ABOUT WEB DEVELOPMENT
WHAT IS WEB DEVELOPMENT?

The process of building websites
HOW TO GET STARTED?

Your computer

A clear mind

This image is pure CSS.

Modified from this brilliant codepen by Will Paige
CODE IS NUMBERS, LETTERS AND SYMBOLS

Regardless of what programming language you use, all code can be read in any text editor.
HTML AND CSS ARE THE FOUNDATION OF THE WEB
BASIC TECHNOLOGY STACK

- **HTML**: For structuring and presenting content
- **CSS**: For formatting the look of the web page
- **JS**: For providing dynamic, interactive capabilities

The diagram shows a basic technology stack with HTML at the bottom, CSS in the middle, and JS at the top, all feeding into a database on the right.
TOOLS WE'LL BE USING

- **GitHub** - Git repository hosting service
- **Nitrous** - Online development environment
- **Heroku** - application hosting service

In most circumstances, we do development on our local machines, but given that setting up for development deserves its own workshop, we'll be using online tools instead.
INTERNET BASICS
WHAT IS THE INTERNET?

The entire network of networks that connect all the world's devices to each other.
GLOBAL SUBMARINE CABLE MAP

From TeleGeography
GLOBAL INTERNET EXCHANGE MAP

From TeleGeography
BIG BANG DATA EXHIBITION @ ARTSCIENCE

Big Bang Data takes you on a journey of exploration though the intricate relationship that we share with data, as well as the meaning and implications of datafication for our future.

About the exhibition
ADVANCED RESEARCH PROJECTS AGENCY (ARPA)

- Set up in 1958 for R&D to expand the frontiers of technology and science
- Computers used to be monoliths which couldn't communicate with each other
- Best and brightest minds in the country came up with the concept of computer networking
RESILIENT COMMUNICATIONS

Centralised circuit switching

Distributed packet switching
PROTOCOLS

- Transmission Control Protocol (TCP) handles breaking up data into *packets* to be sent and reassembling them at their destination
- Internet Protocol (IP) handles the formatting and addressing of the data packets
- Every device connected to the internet needs a unique IP address
TCP/IP

Transmission of data makes use of 4 layers

Sending

1. **Application layer**: HTTP, FTP, SMTP etc.
2. **Transport layer**: TCP, UDP
3. **Internet layer**: IPv4, IPv6
4. **Link layer**: MAC, ADP

Receiving

1. **Application layer**: HTTP, FTP, SMTP etc.
2. **Transport layer**: TCP, UDP
3. **Internet layer**: IPv4, IPv6
4. **Link layer**: MAC, ADP
WORLD WIDE WEB

- Invented by Tim Berners-Lee in 1989
- Created the 3 essential technologies that power the World Wide Web:
  1. **Hypertext Transfer Protocol (HTTP)** for retrieving text from other documents via hypertext links
  2. **Uniform Resource Identifier (URI)** which is the unique identifier for every resource on the web
  3. **Hypertext Markup Language (HTML)** for structuring and presenting content on the web
ROBUSTNESS PRINCIPLE

Be conservative in what you do, be liberal in what you accept from others. - Jon Postel, RFC: 761
IF YOU LIKE READING BOOKS...
CLIENTS AND SERVERS

Clients request resources/services from Servers
Connect -> Request -> Response -> Terminate
FROM SERVER TO YOUR BROWSER

Enter a URL in the address bar

https://www.unicorn.com/rainbow.html

URL consists of the:
- protocol,
- server,
- requested file

Protocol  Server  Path to file
Browser sends request to server and server locates the requested file

https://www.unicorn.com/rainbow.html
Server returns the file to the browser which displays it

Rainbows

The colours of the rainbow are generally said to be red, orange, yellow, green, blue, indigo, and violet.
EVERYTHING IS CONNECTED BY LINKS

A link on a web page is a pre-entered URL. Clicking the link sends a request to the server.

Rainbows

The colours of the rainbow are generally said to be red, orange, yellow, green, blue, indigo, and violet.

