# TypeScript Interview Questions: Intermediate Level Part 2

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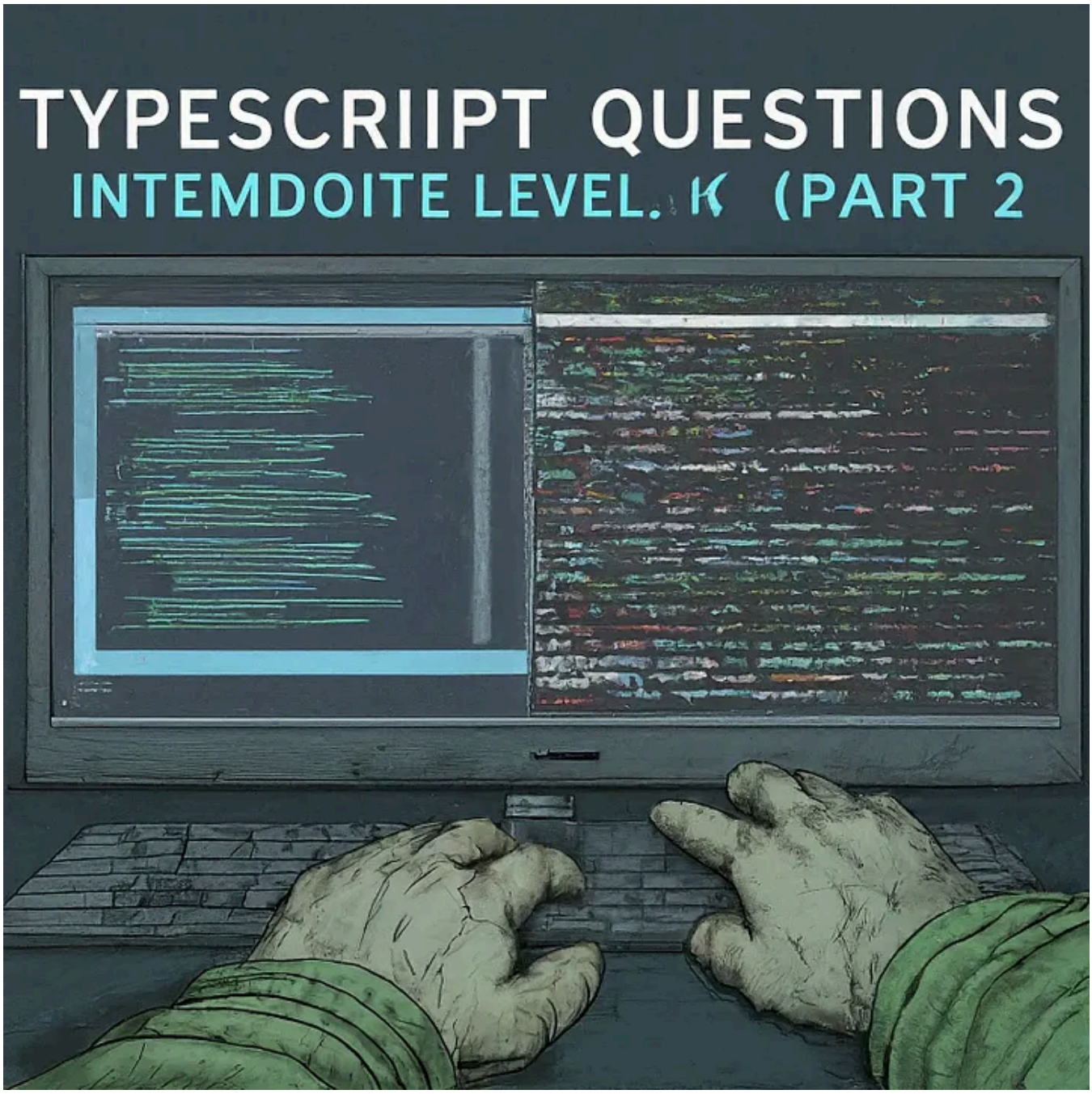

As you advance in your understanding of TypeScript, you'll encounter more complex features that can greatly enhance the robustness and maintainability of your code. In this article, we'll delve into intermediate-level TypeScript interview questions, complete with answers and examples, to help you prepare for more advanced discussions and practical applications of the language.

### 1. What are TypeScript decorators and how are they used?

Answer: Decorators are a special kind of declaration that can be attached to a class, method, accessor, property, or parameter. They are used to modify the behavior of the item they are attached to. Decorators are experimental features and require enabling the `experimentalDecorators` option in `tsconfig.json`.

