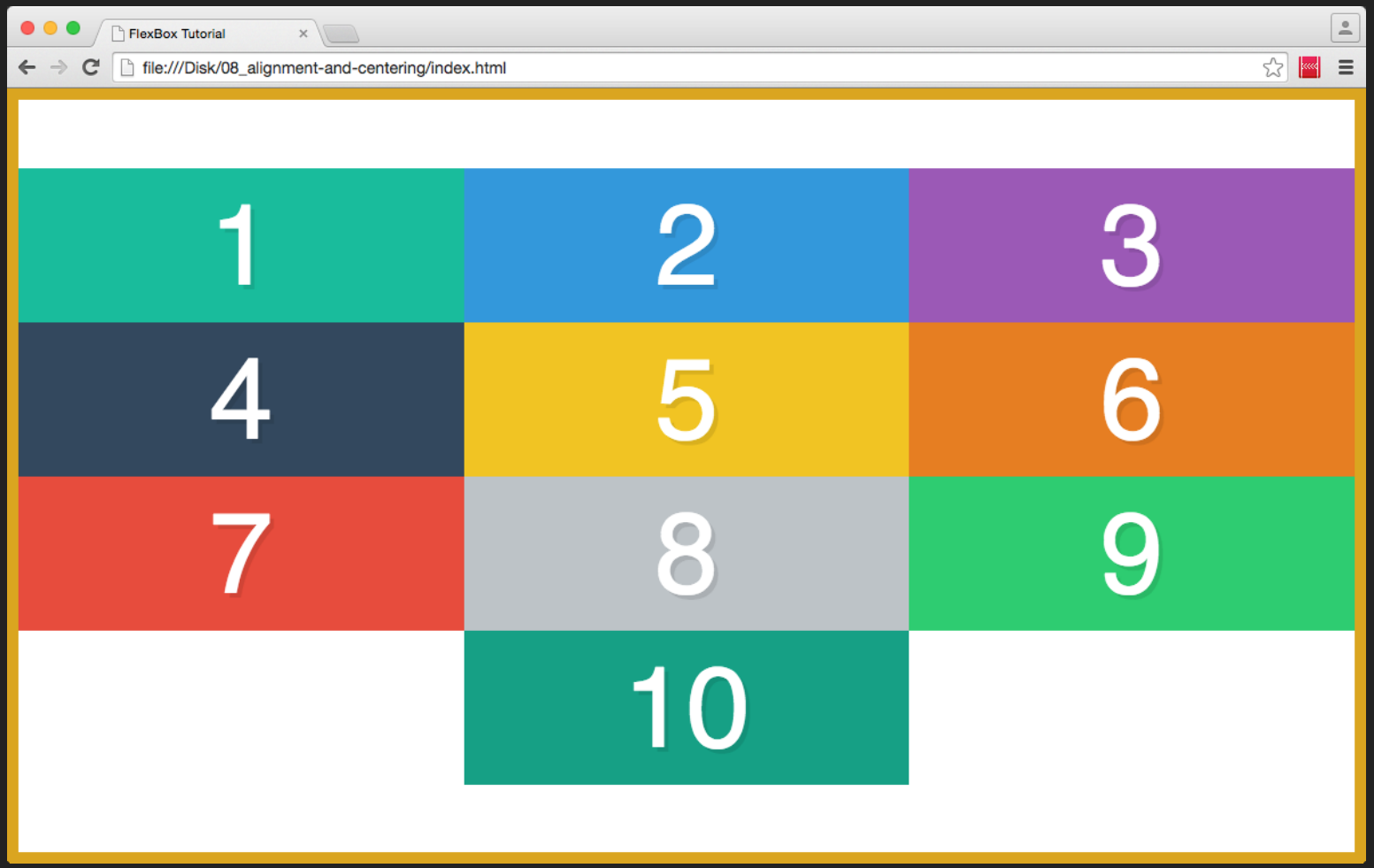
- One more property : *align-content*
- Alignment along the *cross* axis for the whole content
- Possible values: *flex-start* | *flex-end* | *center* | *space-between* | *space-around* | *stretch*
- Default: *stretch*

FLEXBOX ALIGNMENT

```
.container {
  display:flex;
  border:10px solid goldenrod;
  min-height:100vh;
  flex-wrap: wrap;
  justify-content: center;
  align-content: center;
}
.box {
  width: 33.33333%;
}
```

↓ preview ↓

FLEXBOX ALIGNMENT

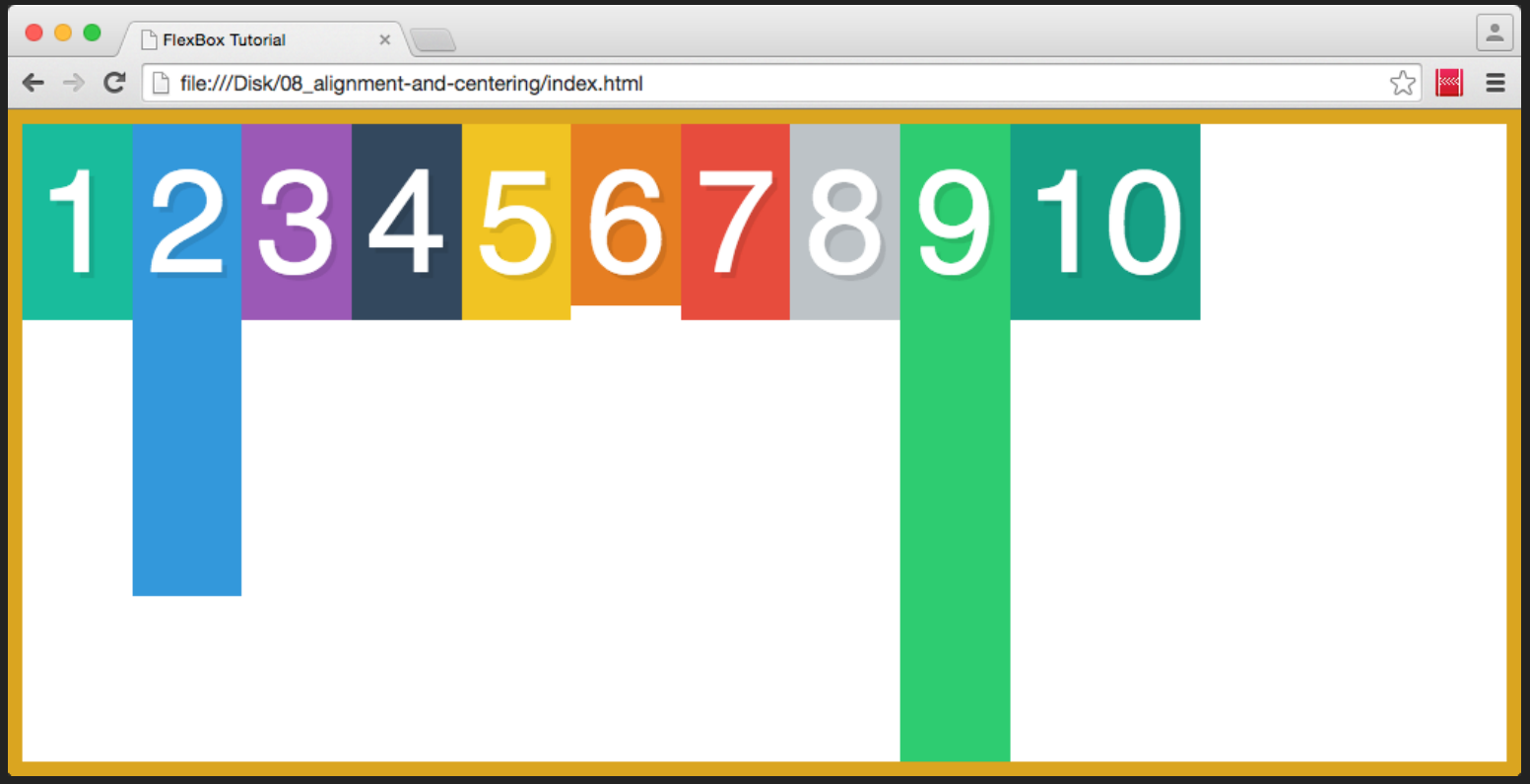


FLEXBOX SELF ALIGNMENT

```
.container {
  display:flex;
  border:10px solid goldenrod;
  min-height:100vh;
  align-items: flex-start;
}
.box2 {
  padding-bottom: 200px;
}
.box6 {
  padding-bottom: 0;
}
.box9 {
  padding-bottom: 50px;
  align-self: stretch;
}
```