If you've never seen a rainbow before, you're missing out. Check out our gallery of rainbows.
The server sends the requested file back to the browser, which replaces the current page with the new file.
ABSOLUTE VS. RELATIVE LINKS

Absolute paths ask for a file from a **specific** location, which includes the protocol and server.

```html
<a href="http://www.unicorn.com/gallery.html">Gallery</a>
```

Relative paths ask for a file without specifying a server.

```html
<a href="gallery.html">Gallery</a>
```

The browser will hence assume you're referring to the same server as the page you're on.
HANDS-ON PRACTICE
GUESS THE NUMBER

1. Fork the repository on Github
2. Follow the instructions here
3. .erb files behave in exactly the same way as HTML
4. Gemfile handles ruby gem dependencies
HYPERTEXT MARK-UP LANGUAGE (HTML)
HYPERTEXT MARK-UP LANGUAGE (HTML)

- **Structures** the document and tells browsers what a certain element's function is
- Content is "marked-up" using tags
- Tags usually (but not always) come in pairs,

```
<p>This is an example of a paragraph element</p>
```

- The opening tag, closing tag and everything in between is a **HTML element**
STRUCTURE OF HTML DOCUMENT

```html
<!DOCTYPE html>
<html>
<head>
  <title>Example page</title>
</head>
<body>
  <h1>Hello world</h1>
</body>
</html>
```
DOCUMENT TYPE ELEMENT

<!DOCTYPE html>

- Appears just above the <html> tag
- Tells the browser to render the HTML in **standards** mode
- Let's validation software know which version of HTML to validate against
- Advised to use the **HTML5 doctype**
<html> ELEMENT

- Represents the root of an HTML document
- Encouraged to specify a language attribute
- Language attribute aids speech synthesis (screen readers), translation tools and other language-related functionality
<head> ELEMENT

- Contains instructions for the browser and metadata for the website
- Title and description are what shows up on search engine results
- Stylesheets are also declared here
<body> ELEMENT

- Represents the **main content** of the document
- Should only be one <body> element on a web page
FORMATTING YOUR WEB PAGE

- `<address>`
- `<article>`
- `<footer>`
- `<header>`
- `<h1>`
- `<h2>`
- `<h3>`
- `<h4>`
- `<h5>`
- `<h6>`
- `<hgroup>`
- `<nav>`
- `<section>`
- `<dd>`
- `<div>`
- `<dl>`
- `<dt>`
- `<figcaption>`
- `<figure>`
- `<hr>`
- `<li>`
- `<main>`
- `<ol>`
- `<p>`
- `<pre>`
- `<ul>`
- `<caption>`
- `<col>`
- `<colgroup>`
- `<table>`
- `<tbody>`
- `<td>`
- `<tfoot>`
- `<th>`
- `<thead>`
- `<tr>`
- `<button>`
- `<datalist>`
- `<fieldset>`
- `<form>`
- `<input>`
- `<keygen>`
- `<label>`
- `<legend>`
- `<meter>`
- `<optgroup>`
- `<option>`
- `<output>`
- `<progress>`
- `<select>`
- `<details>`
- `<dialog>`
- `<menu>`
- `<menuitem>`
- `<summary>`
- `<abbr>`
- `<b>`
- `<bdi>`
- `<bdo>`
- `<br>`
- `<cite>`
- `<code>`
- `<data>`
- `<dfn>`
- `<em>`
- `<i>`
- `<kbd>`
- `<mark>`
- `<q>`
- `<rp>`
- `<rt>`
- `<rtc>`
- `<ruby>`
- `<s>`
- `<samp>`
- `<span>`
- `<strong>`
- `<sub>`
- `<sup>`
- `<time>`
- `<u>`
- `<var>`
- `<wbr>`
- `<area>`
- `<audio>`
- `<map>`
- `<track>`
- `<video>`
- `<embed>`
- `<object>`
- `<param>`
- `<source>`
- `<canvas>`
- `<noscript>`
- `<script>`
- `<del>`
- `<ins>`
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="utf-8">
    <title>title</title>
    <meta name="description" content="A short description of your website">
    <meta name="author" content="Your name">
    <link rel="stylesheet" href="styles.css">
  </head>
  <body>
    <!-- page content -->
    <script src="script.js"></script>
  </body>
</html>
TOP TO BOTTOM, LEFT TO RIGHT

- Web pages are made up of rectangular boxes
- These boxes are placed from top to bottom, left to right

http://www.unicorn.com
BLOCK-LEVEL ELEMENTS

Block-level elements take up the entire width of the container.

