Step 1 - Pre-requisites

Before you go through this module, make sure you've gone through basic typescript classes. You understand `interfaces` , `types` and how typescript is used in a simple Node.js application

If you understand the following code, you're good to go!

```typescript
                                                           Copy
interface User {
    name: string;
    age: number;
}

function sumOfAge(user1: User, user2: User) {
  return a.age + b.age;
};

// Example usage
const result = sumOfAge({
    name: "harkirat",
    age: 20
}, {
    name: "raman",
    age: 21
});
console.log(result); // Output: 9
```

Recap setup procedure

To recap, if you want to start a Typescript project locally, please do the following -

1. Initialize TS

```
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npx tsc --init
```

1. Change tsconfig as per your needs. Usually changing `rootDir` and `outDir` is a good idea

```
                                    Copy
{
    "rootDir": "./src",
    "outDir": "./dist"
}
```

Pick

`Pick` allows you to create a new type by selecting a set of properties (`Keys`) from an existing type (`Type`).

Imagine you have a User model with several properties, but for a user profile display, you only need a subset of these properties.

```
                                                        Copy
interface User {
  id: number;
  name: string;
  email: string;
  createdAt: Date;
}

// For a profile display, only pick `name` and `email`
type UserProfile = Pick<User, 'name' | 'email'>;

const displayUserProfile = (user: UserProfile) => {
  console.log(`Name: ${user.name}, Email: ${user.email}`);
};
```

Partial

`Partial` makes all properties of a type optional, creating a type with the same properties, but each marked as optional.

Specifically useful when you want to do `updates`

```
interface User {
    id: string;
    name: string;
    age: string;
    email: string;
    password: string;
```

```
};

type UpdateProps = Pick<User, 'name' | 'age' | 'email'>

type UpdatePropsOptional = Partial<UpdateProps>

function updateUser(updatedProps: UpdatePropsOptional) {
    // hit the database tp update the user
}
updateUser({})
```

Readonly

When you have a configuration object that should not be altered after initialization, making it
`Readonly` ensures its properties cannot be changed.

```
                                                                    Copy
interface Config {
  readonly endpoint: string;
  readonly apiKey: string;
}

const config: Readonly<Config> = {
  endpoint: 'https://api.example.com',
  apiKey: 'abcdef123456',
};

// config.apiKey = 'newkey'; // Error: Cannot assign to 'apiKey' because
```

> 💡 This is compile time checking, not runtime (unlike const)

Record and Map

Record

Record let's you give a cleaner type to objects

You can type objects like follows -

```
interface User {
  id: string;
  name: string;
}

type Users = { [key: string]: User };

const users: Users = {
  'abc123': { id: 'abc123', name: 'John Doe' },
  'xyz789': { id: 'xyz789', name: 'Jane Doe' },
};
```

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or use **Record**

```
interface User {
  id: string;
```

Copy

```
    name: string;
  }

  type Users = Record<string, User>;

  const users: Users = {
    'abc123': { id: 'abc123', name: 'John Doe' },
    'xyz789': { id: 'xyz789', name: 'Jane Doe' },
  };

  console.log(users['abc123']); // Output: { id: 'abc123', name: 'John Doe
```

Map

maps gives you an even fancier way to deal with objects. Very similar to `Maps` in C++

```
                                                                    Copy
  interface User {
    id: string;
    name: string;
  }

  // Initialize an empty Map
  const usersMap = new Map<string, User>();

  // Add users to the map using .set
  usersMap.set('abc123', { id: 'abc123', name: 'John Doe' });
  usersMap.set('xyz789', { id: 'xyz789', name: 'Jane Doe' });

  // Accessing a value using .get
  console.log(usersMap.get('abc123')); // Output: { id: 'abc123', name: 'J
```

Exclude

In a function that can accept several types of inputs but you want to exclude specific types from being passed to it.

```typescript
type Event = 'click' | 'scroll' | 'mousemove';
type ExcludeEvent = Exclude<Event, 'scroll'>; // 'click' | 'mousemove'

const handleEvent = (event: ExcludeEvent) => {
  console.log(`Handling event: ${event}`);
};

handleEvent('click'); // OK
```

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Type inference in zod

When using zod, we're done runtime validation.

For example, the following code makes sure that the user is sending the right inputs to update their profile information

```
import { z } from 'zod';
import express from "express";

const app = express();

// Define the schema for profile update
const userProfileSchema = z.object({
  name: z.string().min(1, { message: "Name cannot be empty" }),
  email: z.string().email({ message: "Invalid email format" }),
  age: z.number().min(18, { message: "You must be at least 18 years old"
});

app.put("/user", (req, res) => {
  const { success } = userProfileSchema.safeParse(req.body);
  const updateBody = req.body; // how to assign a type to updateBody?

  if (!success) {
    res.status(411).json({});
    return
  }
  // update database here
  res.json({
    message: "User updated"
  })
});

app.listen(3000);
```

More details - https://zod.dev/?id=type-inference