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TS Challenge - 1

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Problem 1

Let's define a `MyReadOnly` type!

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

```
const todo: MyReadOnly<Todo> = {  
  title: "Hey",  
  description: "foobar"  
};
```

```
todo.title = "Hello"; // Error: cannot reassign a readonly property  
todo.description = "barFoo"; // Error: cannot reassign a readonly property
```

```
const todo: MyReadOnly<Todo> = {  
  title: "Hey",  
  description: "foobar"  
};
```

```
type MyReadOnly<Todo> = {  
  readonly title: "Hey",  
  readonly description: "foobar"  
};
```

Solution

```
type MyReadOnly<T> = {  
  readonly [K in keyof T]: T[K]  
};
```

Prerequisites

1. Generics
2. keyof operator
3. Mapped Types
4. index access types

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Generics - Basic

A way to create reusable code that works with multiple types

```
type Foo<T> = {  
    bar: T  
};  
  
type FooString = Foo<string>;  
type FooNumber = Foo<number>;
```


Generics - Extends

Extends allows you to limit a generic type to a specific type

```
type Foo<T extends string> = {  
    bar: T  
};  
  
type FooString = Foo<string>; // OK  
type FooNumber = Foo<number>; // NG
```

Prerequisites

1. Generics

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3. Mapped Types

4. index access types

keyof

A method to get object keys as a union type

```
interface Todo {  
  title: string;  
  description: string;  
}  
  
type TodoKeys = keyof Todo; // "title" | "description"
```

Prerequisites

1. Generics
2. keyof operator
- 3. Mapped Types**
4. index access types

Mapped Types

Can create a new object type
based on a union of keys

```
type TodoKeys = "title" | "description";

type Todo = {
  [K in TodoKeys]: string
};

// It is same as follows;
type Todo = {
  title: string;
  description: string;
};
```

Mapped Types

with keyof operator

```
interface Todo {  
  title: string;  
  description: string;  
}  
  
type Todo1 = {  
  [K in keyof Todo]: string;  
};
```

Prerequisites

1. Generics
2. keyof operator
3. Mapped Types
- 4. index access types**

index access types

Can get the type of a specific key in object

```
interface Todo = {  
  title: string;  
  description: string;  
}  
  
type Title = Todo["title"]; // string
```


Let's define a `MyReadOnly` type!

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  description: string;  
}
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  title: "Hey",  
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```

```
todo.title = "Hello"; // Error: cannot reassign a readonly property  
todo.description = "barFoo"; // Error: cannot reassign a readonly property
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Solution

```
type MyReadOnly<T> = {  
  readonly [K in keyof T]: T[K]  
};
```

Related Problems - ①

Implement a generic `MyReadOnly2<T, K>` which takes two type argument T and K.

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

const todo: MyReadOnly2<Todo, 'title' | 'description'> = {
  title: "Hey",
  description: "foobar",
  completed: false,
};

todo.title = "Hello"; // Error: cannot reassign a readonly property
todo.description = "barFoo"; // Error: cannot reassign a readonly property
todo.completed = true; // OK
```

Solution

- `Omit<Type, Keys>`
 - Creates a new type by excluding properties K from type T.
- `Pick<Type, Keys>`
 - Creates a new type by selecting only the properties K from type T.

```
type MyReadOnly2<T, K extends keyof T = keyof T> = Omit<T, K> &  
  Readonly<Pick<T, K>>;
```

Related Problems - ②

Implement a generic

`DeepReadonly<T>` which make
every parameter of an object and
its sub-objects recursively
readonly.

```
type X = {  
  x: {  
    a: 1;  
    b: 'hi';  
  };  
  y: 'hey';  
};  
  
type Expected = {  
  readonly x: {  
    readonly a: 1;  
    readonly b: 'hi';  
  };  
  readonly y: 'hey';  
};  
  
type Todo = DeepReadonly<X>; // should be same as Expected
```

Solution

- **If T is a primitive type**
 - it directly returns T with readonly
 - because primitive types don't have properties
- **If T is an object type, the type applies recursion**
 - It iterates over all properties of T using keyof T.

```
type DeepReadonly<T> = T extends any ? {  
  readonly [P in keyof T]: keyof T[P] extends never ? T[P] : DeepReadonly<T[P]>;  
} : never;
```