**RAINBOWS**

A rainbow is a meteorological phenomenon that is caused by reflection, refraction and dispersion of light in water droplets resulting in a spectrum of light appearing in the sky.

**COLOURS**

- Red
- Orange
- Yellow
- Green
- Blue
- Indigo
- Violet

The block-level tags shown in this example are h1, h2, p, ul and li.

You can refer to the full list of block-level elements here.
If an element is NOT block-level, it is inline.

Accordingly, the Munsell colour system (a 20th-century system for numerically describing colours, based on equal steps for human visual perception) distinguishes 100 hues.

Commonly used inline-level tags include a, input, label, img and so on.

Full list of inline-level elements available here.
CASCADING STYLE SHEETS (CSS)
CASCADING STYLE SHEETS (CSS)

- Tells the browser how to **display** a certain element
- Follows the general ruleset:
  1. Select the HTML element to be styled
  2. Specify the properties of the element to be styled
  3. Give the values we want each property to have
STRUCTURE OF A CSS RULE

```
selector {
  property1: value;
  property2: value;
  property3: value;
}
```

- The **selector** identifies which HTML elements the rule will be applied to
- The **curly braces** contain the property-value pairs, separated with semi-colons
- The **properties** define the style of the selected element
- The **values** are dependent on the property, and indicate the value of the properties to be set
TYPES OF CSS SELECTORS

- **Element**: matches all the elements of that name on the page

  ```
  p {} 
  ```

- **Class**: matches all the elements with the specified class attribute, e.g. `<div class="example">

  ```
  .example {} 
  ```

- **ID**: matches the element with the specified id attribute, e.g. `<div id="example">

  ```
  #example {} 
  ```
DESCENDENT SELECTORS

Used to select tags that are children of other tags

- 4 large eggs
- 1/4 cup milk
- 2 tsp. butter

1. BEAT eggs, milk, salt and pepper in medium bowl until blended.
2. HEAT butter in large nonstick skillet over medium heat until hot. POUR IN egg mixture. As eggs begin to set, GENTLY PULL the eggs across the pan with a spatula, forming large soft curds.
3. CONTINUE cooking – pulling, lifting and folding eggs – until thickened and no visible liquid egg remains. Do not stir constantly. REMOVE from heat. SERVE immediately.

Selector list is read from right-to-left, with the left-most being the parent.
PSEUDO-SELECTORS

Applies to selectors when certain conditions occur

```css
a {
    /* removes underlines from all text links */
    text-decoration: none;
}

a:hover {
    /* adds an underline and makes the font green when hovered */
    text-decoration: underline;
    color: green;
}
```

- Link 1
- Link 2
- Link 3

There are many other pseudo-selectors you can use as well. The full list is available here.
THE BOX MODEL

The model is made up of four boxes, from inside to outside:

- Content
- Padding
- Border
- Margin

*The box model, visualised*
WHEN TO USE MARGIN

Margin controls the space between elements.

```
h2 {
    margin: 5px 0 5px 0;
}
```

**RAINBOWS**

A rainbow is a meteorological phenomenon that is caused by reflection, refraction and dispersion of light.

**COLOURS**

- Red
- Orange
- Yellow

```
h2 {
    margin: 20px 0 20px 0;
}
```

**RAINBOWS**

A rainbow is a meteorological phenomenon that is caused by reflection, refraction and dispersion of light.

**COLOURS**

- Red
- Orange
- Yellow
WHEN TO USE PADDING

Padding controls the size of the box without adjusting the size of the content within it.

RAINBOWS
A rainbow is a meteorological phenomenon that is caused by reflection, refraction and dispersion of light.

COLOURS
- Red
- Orange
- Yellow

RAINBOWS
A rainbow is a meteorological phenomenon that is caused by reflection, refraction and dispersion of light.

