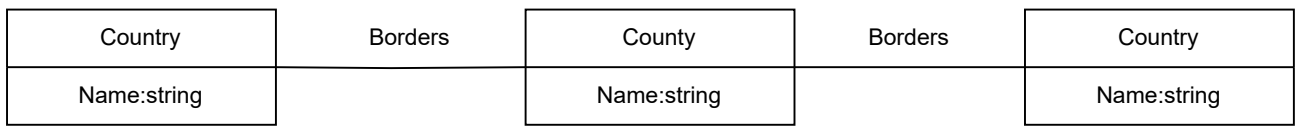
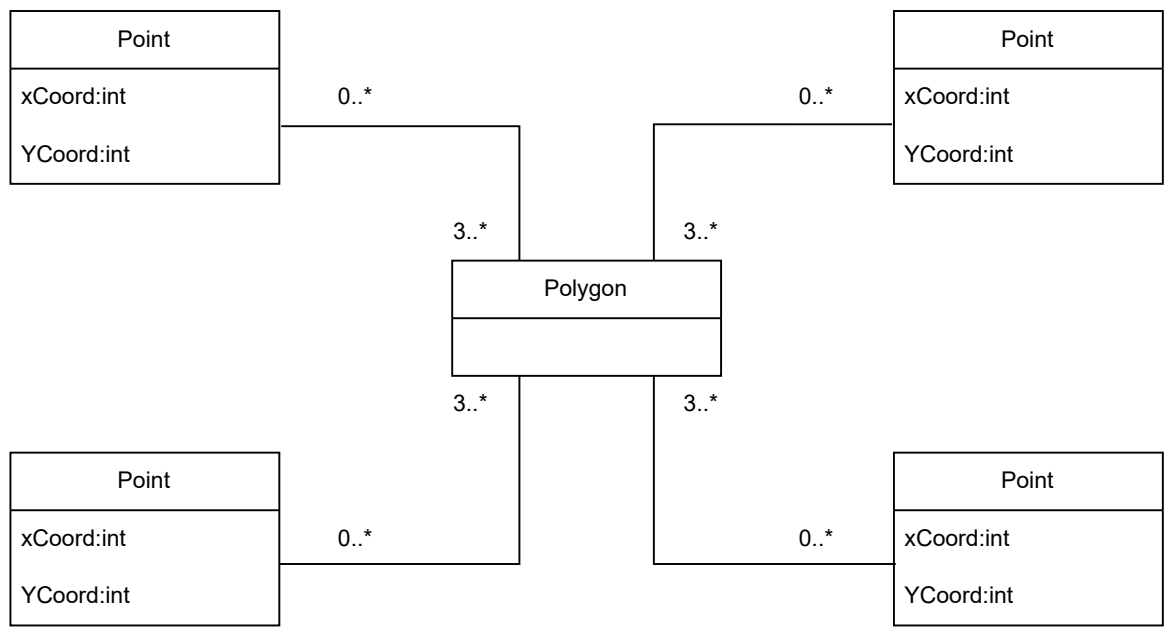
Q.1 Prepare a class diagram for the following object diagram that shows a portion of Europe.



Q.2 Prepare a class diagram for object diagram given in Figure -2. Explain your multiplicity decisions. What is the smallest number of points required to construct a polygon? Does it make a difference whether or not point may be shared between polygons? Your answer should address the fact that points are ordered.



Multiplicity Decisions:

- **`Polygon` to `Point` Multiplicity**: A `Polygon` must have a minimum of three `Point` objects (`3..*`). This reflects the minimum number of points needed to create a closed polygon.
- **`Point` to `Polygon` Multiplicity**: A `Point` can belong to zero or more `Polygon` objects (`0..*`). Points can be shared between different polygons, allowing for intersections or overlaps.