### Example:

```
function log(target: any, key: string) {
  let value = target[key];

  const getter = () => {
    console.log(`Getting value: ${value}`);
    return value;
  };

  const setter = (newValue: any) => {
    console.log(`Setting value: ${newValue}`);
    value = newValue;
  };

  Object.defineProperty(target, key, {
    get: getter,
    set: setter,
    enumerable: true,
    configurable: true
  });
}

class Person {
  @log
  public name: string;

  constructor(name: string) {
    this.name = name;
  }
}

let person = new Person('John Doe');
```

```
person.name = 'Jane Doe'; // Setting value: Jane Doe
console.log(person.name); // Getting value: Jane Doe
```

### 2. How does TypeScript handle null and undefined?

Answer: TypeScript has `null` and `undefined` types. By default, `null` and `undefined` are subtypes of all other types, meaning you can assign `null` or `undefined` to any type. However, with the `strictNullChecks` flag enabled in `tsconfig.json`, `null` and `undefined` are only assignable to `any`, `unknown`, `void`, or their respective types.

**Example:**

```
let name: string | null = 'Alice';
name = null; // Allowed when strictNullChecks is false

function greet(name: string | null) {
  if (name === null) {
    console.log('Hello, stranger!');
  } else {
    console.log(`Hello, ${name}!`);
  }
}

greet(null); // Hello, stranger!
greet('Bob'); // Hello, Bob!
```

### 3. What is the difference between `interface` and `type` in TypeScript?

Answer: Both `interface` and `type` can be used to define the shape of an object. However, there are some differences:

- `interface` can be merged (declaration merging), but `type` cannot.
- `type` can define a union or intersection type, but `interface` cannot.
- `interface` is generally preferred for defining object shapes, while `type` is used for more complex type definitions.

**Example:**

```
// Interface
interface Person {
  name: string;
  age: number;
}

// Type alias
type PersonType = {
  name: string;
  age: number;
};

// Using type for union
type StringOrNumber = string | number;

// Using type for intersection
type Name = { name: string };
type Age = { age: number };
type PersonIntersection = Name & Age;
```

### 4. How do you use generics in TypeScript?

Answer: Generics allow you to create reusable components that can work with a variety of types. You can define generics with a type parameter that can be used within the function, class, or interface.

### Example:

```
function identity<T>(arg: T): T {
  return arg;
}

let output1 = identity<string>('Hello');
let output2 = identity<number>(123);

console.log(output1); // Hello
console.log(output2); // 123

class GenericNumber<T> {
  zeroValue: T;
  add: (x: T, y: T) => T;
}

let myGenericNumber = new GenericNumber<number>();
```

```
myGenericNumber.zeroValue = 0;
myGenericNumber.add = (x, y) => x + y;
```

### 5. What are mapped types in TypeScript?

Answer: Mapped types allow you to create new types by transforming properties of an existing type. They are often used with the `keyof` operator to iterate over the keys of a type.

### Example:

```
type Readonly<T> = {
  readonly [P in keyof T]: T[P];
};

interface Person {
  name: string;
  age: number;
}

type ReadonlyPerson = Readonly<Person>;

let person: ReadonlyPerson = {
  name: 'Alice',
  age: 30
};

// person.name = 'Bob'; // Error: Cannot assign to 'name' because it is a read-only
```

### 6. How do you create and use namespaces in TypeScript?

Answer: Namespaces are a way to organize code into logical groups and prevent name collisions. They are defined using the `namespace` keyword and can be nested.

### Example:

```
namespace Validation {
  export interface StringValidator {
    isAcceptable(s: string): boolean;
  }

  export class LettersOnlyValidator implements StringValidator {
```

```
    isAcceptable(s: string): boolean {
      return /^[A-Za-z]+$/.test(s);
    }
  }

  export class ZipCodeValidator implements StringValidator {
    isAcceptable(s: string): boolean {
      return /^\d{5}$/.test(s);
    }
  }
}

let validators: { [s: string]: Validation.StringValidator } = {};
validators['Letters only'] = new Validation.LettersOnlyValidator();
validators['ZIP code'] = new Validation.ZipCodeValidator();

for (let s in validators) {
  console.log(`"${s}" - ${validators[s].isAcceptable('12345')}`);
}
```

## 7. What are modules in TypeScript and how do they work?

Answer: Modules in TypeScript are files that can export and import other modules using `export` and `import` keywords. Modules help in organizing code and managing dependencies.

## Example:

```
// mathUtils.ts
export function add(a: number, b: number): number {
  return a + b;
}

export function subtract(a: number, b: number): number {
  return a - b;
}

// main.ts
import { add, subtract } from './mathUtils';

console.log(add(5, 3)); // 8
console.log(subtract(5, 3)); // 2
```

## 8. How does TypeScript’s type inference work?

Answer: TypeScript uses type inference to automatically determine the type of a variable when there is no explicit type annotation. This can occur during variable initialization, function return types, and more.