COLOURS
- Red
- Orange
- Yellow
WHERE TO WRITE YOUR STYLES

Browsers will pick up your CSS if they are between a <style> tags which is a child of the <head> tag.

```html
<!DOCTYPE html>
<html lang="en">
<head>
  <style type="text/css">
    h1 {
      font-size: 2rem;
    }
    a {
      text-decoration: none;
    }
    a:hover {
      text-decoration: underline;
      color: darkred;
    }
  </style>
</head>
</html>
```
USE A SEPARATE CSS FILE

As your site grows, you'll have many more styles, so it's better to move them all into a separate file.

```html
<!DOCTYPE html>
<html lang="en">
  <head>
    <link type="text/css" rel="stylesheet" href="main.css">
  </head>
</html>
```

In this example, we are using `main.css` but you can name the file anything. This file will hold all your CSS and be linked in the `<head>` of every page.
CSS SPECIFICITY

- Inline styles: $0-\infty$
- IDs: $0-\infty$
- Classes, attributes and pseudo-classes: $0-\infty$
- Elements and pseudo-elements: $0-\infty$

Example CSS:

- `ul { /* CSS properties */ }` (0, 0, 0, 1)
- `.class-1 .class-2 p { /* CSS properties */ }` (0, 0, 2, 1)
- `#id-1 .class-3 div { /* CSS properties */ }` (0, 1, 1, 1)
GENERAL GUIDELINES FOR WRITING CSS

- Declare your styles from lowest specificity then move up
- Keep your specificity as low as possible
- Name your classes sensibly
- Never style IDs
- Don't write inline styles
USING IMAGES
TYPES OF IMAGES

- Content images
  - contain relevant information
  - help the user understand the content

- Background images
  - decorative in nature
  - contribute to the overall look and feel of the site
CONTENT IMAGES

Content images are created using the `<img>` tag

```
<img src="path/to/image" alt="Description of the image">
```

- Doesn't need a closing tag.
- Requires a `<src>` attribute to tell the browser where to find the image file
- Requires an `<alt>` attribute which describes the image or its purpose
BACKGROUND IMAGES

Background images are set via CSS

There are several properties related to backgrounds:

```css
background-image: none
background-position: 0% 0%
background-size: auto auto
background-repeat: repeat
background-origin: padding-box
background-clip: border-box
background-attachment: scroll
background-color: transparent
```

background is one of many CSS properties that can be written in shorthand.
SETTING BACKGROUND IMAGES

background-image can use relative or absolute paths

It's advisable to set a background-color as a fallback for the background image.
BACKGROUND-POSITION

This is used to set the position of the image

```
div {
    background-color: #170104;
    background-image: url('img/back');
    background-position: center center;
}
```

```
div {
    background-color: #170104;
    background-image: url('img/back');
    background-position: left bottom;
}
```

Position has been set to center

Position has been set to left bottom
BACKGROUND-REPEAT

Used for tiling patterned backgrounds

Takes the following values:

- repeat-x: tiles the image horizontally
- repeat-y: tiles the image vertically
- no-repeat: don't tile or repeat anything

```css
div {
    background-color: #EBEBEB;
    background-image: url('img/sativa.jpg');
    background-repeat: repeat;
}
```
WEB TYPOGRAPHY
TYPOGRAPHY TERMINOLOGY

Typography is, quite simply, the art and technique of arranging type.
GENERAL GUIDELINES

- Default font-size is 16px. Don't go smaller than that for body copy.
- Adjust the measure to around 45-75 characters per line.
- Have a line-height of around 140%.
- Ensure sufficient contrast between the text and the background.
- Create a visual hierarchy, through size or text styles.
WEB FONTS

Don't go crazy with the number of fonts used. Usually 2 is enough.

Serve the font files yourself using @font-face or use a hosted service, like Google Fonts, using @import.

```html
@import url(https://fonts.googleapis.com/css?family=Fjalla+One|Average);

body {
    font-family: "Average", serif;
}

h1 {
    font-family: "Fjalla One", sans-serif;
}
```
BROWSER DEVELOPER TOOLS
WHAT ARE DEVTOOLS?

Every modern browser has a powerful suite of developer tools.

- Inspect currently loaded HTML, CSS and Javascript
- Check which assets were loaded
- See how long it took for your assets to load
- Provides details for each HTTP request/response
- And a lot more...
HOW TO USE DEVTOOLS?