↓ preview ↓

FLEXBOX SELF ALIGNMENT



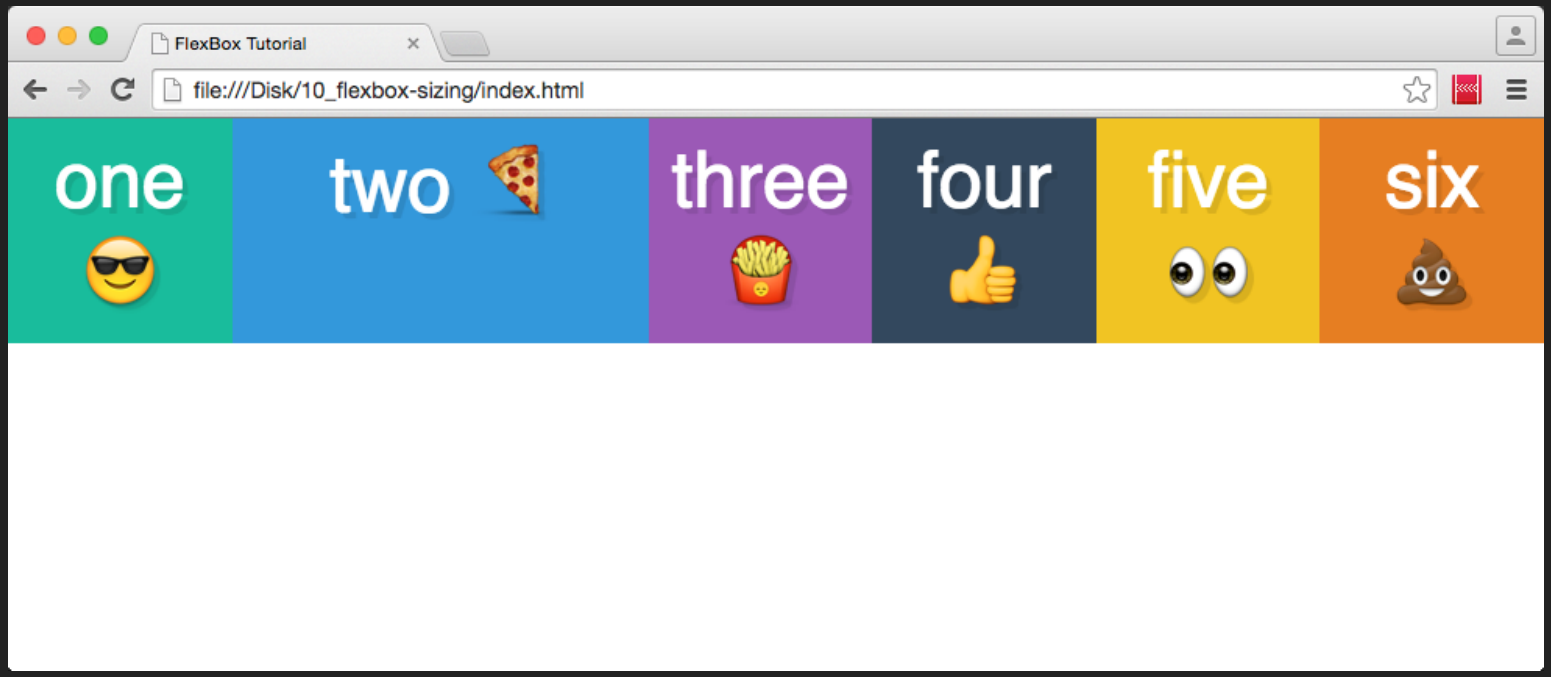
FLEXBOX SIZING

```html
<!-- HTML -->
<div class="container">
  <div class="box box1">one   </div>
  <div class="box box2">two   </div>
  <div class="box box3">three   </div>
  ...
</div>
```

```css
/* CSS */
.container {
  display:flex;
}
.box { /*...*/
  flex:1;
}
.box2 {
  flex:2;
}
```

↓ preview ↓

FLEXBOX SIZING



GROW AND SHRINK FLEX ITEMS

- `flex-grow`
  - Defines the ability for a flex item to grow if necessary
  - Unitless value that serves as a proportion
  - Default: 0
- `flex-shrink`
  - Defines the ability for a flex item to shrink if necessary
  - Default: 1
- `flex-basis`
  - Size of an element before the remaining space is distributed
  - Default: *auto*

