

Review Lab

1. (medium) What is the runtime for the following piece of code

```
int[] a = new int[n + 1];
for(int j = 1; j <= n; j++)
{
    for (int k = j; k * j <= n; k++)
    {
        if (a[k] > 0)
            break;
        a[k]++;
    }
}
```

2. (easy) What is the worst-case runtime for the minimum distance algorithms (Floyd, Bellman-Ford, and Dijkstra) as presented in class?
3. (hard; partially from bonus lecture) Bitland has $3n$ cities and m roads. Each city currently has a path to any other city. Bitland's king has decided to give his 3 children an equal number of cities to govern. The king's children do not wish their citizens to leave their smaller kingdoms. The children have requested that the king split the land such that the princes can destroy at most 2 roads in total and have each of their smaller kingdoms only reach other cities in their kingdom. Additionally, for each child all cities in their kingdom needs to reach all other cities in their respective kingdoms after the destruction of the selected roads. As esteemed advisor to the king he has asked you to determine if it is possible to divvy up the kingdom to satisfy his children.
4. (easy) What is the worst case runtime for FFA on an arbitrary graph?