Foundations of Programming

A graph consists of nine numbered vertices and 12 edges thus:

By inspection, it is clear that to get from vertex 0 to vertex 8 there are just six routes in which progress is always from a lower-numbered vertex to one with a higher number.

A programmer wishes to write a Java program to count the routes and begins with the following code:

```java
public class Routes {
    private static final int[] first = {1, 3, 4, 6, 6, 7, 8, 8};
    private static final int[] second = {2, 4, 5, 0, 7, 0, 0, 0};
    private static int[] state = {-1, -1, -1, -1, -1, -1, -1, -1, 1};

    public static void main(String[] args) {
        System.out.println("There are " + tryit(0) + " routes");
    }

    private static int tryit(int vertex) {
        // Together the first and second arrays form a data structure representing the graph.
        // Explain and critically comment on these arrays. [5 marks]

        // Ultimately, element v of the array state is intended to show the number of routes from vertex v to vertex 8.
        // A value of -1 indicates that the number is not yet known.
        // The method tryit(int vertex) returns the value of state[vertex], calculating and saving this value first if necessary.
        // Supply an appropriate body for this method and explain its operation. [15 marks]
    }
}
```