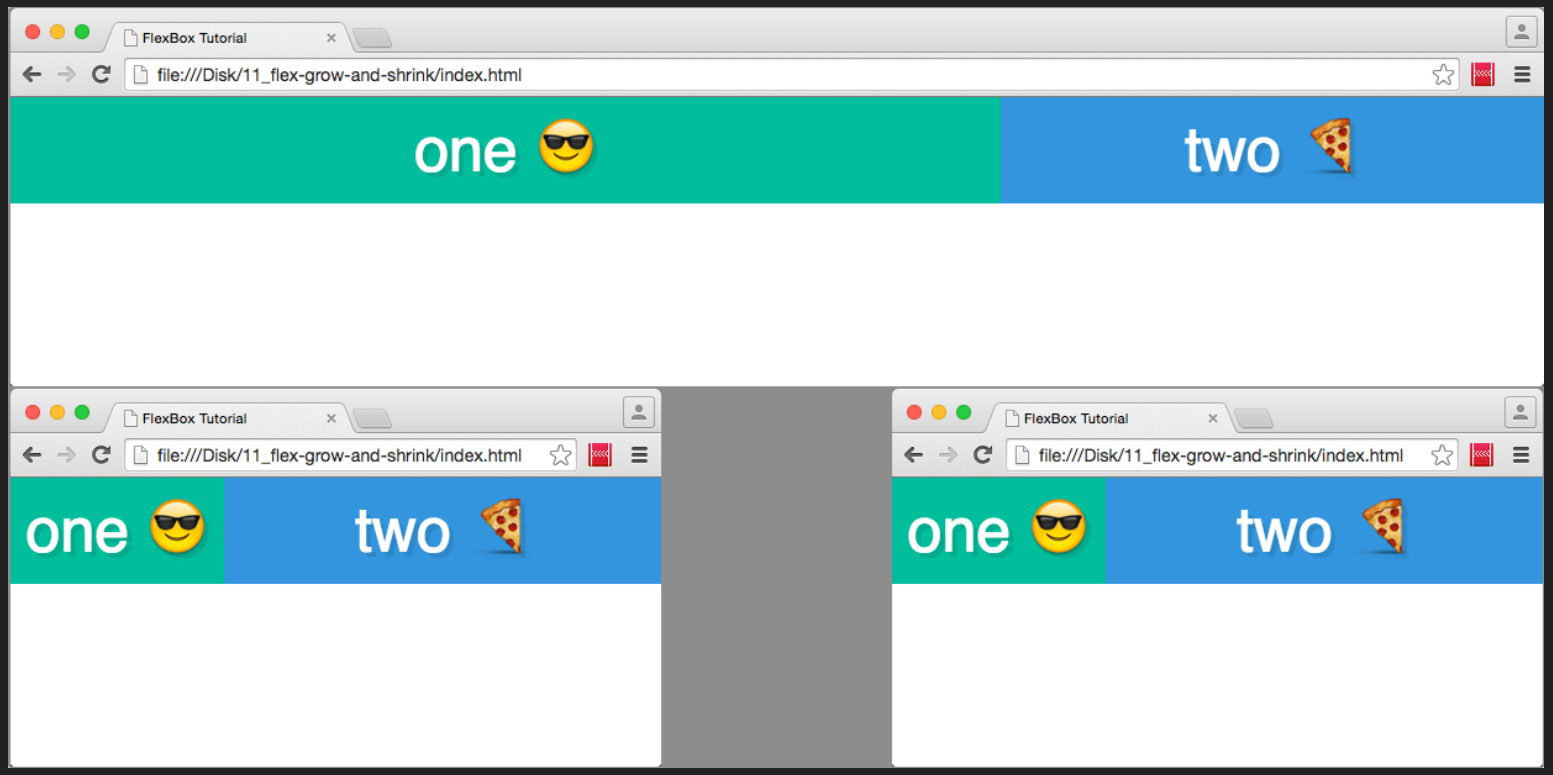
PROPERTY *FLEX*

- Shorthand for *flex-grow*, *flex-shrink* and *flex-basis* combined
- Second and third parameters are optional
- Default: 0 1 auto

```
.box1 {
    flex: 10 5 400px;
}
.box2 {
    flex: 1 1 400px;
}
```

↓ preview ↓

GROW AND SHRINK FLEX ITEMS



RESIZING COMBINED WITH WRAPPING

- Resizing/wrapping combined allows for flexible layouts
- To demonstrate we use a container with six flex items

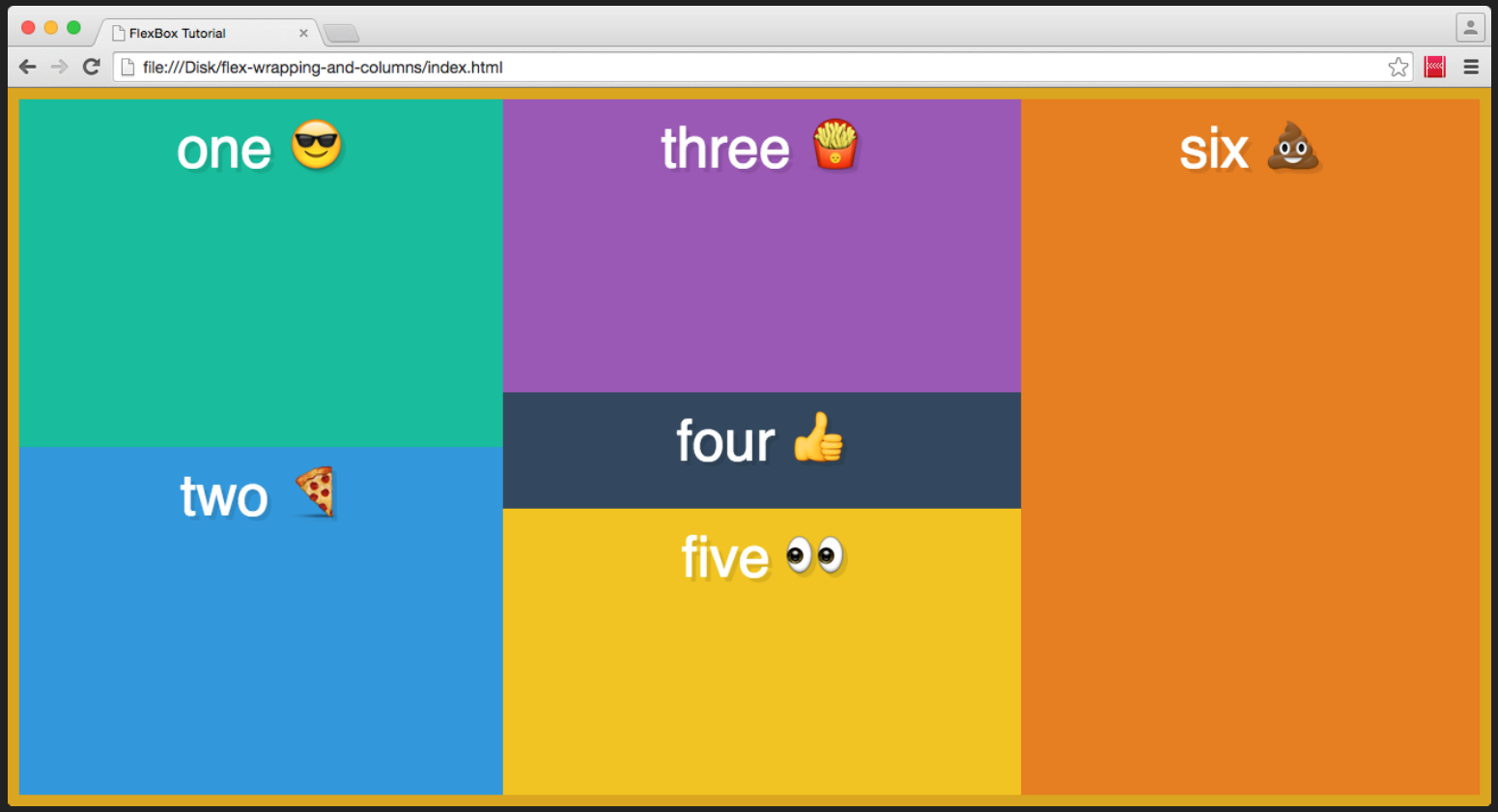
```
<div class="container">
    <div class="box box1">one   </div>
    ...
    <div class="box box6">six   </div>
</div>
```

RESIZING COMBINED WITH WRAPPING

```
.container {
    display:flex;
    flex-wrap:wrap;
    flex-direction:column;
    border:10px solid goldenrod;
    height:100vh;
}
.box {
    flex-basis:250px;
    flex-grow:1;
}
.box3 {
    flex-grow:5;
}
.box4 {
    flex-basis:100px;
}
```