- Keyboard shortcut
  - Windows: Ctrl + Shift + I
  - Mac: Option + Command + I

- Menu bar
  - Firefox: Tools > Web Developer > Toggle Tools
  - Chrome: View > Developer > Developer Tools
  - Safari: Develop > Show Web Inspector
  - Opera: Developer > Web Inspector

- Context menu
  - Right-click on an element in the browser and select Inspect
RESPONSIVE WEB DESIGN
THE WEB IS FLUID

CONTENT IS LIKE WATER

"You put water into a cup it becomes the cup. You put water into a bottle it becomes the bottle. You put it in a teapot, it becomes the teapot."

Josh Clark (originally Bruce Lee) - Seven deadly mobile myths
Illustration by Stephanie Walter

Image by Stephanie Walter
BROWSERS ARE RESPONSIVE BY DEFAULT

Our problems with websites are self-created

Satirical but true example

"The control which designers know in the print medium, and often desire in the web medium, is simply a function of the limitation of the printed page."
- John Allsop, A Dao of Web Design (2000)
MEDIA QUERIES

Tell the browser to display the site’s content in a particular way when certain conditions are true.

Basic syntax as follows:

```css
@media <media-type> (<media-feature>);  
```

- **media-type**: e.g. screen, print
- **media-feature**: e.g. width, height
MOBILE-FIRST MEDIA QUERIES

```css
.o-flex3__item {
  flex: 0 0 100%
}

@media all and (min-width: 30em) and (max-width: 47.9375em) {
  .o-flex3__item {
    flex: 0 0 49.15254%
  }
}

@media all and (min-width: 48em) {
  .o-flex3__item {
    flex: 0 0 32.20339%
  }
}
```

- Default styles are for small screen sizes
- Add styles as the screen size gets bigger
- Can chain additional media features
WEB ACCESSIBILITY
SEMANTICS AND ACCESSIBILITY

- To make the web easier to use and access, and available to everyone
- Encompasses all disabilities, including visual, auditory, physical, speech, cognitive and neurological disabilities
- Benefits people *without* disabilities as well
- Accessible websites benefit from search engine optimisation (SEO)
BASIC ACCESSIBILITY CHECKLIST
(1/2)

- **Page title**: To adequately and briefly describe the content of the page
- **Image text alternatives**: To make visual information accessible
- **Headings**: To provide meaningful hierarchy for facilitation of navigation
- **Contrast ratio**: To have sufficient luminance contrast ratio, for people with different requirements
- **Resize text**: To ensure visibility and usability as text size increases
BASIC ACCESSIBILITY CHECKLIST
(2/2)

• **Keyboard access & visual focus**: To provide full functionality through a keyboard, and visible focus with logical order

• **Forms, labels & errors**: To have proper labels, keyboard access, clear instructions, and effective error handling

• **Multimedia alternatives**: To have alternative formats for audio and visual impaired

Visit [Web Accessibility Initiative (WAI)](https://www.w3.org/WAI) to understand more about this important aspect of the web
DEPLOYING YOUR WEBSITE
WEB HOSTING

Renting server space for your website

Shared hosting, Dedicated hosting, VPS (Virtual Private Server)

Managed vs Unmanaged
DOMAIN NAME REGISTRATION

Domain names map to your server's IP address
Provides a human-readable name for your site
Top-level domains, e.g. .com, .io, .org, .edu
Register domain names with a domain name registrar
GETTING YOUR SITE ONLINE

Upload the files onto your server, Git or FTP

Servers usually run on Linux

Type of hosting determines level of control

Must be running a HTTP server, common ones are Apache or Nginx
BASIC GIT TERMINOLOGY

Git is a **version control system**

**Repository**: A place that stores all your project files

**Commit**: Used to take a "snapshot" of the state of your project

**Branch**: Used to develop features without disrupting the main code base
COMMIT YOUR WORK

Make sure you're in your project directory, otherwise the following commands will not work.

Stage the files you've been working on

```
git add .
```

Write a sensible commit message

```
git commit -m "Add styling to Guess the Number app"
```

Push your changes to the remote repository

```
git push origin master
```
HEROKU

A platform that allows developers to easily host and run their applications

Deployment instructions
RESOURCES
TO FIND OUT MORE...

- Dash (online course)
- Codeacademy (online course)
- Bento (online resources)
- Mozilla Developer Network (MDN) (website)
- HTML & CSS: Design and Build Web Sites by Jon Duckett (book)
- Designing with Web Standards by Jeffrey Zeldman (book)
THE END

https://www.chenhuijing.com

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