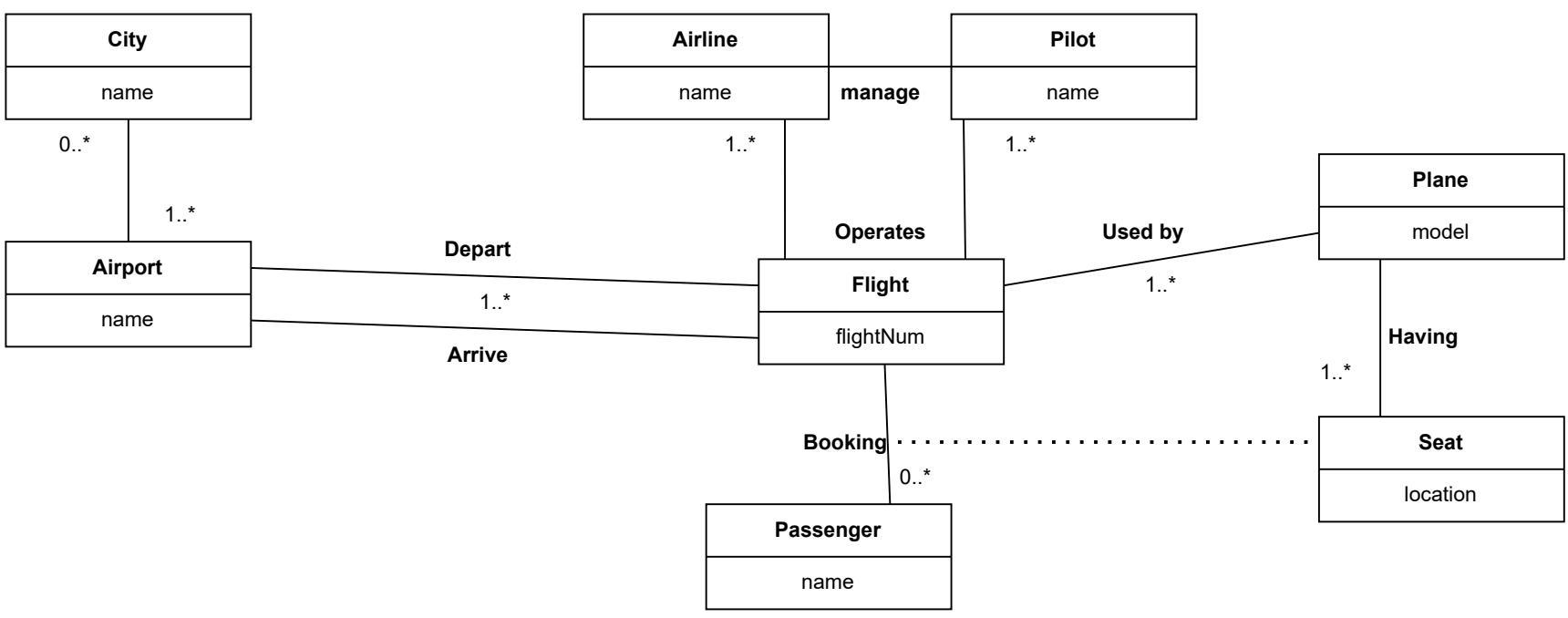
Smallest Number of Points for a Polygon:

- The smallest number of points required to construct a polygon is **3**. A polygon with fewer than three points cannot form a closed geometric figure.

Impact of Shared Points Between Polygons:

- If points are shared between polygons, a single `Point` instance can be associated with multiple `Polygon` objects. This allows for complex geometric arrangements.
- The ordering of points in each `Polygon` is crucial for defining its shape and orientation. Even when points are shared, the specific sequence of points determines the unique shape of each polygon.

Q.3 Figure 3 is a partially completed class diagram of an air transportation system. Add multiplicities in the diagram. Also add association names to unlevelled associations.



Q.4 We want to model a system for management of flights and pilots. An airline operates flights. Each airline has an ID. Each flight has an ID a departure airport and an arrival airport: an airport as a unique identifier. Each flight has a pilot and a co-pilot, and it uses an aircraft of a certain type; a flight has also a departure time and an arrival time. An airline owns a set of aircrafts of different types. An aircraft can be in a working state or it can be under repair. In a particular moment an aircraft can be landed or airborne. A company has a set of pilots: each pilot has an experience level: 1 is minimum, 3 is maximum. A type of aeroplane may need a particular number of pilots, with a different role (e.g.: captain, co-pilot, navigator): there must be at least one captain and one co-pilot, and a captain must have a level 3.