↓ preview ↓

RESIZING COMBINED WITH WRAPPING



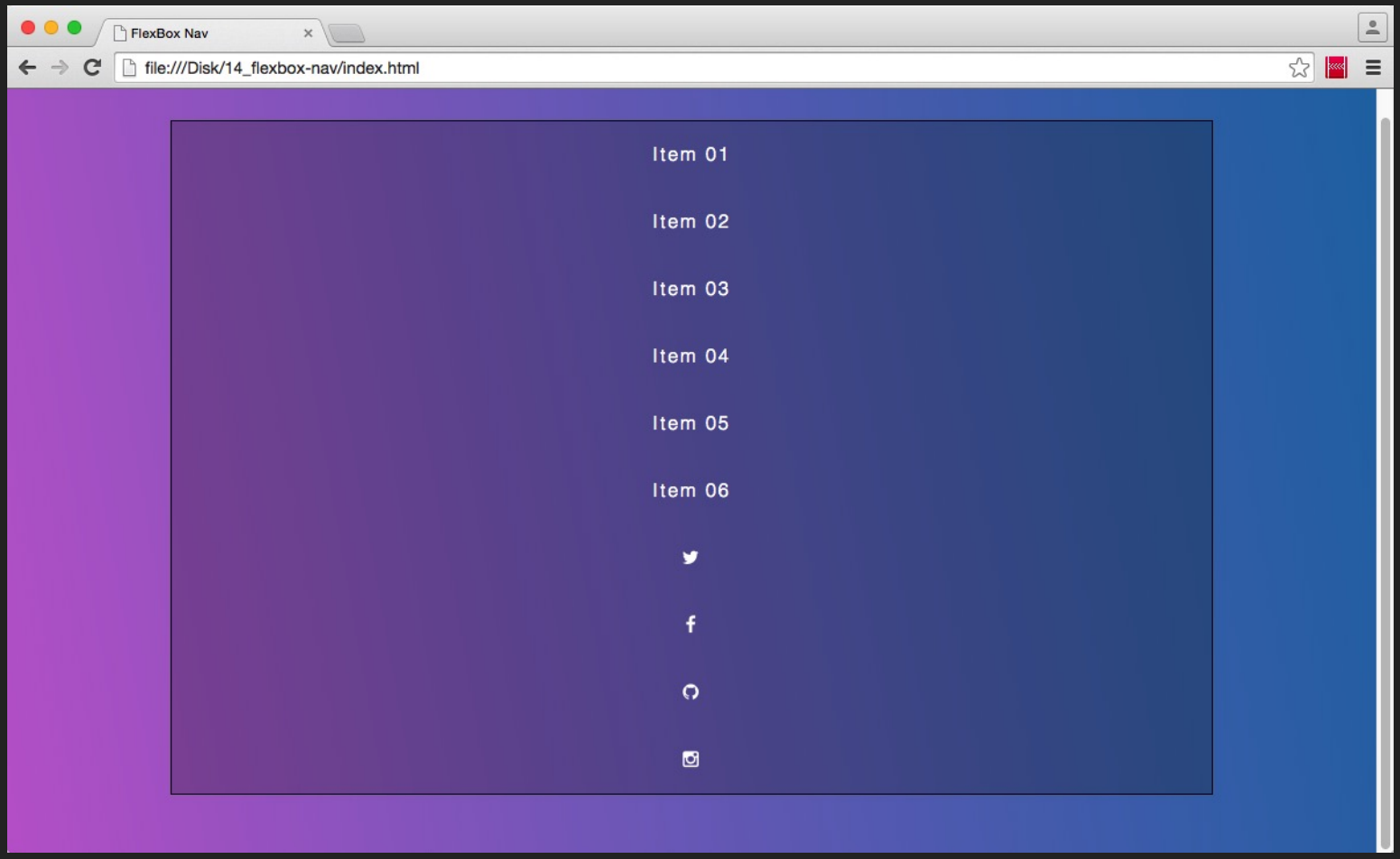
EXAMPLE: NAVIGATION

HTML

```
<nav class="flex-nav">
  <ul>
    <li><a href="#">Item 01</a></li>
    <li><a href="#">Item 02</a></li>
    ...
    <li class="social">
      <a href="http://twitter.com/wesbos"><i class="fa fa-twitter"></i></a>
    </li>
    ...
  </ul>
</nav>
```

↓ With a little bit of styling not shown here ↓

EXAMPLE: NAVIGATION

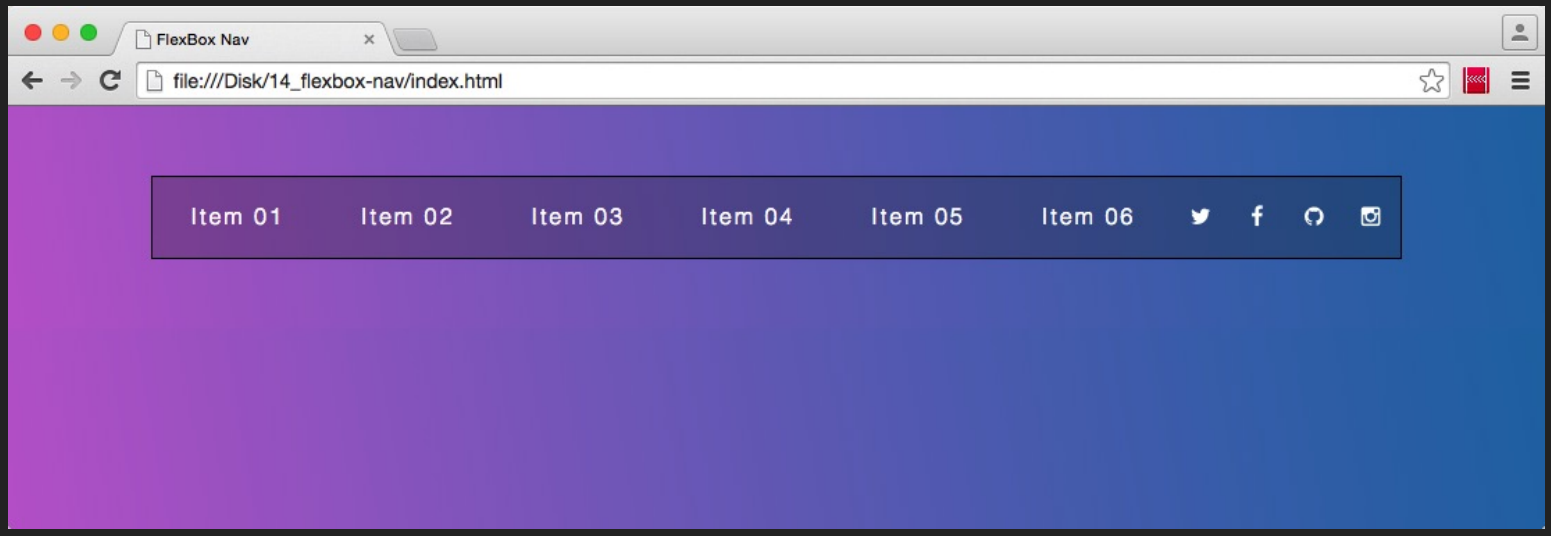


EXAMPLE: NAVIGATION

```
.flex-nav ul {
    border:1px solid black;
    list-style: none;
    margin: 0;
    padding: 0;
    display: flex;
}
.flex-nav li {
    flex: 3;
}
.flex-nav .social {
    flex: 1;
}
```

