Problem 1

a) Find an Euler circuit for the graph below.

**ANSWER:**

```
A -> B -> C 
D -> E -> F 
H -> I -> J 
```

b) If the edge \{d, e\} is removed from the graph, find an Euler path for the resulting subgraph. *Tip: An Euler path is a path that uses every edge of a graph exactly once.*

**ANSWER:**

```
d -> a -> b -> d -> h -> i -> e -> f -> i -> j -> f -> b -> c -> g -> k -> j -> g -> b -> e 
```
Problem 2

Give an example of a connected graph that has:

a) Neither an Euler circuit nor a Hamilton cycle.
ANSWER a:

b) An Euler circuit but no Hamilton cycle.
ANSWER b: *Note that the curved line is meant to got from the top right corner to the bottom left—NOT go through the top left

c) a Hamilton cycle but no Euler circuit.
ANSWER c: *Note that the curved line is meant to got from the top left corner to the bottom right—NOT go through the top right

d) Both a Hamilton cycle and an Euler circuit
ANSWER c:

Problem 3

Hannah and Dominic invite 10 friends to dinner. In the group of 12 people everyone knows at least 6 others. Prove that the 12 can be seated around a circular table in such a way that each person is acquainted with the persons sitting on either side.
ANSWER: Construct a graph with 12 vertices, one for each person. If two people know each other, draw an edge connecting their corresponding vertices. This graph has a Hamilton cycle and this cycle provides such a seating arrangement.
Problem 4

a) Apply Dijkstra’s algorithm to the weighted graph below, and determine the shortest distance from vertex a to each of the other six vertices.
ANSWER: b = 13, c = 22, f = 21, g = 10, h = 15, i = 14,

b) Determine the shortest path from vertex a to each of the vertices c, f, i.
ANSWER: c: \{a, g\}, \{g, b\}, \{b, c\} f: \{a, g\}, \{g, i\}, \{i, f\} i: \{a, g\}, \{g, i\}
Problem 5

When visiting a chamber of horrors, Paul and David try to figure out whether they can travel through the seven rooms and surrounding corridor of the attraction without passing through any door more than once. If they must start from the X position in the corridor shown below, can they accomplish their goal?

ANSWER: Yes. Model the situation with a graph where there is a vertex for each room and the surrounding corridor. Draw an edge between two vertices if there is a door common to both rooms, or a room and the surrounding corridor. The resulting multigraph is connected with every vertex of even degree.