### Example:

```
let x = 3; // TypeScript infers the type as number
x = 'hello'; // Error: Type 'string' is not assignable to type 'number'

function multiply(a: number, b: number) {
  return a * b; // TypeScript infers the return type as number
}
```

## 9. What is a type alias in TypeScript?

Answer: A type alias is a name for any type. It can be used to simplify complex type definitions and make code more readable.

### Example:

```
type StringOrNumber = string | number;

let value: StringOrNumber;
value = 'Hello';
value = 123;

type Point = {
  x: number;
  y: number;
};

function printPoint(point: Point) {
  console.log(`x: ${point.x}, y: ${point.y}`);
}
```

## 10. How do you define and use union and intersection types in TypeScript?

Answer:

- Union types allow a variable to hold one of several types.

- Intersection types combine multiple types into one.

### Example:

```
// Union Type
type StringOrNumber = string | number;

let value: StringOrNumber;
value = 'Hello';
value = 123;

// Intersection Type
type Person = { name: string };
type Employee = { id: number };
type EmployeeDetails = Person & Employee;

let employee: EmployeeDetails = { name: 'Alice', id: 1 };
```

## 11. What are the advantages of using `readonly` in TypeScript?

Answer: The `readonly` modifier makes properties immutable, preventing them from being reassigned after initialization. This helps maintain the integrity of data and reduces bugs caused by unintended mutations.

### Example:

```
interface Point {
  readonly x: number;
  readonly y: number;
}

let point: Point = { x: 10, y: 20 };
// point.x = 5; // Error: Cannot assign to 'x' because it is a read-only property.
```

## 12. How do you work with advanced types like `Partial`, `Pick`, and `Omit` in TypeScript?

Answer:

- `Partial<T>` makes all properties in `T` optional.

- `Pick<T, K>` creates a new type by picking a set of properties `K` from `T`.
- `Omit<T, K>` creates a new type by omitting a set of properties `K` from `T`.

**Example:**

```
interface Person {
  name: string;
  age: number;
  address: string;
}

// Partial
type PartialPerson = Partial<Person>;

// Pick
type NameAndAge = Pick<Person, 'name' | 'age'>;

// Omit
type AddressOnly = Omit<Person, 'name' | 'age'>;

let partialPerson: PartialPerson = { name: 'Alice' };
let nameAndAge: NameAndAge = { name: 'Bob', age: 30 };
let addressOnly: AddressOnly = { address: '123 Main St' };
```

### 13. What are conditional types in TypeScript?

Answer: Conditional types enable type relationships to be expressed using conditional logic. The type `T extends U ? X : Y` means if `T` is assignable to `U`, then the type is `X`, otherwise it's `Y`.

**Example:**

```
type IsString<T> = T extends string ? 'Yes' : 'No';

type A = IsString<string>; // 'Yes'
type B = IsString<number>; // 'No'
```

### 14. How do you handle asynchronous operations in TypeScript?

Answer: TypeScript handles asynchronous operations using promises and the `async` / `await` syntax, similar to JavaScript. TypeScript provides type definitions for

promises and async functions.

### Example:

```
function fetchData(): Promise<string> {
  return new Promise((resolve) => {
    setTimeout(() => resolve('Data received'), 1000);
  });
}

async function getData() {
  const data = await fetchData();
  console.log(data);
}

getData(); // Data received
```

## 15. How do you define and use utility types in TypeScript?

Answer: TypeScript provides several utility types to facilitate common type transformations:

- `Partial<T>`
- `Required<T>`
- `Readonly<T>`
- `Record<K, T>`
- `Pick<T, K>`
- `Omit<T, K>`

### Example:

```
interface Todo {
  title: string;
  description: string;
}

// Partial
type PartialTodo = Partial<Todo>;
```

```
// Required
type RequiredTodo = Required<Todo>;

// Readonly
type ReadonlyTodo = Readonly<Todo>;

// Record
type StringRecord = Record<string, number>;

let partialTodo: PartialTodo = { title: 'Learn TypeScript' };
let requiredTodo: RequiredTodo = { title: 'Learn TypeScript', description: 'Underst
let readonlyTodo: ReadonlyTodo = { title: 'Learn TypeScript', description: 'Underst
// readonlyTodo.title = 'New Title'; // Error: Cannot assign to 'title' because it
let stringRecord: StringRecord = { key1: 1, key2: 2 };
```

## Conclusion

By mastering these intermediate-level concepts in TypeScript, you can write more efficient, type-safe, and maintainable code. These skills are crucial for building robust applications and will be valuable in your career as a developer. Stay tuned for the next part of this series where we will delve into advanced TypeScript interview questions.



For further reading, don't miss the other parts of this series:

- **TypeScript Interview Questions: From Beginners to Advanced Part 1**
- **TypeScript Interview Questions: Advanced Level Part 3**