↓ preview ↓

EXAMPLE: NAVIGATION

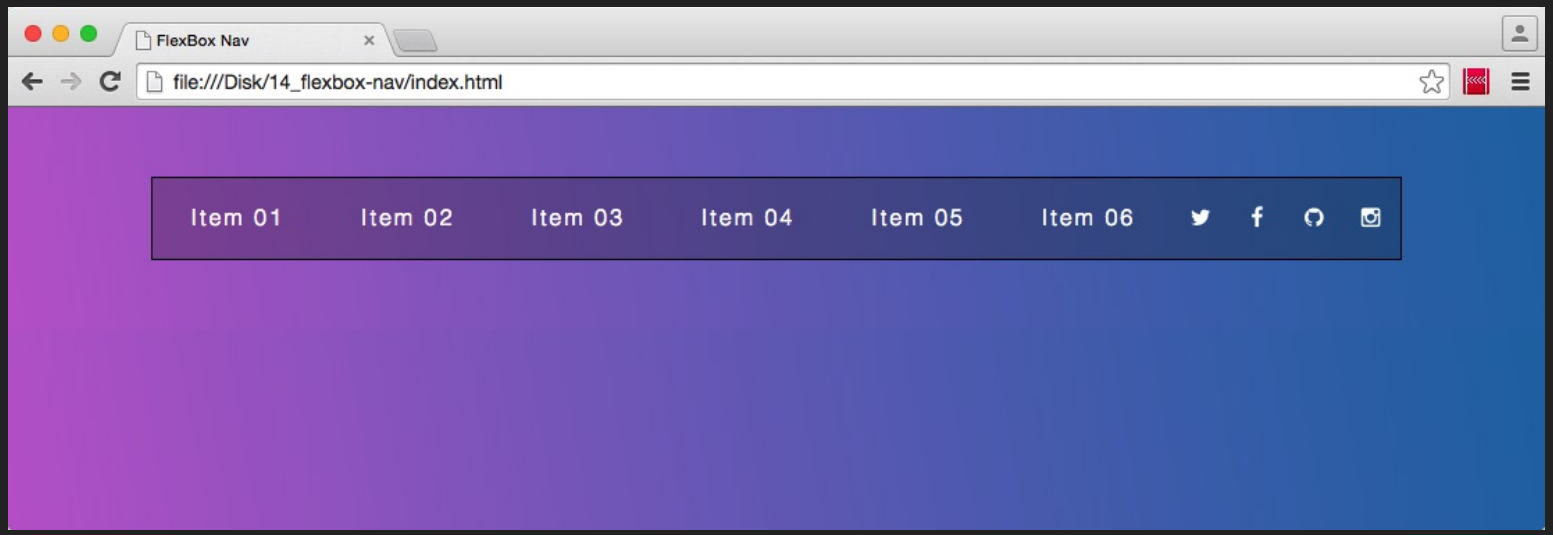


EXAMPLE: NAVIGATION

```
@media all and (max-width:1000px) {
    .flex-nav ul {
        flex-wrap: wrap;
    }
    .flex-nav li {
        flex: 1 1 50%;
    }
    .flex-nav .social {
        flex: 1 1 25%;
    }
}
@media all and (max-width:500px) {
  .flex-nav li {
      flex-basis: 100%;
  }
}
```

