Program 1: Abstraction with YouTube Videos

Classes and Responsibilities
1. **Comment**
   o **Attributes**:
      ▪ `Name` (string)
      ▪ `Text` (string)
   o **Methods**:
      ▪ `ToString()`: Returns a string representation of the comment.
2. **Video**
   o **Attributes**:
      ▪ `Title` (string)
      ▪ `Author` (string)
      ▪ `Length` (int, in seconds)
      ▪ `Comments` (List<Comment>)
   o **Methods**:
      ▪ `AddComment(Comment comment)`: Adds a comment to the video.
      ▪ `GetNumberOfComments()`: Returns the number of comments.
      ▪ `ToString()`: Returns a string representation of the video details including comments.

Comment: _Name: string; _Text: string | ToString(): string

Video: _Title: string; _Author: string; _Length: int; _Comments: List<Comment> |
AddComment(comment: Comment): void; GetNumberOfComments(): int; ToString(): string

Program 2: Encapsulation with Online Ordering
Classes and Responsibilities

1. **Product**
   o **Attributes**:
      ▪ `Name` (string)
      ▪ `ProductId` (string)
      ▪ `Price` (decimal)
      ▪ `Quantity` (int)
   o **Methods**:
      ▪ `TotalCost()`: Returns the total cost for the product.
      ▪ `ToString()`: Returns a string representation of the product.
2. **Address**
   o **Attributes**:
      ▪ `StreetAddress` (string)
      ▪ `City` (string)
      ▪ `StateOrProvince` (string)
      ▪ `Country` (string)
   o **Methods**:
      ▪ `IsInUSA()`: Returns whether the address is in the USA.

- ToString(): Returns a string representation of the address.
   3. **Customer**
      - **Attributes**:
         - Name (string)
         - Address (Address)
      - **Methods**:
         - IsInUSA(): Returns whether the customer is in the USA.
         - ToString(): Returns a string representation of the customer.
   4. **Order**
      - **Attributes**:
         - Products (List<Product>)
         - Customer (Customer)
      - **Methods**:
         - AddProduct(Product product): Adds a product to the order.
         - TotalCost(): Returns the total cost of the order including shipping.
         - GetPackingLabel(): Returns the packing label for the order.
         - GetShippingLabel(): Returns the shipping label for the order.

Address: _Street: string; _City: string; _State: string; _Country: string |
IsInUSA(): bool; ToString(): string

Customer: _Name: string; _Address: Address |
IsInUSA(): bool; ToString(): string

Product: _Name: string; _ProductId: string; _Price: decimal; _Quantity: int |
TotalCost(): decimal; ToString(): string

Order: _Products: List<Product>; _Customer: Customer |
AddProduct(product: Product): void; TotalCost(): decimal; GetPackingLabel(): string;
GetShippingLabel(): string

Program 3: Inheritance with Event Planning

Classes and Responsibilities
   1. **Address**
      - **Attributes**:
         - StreetAddress (string)
         - City (string)
         - StateOrProvince (string)
         - Country (string)
      - **Methods**:
         - ToString(): Returns a string representation of the address.
   2. **Event**
      - **Attributes**:
         - Title (string)

- - - Description (string)
  - Date (DateTime)
  - Time (DateTime)
  - Address (Address)
  - **Methods**:
    - GetStandardDetails(): Returns standard details of the event.
    - GetFullDetails(): Returns full details of the event.
    - GetShortDescription(): Returns a short description of the event.
3. **Lecture** (inherits from Event)
   - **Attributes**:
     - Speaker (string)
     - Capacity (int)
   - **Methods**:
     - Overrides GetFullDetails() to include speaker and capacity.
4. **Reception** (inherits from Event)
   - **Attributes**:
     - RSVPEmail (string)
   - **Methods**:
     - Overrides GetFullDetails() to include RSVP email.
5. **OutdoorGathering** (inherits from Event)
   - **Attributes**:
     - Weather (string)
   - **Methods**:
     - Overrides GetFullDetails() to include weather information.

Address: _Street: string; _City: string; _State: string; _Country: string |
ToString(): string

Event: _Title: string; _Description: string; _Date: string; _Time: string; _Address: Address |
GetStandardDetails(): string; GetFullDetails(): string; GetShortDescription(): string

Lecture: _Speaker: string; _Capacity: int |
GetFullDetails(): string

Reception: _RSVP_Email: string |
GetFullDetails(): string

OutdoorGathering: _WeatherForecast: string |
GetFullDetails(): string

Program 4: Polymorphism with Exercise Tracking

Classes and Responsibilities
1. **Activity**
   - **Attributes:**

- **▪** `_Date: DateTime`
- **▪** `_Length: int` (in minutes)
    - o **Methods:**
        - ▪ `GetDistance(): double` - Virtual method to get the distance.
        - ▪ `GetSpeed(): double` - Virtual method to get the speed.
        - ▪ `GetPace(): double` - Virtual method to get the pace.
        - ▪ `GetSummary(): string` - Returns a summary of the activity.
2. **Running** (inherits from Activity)
    - o **Attributes:**
        - ▪ `_Distance: double` (in miles)
    - o **Methods:**
        - ▪ `GetDistance(): double` - Overrides method to get the distance.
        - ▪ `GetSpeed(): double` - Overrides method to get the speed.
        - ▪ `GetPace(): double` - Overrides method to get the pace.
        - ▪ `GetSummary(): string` - Returns a summary of the running activity.
3. **Cycling** (inherits from Activity)
    - o **Attributes:**
        - ▪ `_Speed: double` (in miles per hour)
    - o **Methods:**
        - ▪ `GetDistance(): double` - Overrides method to get the distance.
        - ▪ `GetSpeed(): double` - Overrides method to get the speed.
        - ▪ `GetPace(): double` - Overrides method to get the pace.
        - ▪ `GetSummary(): string` - Returns a summary of the cycling activity.
4. **Swimming** (inherits from Activity)
    - o **Attributes:**
        - ▪ `_Laps: int`
    - o **Methods:**
        - ▪ `GetDistance(): double` - Overrides method to get the distance.
        - ▪ `GetSpeed(): double` - Overrides method to get the speed.
        - ▪ `GetPace(): double` - Overrides method to get the pace.
        - ▪ `GetSummary(): string` - Returns a summary of the swimming activity.

Activity: _Date: string; _Length: int |
GetDistance(): double; GetSpeed(): double; GetPace(): double; GetSummary(): string

Running: _Distance: double |
GetDistance(): double; GetSpeed(): double; GetPace(): double; GetSummary(): string

Cycling: _Speed: double |
GetDistance(): double; GetSpeed(): double; GetPace(): double; GetSummary(): string

Swimming: _Laps: int |
GetDistance(): double; GetSpeed(): double; GetPace(): double; GetSummary(): string