CSCI 3333 Practice Quiz DP1

- The actual quiz consists of one question and a 10-minute duration.
- The actual quiz question may or may not be one of the questions here.

**Problem 1.** Fill in the table in Figure 1 of the minimum number of coins from the set \( C = \{1, 5, 6\} \) that sum to the given amount.

<p>| | | | | | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
</tr>
</tbody>
</table>

Figure 1: The table for the first part of Problem 1.

Fill in the table in Figure 2 of the minimum number of coins from the set \( C = \{2, 3, 8\} \) that sum to the given amount.

<p>| | | | | | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 2: The table for the second part of Problem 1.
Problem 2. Fill in the table in Figure 3 of the minimum number of coins from the set $C = \{1, 6, 7\}$ that sum to the given amount.

<p>| | | | | | | | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3: The table for the first part of Problem 2.

Fill in the table in Figure 4 of the minimum number of coins from the set $C = \{2, 3, 9\}$ that sum to the given amount.

<p>| | | | | | | | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 4: The table for the second part of Problem 2.

Problem 3. Complete the following implementation of a function hamiltonian that returns whether an input graph with vertices $V$ has a Hamiltonian cycle.

```cpp
bool hamiltonian(vector<Vertex*> &partial, set<Vertex*> &V)
{
    if (partial.size() _____ V.size()+1)
    {
        set<Vertex*> S;
        for (Vertex* v : partial)
            S.insert(v);
        return S.size() _____ V.size();
    }

    Vertex* last = partial.back();
    for (Vertex *vn : last->neighs)
    {
        partial.push_back(vn);
        if (hamiltonian(partial, V))
            return _____;
        partial.pop_back();
    }

    return _____;
}
```
int main()
{
    Vertex v1, v2, v3, v4;
    v1.neighs.push_back(&v2);
    v1.neighs.push_back(&v4);
    v2.neighs.push_back(&v3);
    v2.neighs.push_back(&v4);
    v3.neighs.push_back(&v1);
    v3.neighs.push_back(&v4);
    v4.neighs.push_back(&v1);
    set<Vertex*> V = {&v1, &v2, &v3, &v4};

    vector<Vertex*> partial;
    partial.push_back(&v1);
    cout << "The graph is Hamiltonian: ";
    cout << hamiltonian(partial, V) << endl;
}