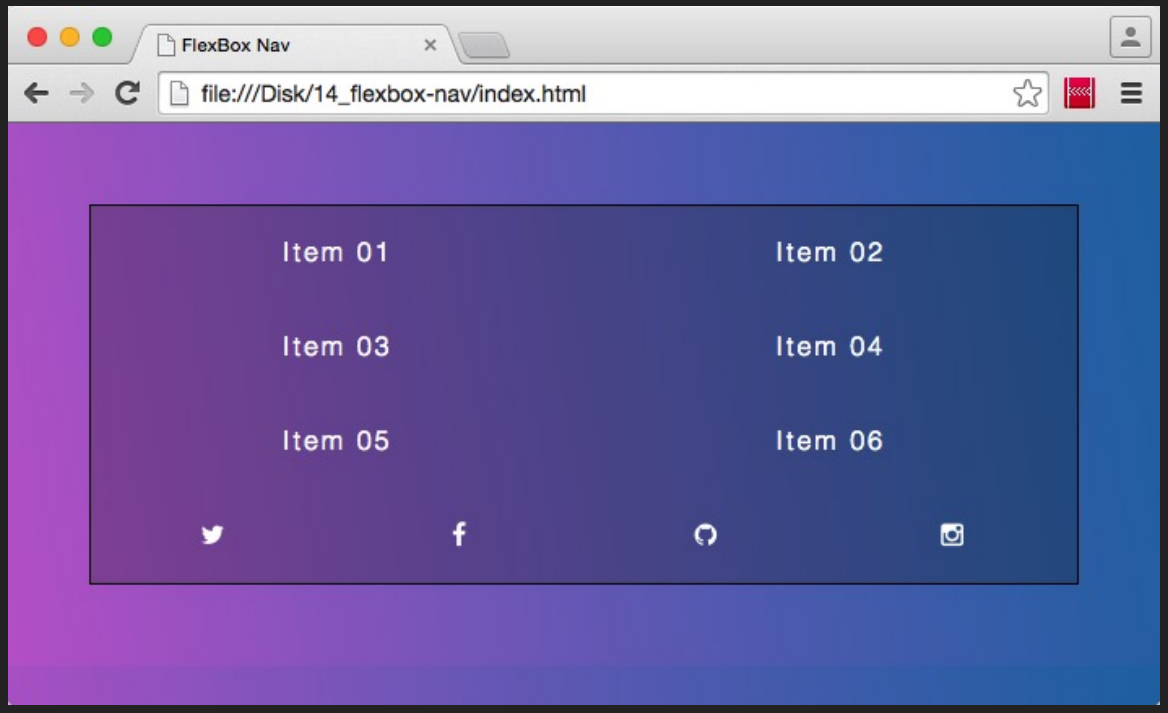
↓ preview ↓

EXAMPLE: NAVIGATION



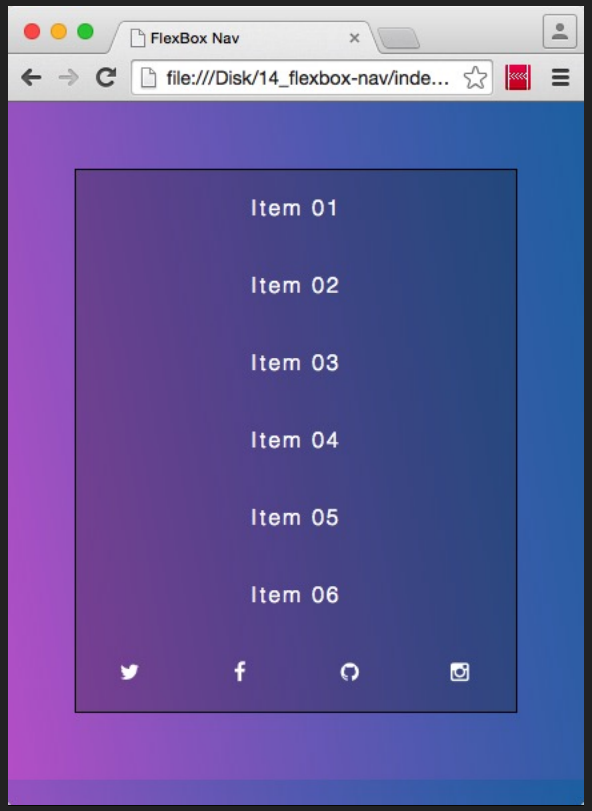
↓ more ↓

EXAMPLE: NAVIGATION

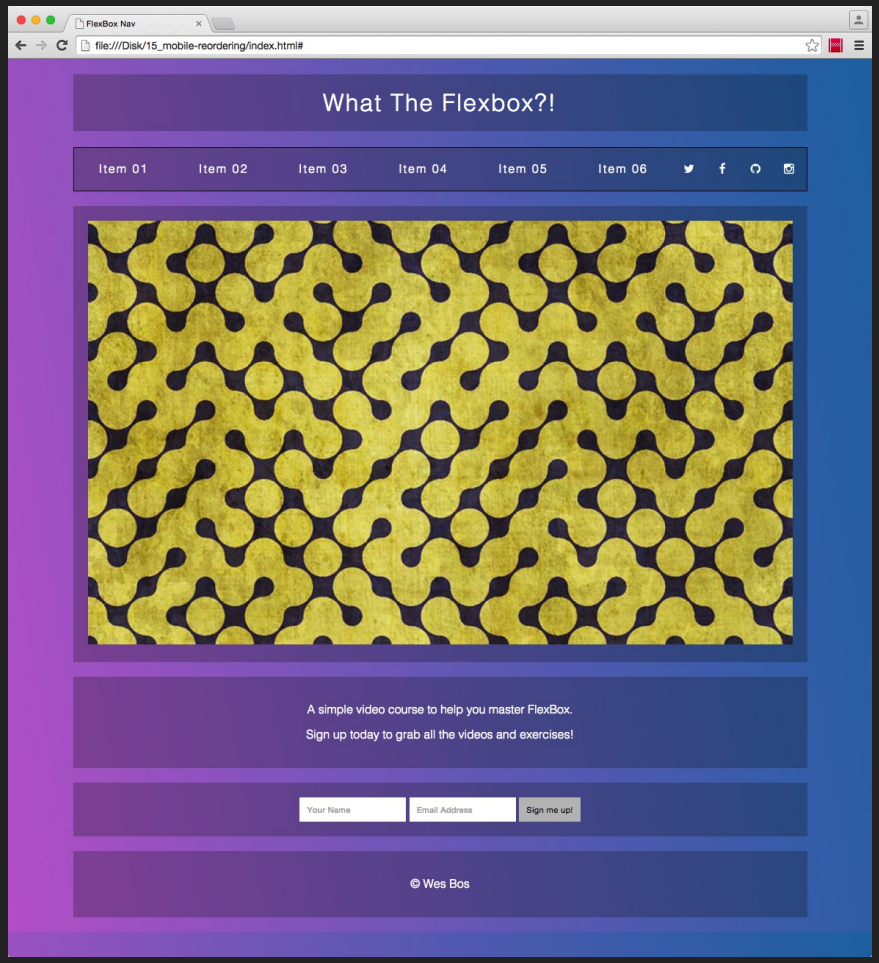


↓ more ↓

EXAMPLE: NAVIGATION



EXAMPLE: MOBILE REORDERING



EXAMPLE: MOBILE REORDERING

```
<body>
    <div class="wrapper">
        <header class="top">...</header>
        <nav class="flex-nav">...</nav>
        <section class="hero">...</section>
        <section class="details">...</section>
        <section class="signup">...</section>
        <footer>...</footer>
    </div>
  <script>...</script>
</body>
```

EXAMPLE: MOBILE REORDERING

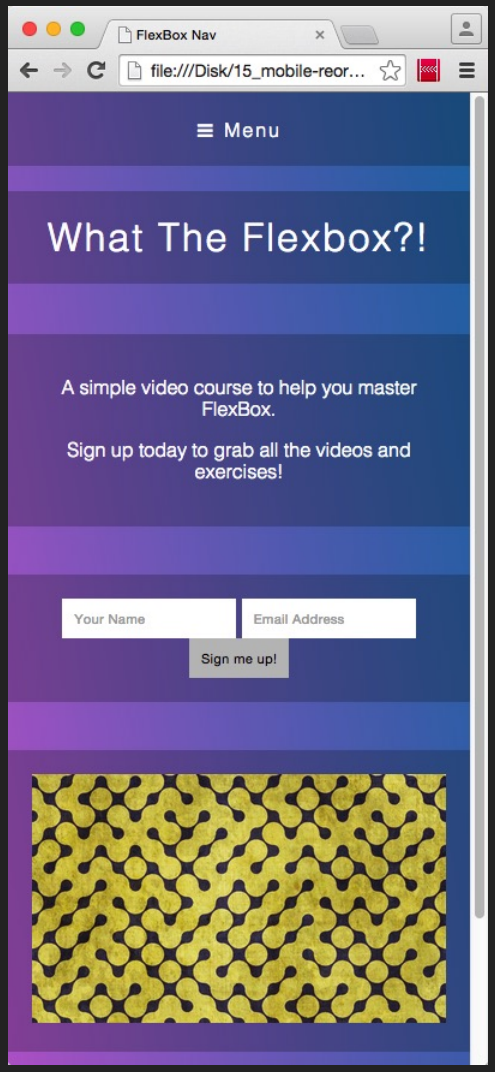
- On small mobile devices
  - the navigation should be on top of the screen
  - it should also be replaced by a toggle button
  - the details and signup areas should be moved up
- All this is easy with flexbox
- For re-ordering, the outer div must be *flex*

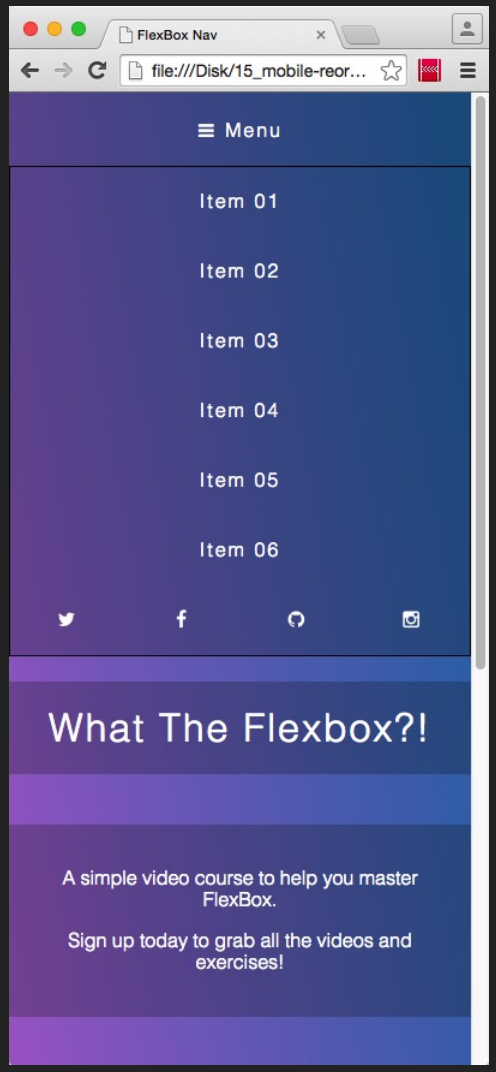
EXAMPLE: MOBILE REORDERING

```
@media all and (max-width:500px) {
  .wrapper {
    display: flex;
    flex-direction: column;
  }
  .wrapper > * {
    order: 9999;
  }
  .flex-nav { order: 1;
  }
  .toggleNav {
    display: block;
  }
  .flex-nav ul {
    display: none;
  }
  .flex-nav ul.open {
    display: flex;
  }
  .top { order: 2; }
  .details { order: 3; }
  .signup  { order: 4; }
}
```

↓ preview ↓

EXAMPLE: MOBILE REORDERING





MOBILE APP LAYOUT

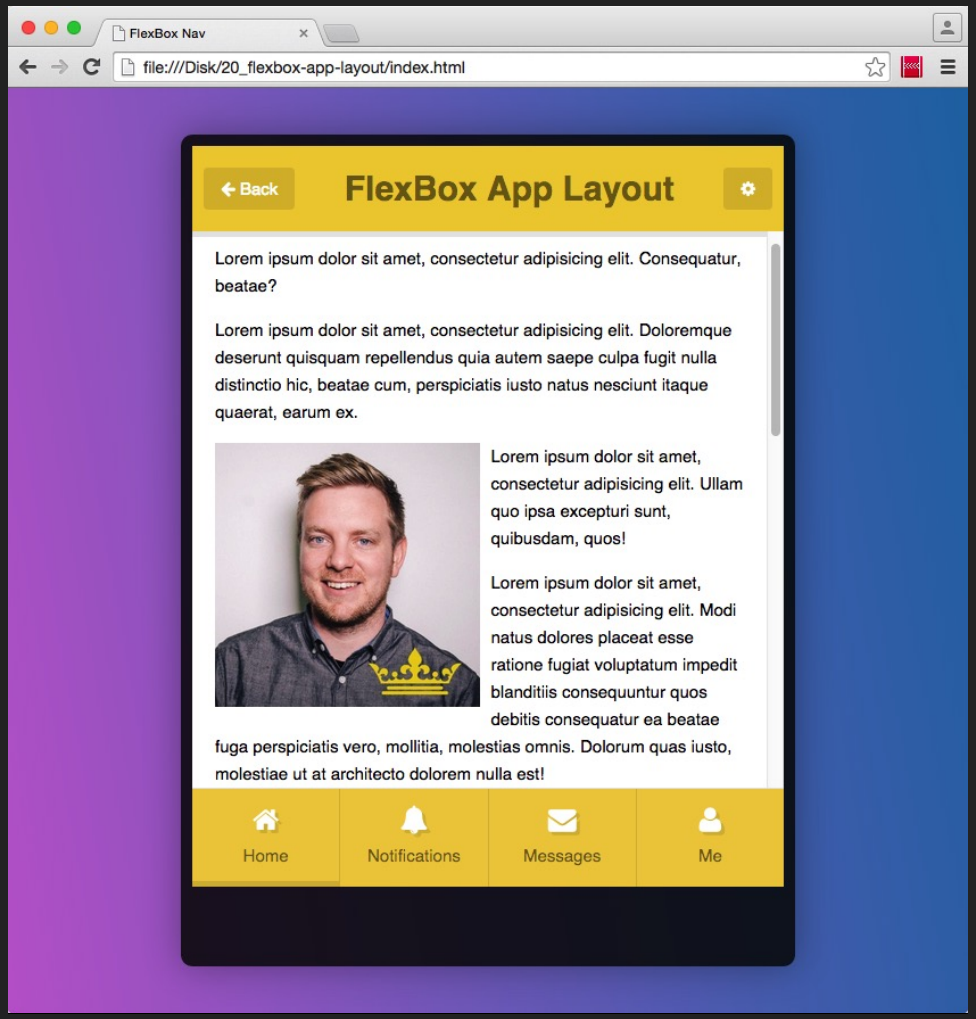
```
<div class="app-wrap">
  <header class="app-header">
    <a class="button">...</a>
    <h1>FlexBox App Layout</h1>
    <a class="button">...</a>
  </header>

  <div class="content">
    <p>...</p><p>...</p><img><p>...</p>
  </div>

  <div class="icon-bar">
    <a><i class="fa fa-home"></i>Home</a>
    <a><i class="fa fa-bell"></i>Notifications</a>
    <a><i class="fa fa-envelope"></i>Messages</a>
    <a><i class="fa fa-user"></i>Me</a>
  </div>
</div>
```

