TypeScript Cheat Sheet

Setup

Install TS globally on your machine

```
$ npm i -g typescript
```

Check version

```
$ tsc -v
```

Create the tsconfig.json file

```
$ tsc --init
```

Set the root (to compile TS files from) and output (for the compiled JS files) directories in tsconfig.json

```
"rootDir": "./src",
"outDir": "./public",
```

Compiling

Compile a specified TS file into a JS file of the same name, into the same directory (i.e. index.ts to index.js).

```
$ tsc index.ts
```

Tell tsc to compile specified file whenever a change is saved by adding the watch flag (-w)

```
$ tsc index.ts -w
```

Compile specified file into specified output file

```
$ tsc index.ts --outfile out/script.js
```

If no file is specified, tsc will compile all TS files in the "rootDir" and output in the "outDir". Add -w to watch for changes.

```
$ tsc -w
```

Strict Mode

In tsconfig.json, it is recommended to set strict to true. One helpful feature of strict mode is No Implicit Any:

```
// Error: Parameter 'a' implicitly has an 'any' type.
function logName(a) {
  console.log(a.name);
}
```

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Primitive Types

There are 7 primitive types in JS: string, number, bigInt, boolean, undefined, null, symbol.

Explicit type annotation

```
let firstname: string = 'Danny'
```

If we assign a value (as above), we don't need to state the type - TS will infer it ("implicit type annotation")

```
let firstname = 'Danny'
```

Union Types

A variable that can be assigned more than one type

```
let age: number | string;
age = 26;
age = "26";
```

Dynamic Types

The any type basically reverts TS back to JS.

```
let age: any = 100;
age = true;
```

Literal Types

We can refer to specific strings & numbers in type positions

```
let direction: 'UP' | 'DOWN';
direction = 'UP';
```

Objects

Objects in TS must have all the correct properties & value types

```
let person: {
 name: string;
 isProgrammer: boolean;
};

person = {
 name: 'Danny',
 isProgrammer: true,
};

person.age = 26; // Error - no age prop on person object

person.isProgrammer = 'yes'; // Error - should be boolean
```

Arrays

We can define what kind of data an array can contain

```
let ids: number[] = [];
ids.push(1);
ids.push("2"); // Error
```

Use a union type for arrays with multiple types

```
let options: (string | number)[];
options = [10, 'UP'];
```

If a value is assigned, TS will infer the types in the array.

```
let person = ['Delia', 48];
person[0] = true; // Error - only strings or numbers allowed
```

Tuples

A tuple is a special type of array with fixed size & known data types at each index. They're stricter than regular arrays.

```
let options: [string, number];
options = ['UP', 10];
```

Functions

We can define the types of the arguments, and the return type. Below, : string could be omitted because TS would infer the return type.

```
function circle(diam: number): string {
 return 'Circumf = ' + Math.PI * diam;
}
```

The same function as an ES6 arrow

```
const circle = (diam: number): string => 'Circumf = ' + Math.PI * diam;
```

If we want to declare a function, but not define it, use a function signature

```
let sayHi: (name: string) => void;

sayHi = (name: string) =>
console.log('Hi ' + name);

sayHi('Danny'); // Hi Danny
```

Type Aliases

Allow you to create a new name for an existing type. They can help to reduce code duplication. They're similar to interfaces, but can also describe primitive types.

```
type StringOrNum = string | number;
let id: StringOrNum = 24;
```

Interfaces

Interfaces are used to describe objects. Interfaces can always be reopened & extended, unlike Type Aliases. Notice that `name` is `readonly`

```
interface Person {
 name: string;
 isProgrammer: boolean;
}

let p1: Person = {
 name: 'Delia',
 isProgrammer: false,
};

p1.name = 'Del'; // Error - read only
```

Two ways to describe a function in an interface

```
interface Speech {
 sayHi(name: string): string;
 sayBye: (name: string) => string;
}

let speech: Speech = {
 sayHi: function (name: string) {
  return 'Hi ' + name;
 },
 sayBye: (name: string) => 'Bye ' + name,
};
```

Extending an interface

```
interface Animal {
 name: string;
}

interface Dog extends Animal {
 breed: string;
}
```

The DOM & Type Casting

TS doesn't have access to the DOM, so use the non-null operator, !, to tell TS the expression isn't null or undefined

```
const link = document.querySelector('a')!;
```

If an element is selected by id or class, we need to tell TS what type of element it is via Type Casting

```
const form = document.getElementById('signup-form') as HTMLFormElement;
```

Generics

Generics allow for type safety in components where the arguments & return types are unkown ahead of time.

```
interface HasLength {
 length: number;
}

// logLength accepts all types with a length property
const logLength = <T extends HasLength>(a: T) => {
 console.log(a.length);
};

// TS "captures" the type implicitly
logLength('Hello'); // 5

// Can also explicitly pass the type to T
logLength<number[]>([1, 2, 3]); // 3
```

Declare a type, T, which can change in your interface.

```
interface Dog<T> {
 breed: string;
 treats: T;
}

// We have to pass in a type argument
let labrador: Dog<string> = {
 breed: 'labrador',
 treats: 'chew sticks, tripe',
};

let scottieDog: Dog<string[]> = {
 breed: 'scottish terrier',
 treats: ['turkey', 'haggis'],
};
```

Enums

A set of related values, as a set of descriptive constants

```
enum ResourceType {
 BOOK,
 FILE,
 FILM,
}
ResourceType.BOOK; // 0
ResourceType.FILE; // 1
```

Narrowing

Occurs when a variable moves from a less precise type to a more precise type

```
let age = getUserAge();
age // string | number

if (typeof age === 'string') {
 age; // string
}
```