MOBILE APP LAYOUT

```
.app-wrap {
  display:flex;
  flex-direction:column;
}
.app-wrap > * {
  flex:1 1 auto;
}
.app-header {
  display:flex;
  align-items:center;
  justify-content:space-between;
}
.content {
  overflow-y:scroll;
  -webkit-overflow-scrolling:touch;
}
.icon-bar {
  display:flex;
}
.icon-bar a {
  flex:1;
}
```

↓ preview ↓

MOBILE APP LAYOUT



FLEXBOX COMPATIBILITY

- Flexbox changed over time
  - CSS Tricks: Old Flexbox and New Flexbox
  - Mozilla Developer Network: flex-basis
- Some browsers (Safari < 9) need vendor prefixes
- Use an autoprefixer
  - Try: autoprefixer.github.io
- Make this part of your build procedure
  - Use Grunt, Gulp, CodeKit, or similar tool

JAVASCRIPT: ES6

ECMA-262 6TH EDITION

Also called:

- ECMAScript 6
- ES6
- ECMAScript 2015
- JavaScript 2015

ECMASCRIPT 2015

- Major improvement (?) over ES5
- Language spec has almost 600 pages (ES 5.1: 245)
- Much needed features such as modules and classes
- Useful features like Maps, Sets, Promises or Generators
- Work has started on ECMAScript 2016

GOALS FOR ECMASCRIPT 2015

Among others: make JavaScript better ...

- for complex applications
- for libraries (including the DOM)
- as a target of code generators

HOW TO UPGRADE A WEB LANGUAGE?

JavaScript engines

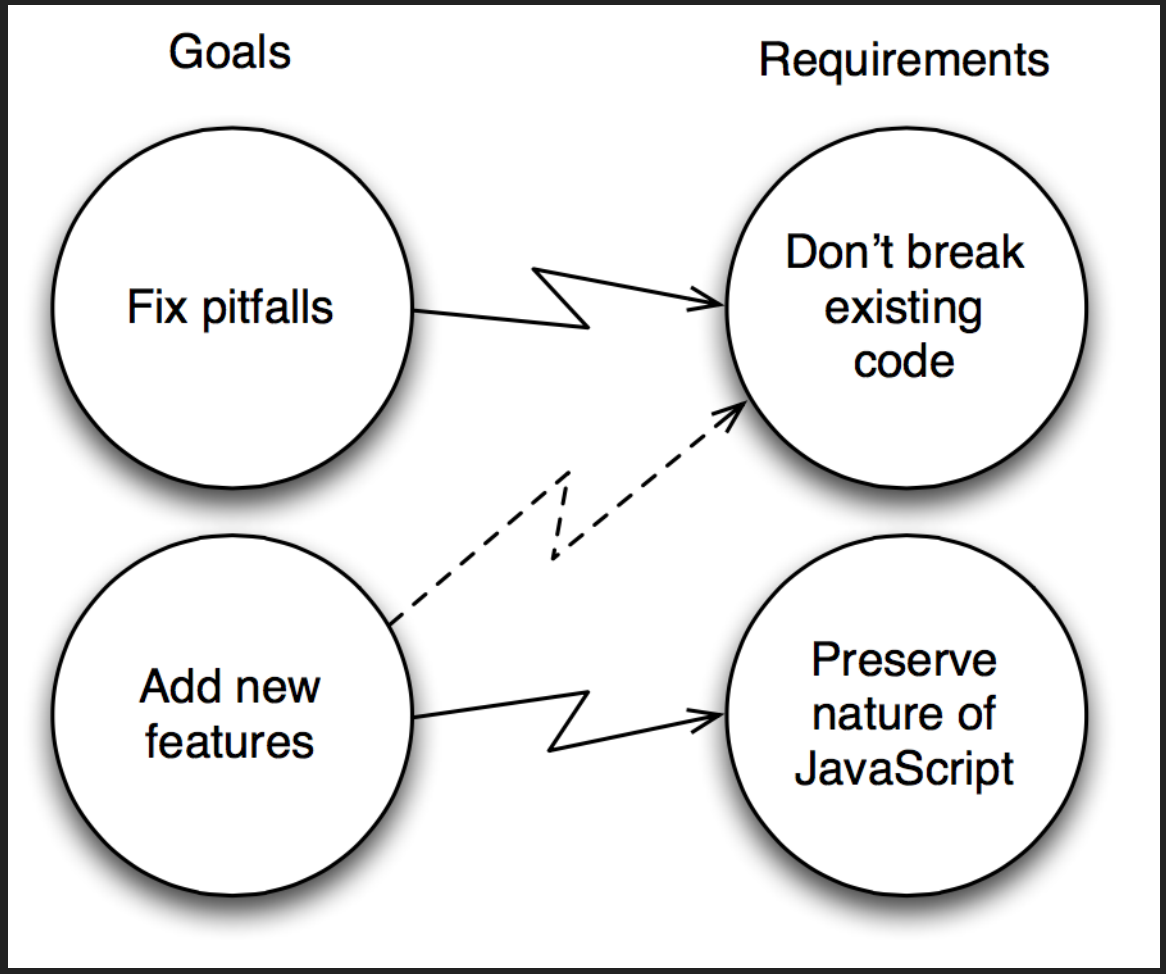
- New versions = forced upgrades
- Must run all existing code
- Consequence: ES6 only adds features

JavaScript code

- Must run on all engines that are in use
- Consequence: wait or compile ECMAScript 6 to ES5

↓ more ↓

GOALS AND REQUIREMENTS



ECMASCRIPT 2015

- Thes slides only cover a small selection of features
- Consult the link list at the end of the slides for more

BASICS

- Better unicode support
- New string methods
- Block bindings
- Destructuring assignment
- Numbers
- Other basics

LET DECLARATIONS

- Block level scope

Example:

```
for (var i=0; i < items.length; i++) {
    process(items[i]);
}
// i is still accessible here and is equal to items.length

for (let m=0; m < items.length; m++) {
    process(items[m]);
}
// m is not accessible here
```

CONSTANT DECLARATIONS

- Declaration of constants
- Value cannot be changed once set
- Every *const* variable must be initialized
- Constants are block-level declarations, similar to let

Example:

```
// Valid constant
const MAX_ITEMS = 30;
```

DESTRUCTURING ASSIGNMENT

```
var options = {
        repeat: true,
        save: false
    };

// later

var { repeat: localRepeat, save: localSave } = options;

console.log(localRepeat);       // true
console.log(localSave);         // false
```

- Object destructuring
- Array and mixed destructuring

FUNCTIONS

- Default parameters
- Rest parameters
- Destructured parameters
- The spread operator
- Arrow functions
- Syntax

DEFAULT PARAMETERS

```
// ES5
function makeRequest(url, timeout, callback) {
    timeout = timeout || 2000;
    callback = callback || function() {};
    // the rest of the function
}

// ES6
function makeRequest(url, timeout = 2000, callback = function() {}) {
    // the rest of the function
}
```

REST PARAMETERS

- Indicated by three dots (...)
- Named parameter becomes an array containing the rest of the parameters
- No other named arguments can follow

Example:

```
function sum(first, ...numbers) {
    let result = first,
        i = 0,
        len = numbers.length;
    while (i < len) {
        result += numbers[i];
        i++;
    }
    return result;
}
```

DESTRUCTURED PARAMETERS

```
// pre ES6
function setCookie(name, value, options) {
    options = options || {};
    var secure = options.secure,
        path = options.path,
        domain = options.domain,
        expires = options.expires;
    // ...
}

// ES6
function setCookie(name, value, { secure, path, domain, expires }) {
    // ...
}
```

THE SPREAD OPERATOR

```
var values = [25, 50, 75, 100];

console.log(Math.max.apply(Math, values));  // pre ES6
console.log(Math.max(...values));           // ES6
```

ARROW FUNCTIONS

- Arrow functions are defined with a new syntax that uses an “arrow” (=>)
- The value of this inside of the function is determined by where the arrow function is defined not where it is used
- Cannot be used as constructors (with new)
- Can’t change *this*
- No arguments object

ARROW FUNCTIONS

```
// ES6
var sum = (num1, num2) => num1 + num2;

// pre ES6
var sum = function(num1, num2) {
    return num1 + num2;
};

// ES6
var doNothing = () => {};

// pre ES6
var doNothing = function() {};
```

ARROW FUNCTIONS

```
let arr = [1, 2, 3];
let squ;

squ = arr.map(function (a) {return a * a});
squ = arr.map(a => a * a);
```

SYMBOLS

A new kind of primitive value – unique IDs:

```
let sym = Symbol();
console.log(typeof sym)  // 'symbol'
```

SYMBOLS: ENUM-STYLE VALUES

```
const COLOR_RED = Symbol();
const COLOR_ORANGE = Symbol();
...

function getComplement(color) {
  switch (color) {
    case COLOR_RED:
      return COLOR_GREEN;
    case COLOR_ORANGE:
      return COLOR_BLUE; ...
    default:
      throw new Exception('Unknown color: '+color);
  }
}
```

OBJECTS

- Object Literal Extensions
- Property value shorthands
- Computed property keys
- Other new features

OBJECTS: METHOD DEFINITIONS

```
let obj = {
  myMethod() {
    ...
  }
};

// instead of:
var obj = {
  myMethod: function () {
    ...
  }
};
```

OTHER OBJECT FEATURES

- Object Categories
- Object.assign() (similar to jQuery extend)
- Duplicate Object Literal Properties
- Changing Prototypes
- Super References
- Reflection Methods

CLASSES

- Class Declarations
- Subclassing

CLASS DECLARATIONS

```
class Point {
    constructor(x, y) {
        this.x = x;
        this.y = y;
    }
    toString() {
        return '('+this.x+', '+this.y+')';
    }
}
```

SUBCLASSING

```
class ColorPoint extends Point {
    constructor(x, y, color) {
        super(x, y);
        this.color = color;
    }
    toString() {
        return this.color+' '+super.toString();
    }
}
```

OTHER CLASS FEATURES

- Class expressions
- Accessor properties
- Static members
- new.target

MODULES

- Basic Exporting and Importing

Other features:

- Exporting and Importing Defaults
- Re-exporting
- Importing Without Bindings

MODULES: BASICS

```
// lib/math.js
let notExported = 'abc';
export function square(x) {
    return x * x;
}
export const MY_CONSTANT = 123;

// main1.js
import {square} from 'lib/math';
console.log(square(3));

// main2.js
import * as math from 'lib/math';
console.log(math.square(3));
```

TEMPLATE STRINGS

- Basic Syntax
- Multiline Strings

Other features:

- Substitutions
- Tagged Templates

TEMPLATE STRINGS

```
// String interpolation
if (x > MAX) {
    throw new Error(
        `At most ${MAX} allowed: ${x}!`
        // 'At most '+MAX+' allowed: '+x+'!'
    );
}

// Multiple lines
let str = `this is
a text with
multiple lines`;
```

MORE

- Collections
  - Maps
  - Sets
- Iterators
- Generators
- Promises

COLLECTIONS: MAPS

```
let map = new Map();
let obj = {};

map.set(obj, 123);
console.log(map.get(obj)); // 123
console.log(map.has(obj)); // true

map.delete(obj);
console.log(map.has(obj)); // false

for (let [key,value] of map) {
    console.log(key, value);
}
```

ECMASCRIPT 6 TODAY

Compile ES6 to ES5

- Babel (babeljs.io)
- Google Traceur (github.com/google/traceur-compiler)
- TypeScript (typescriptlang.org): ECMAScript 6 plus (optional) type annotations

READING MATERIAL, SOURCES

READING MATERIAL

Repetition of Web basics

- Learn to Code HTML & CSS, Shay Howe
  learn.shayhowe.com/html-css/
- Chapter 1 „Basic JavaScript“ of the book „Speaking JavaScript“, Axel Rauschmayer
  speakingjs.com/es5/ch01.html
- A guide to the basics of jQuery
  jqfundamentals.com

READING MATERIAL

- A Complete Guide to Flexbox, CSS-Tricks
  css-tricks.com/snippets/css/a-guide-to-flexbox/
- Learn ES2015, A detailed overview of ECMAScript 6 features
  babeljs.io/docs/learn-es2015/

SOURCES: FLEXBOX

- What The Flexbox?! Video Tutorial by Wes Bos
  flexbox.io/
- A Complete Guide to Flexbox, CSS-Tricks
  css-tricks.com/snippets/css/a-guide-to-flexbox/
- Old Flexbox and New Flexbox, CSS Tricks
  css-tricks.com/old-flexbox-and-new-flexbox/
- Mozilla Developer Network: Using CSS flexible boxes
  developer.mozilla.org/en-US/docs/Web/Guide/CSS/Flexible_boxes
- Autoprefixer on GitHub
  autoprefixer.github.io
- Mozilla Developer Network: CSS Length Units
  developer.mozilla.org/en-US/docs/Web/CSS/length

SOURCES: ECMASCRIPT 6

- ECMAScript 2015 Language Specification
  ecma-international.org/ecma-262/6.0/index.html
- Understanding ECMAScript 6
  https://leanpub.com/understandinges6
- Using ECMAScript 6 today, Rolling Scopes Conference, 2015, Slides:
  speakerdeck.com/rauschma
- Exploring ES6: Upgrade to the next version of JavaScript, Dr. Axel Rauschmayer
  exploringjs.com
- ECMAScript compatibility table
  kangax.github.io/compat-table/es6/
- ECMAScript 6 Features
  github.com/lukehoban/es6features