Homework 6 Solutions

1.

```
p1(n, d[1..k], s[1..k])
{
    a[0..k][0..n];
    // no solutions if no denominations available
    for (i = 0; i < n; ++i)
        a[0][i] = ∞;

    // 0 if n = 0
    for (r = 0; r <= k; ++r)
        a[r][0] = 0;

    for (r = 1; r <= k; ++r)
        for (i = 1; i <= n; ++i)
        {
            a[r][i] = ∞;
            // try all choices for denomination r
            for (m = 0; m <= s[r]; ++m)
                a[r][i] = min(a[r][i], m + a[r-1][i-m*d[m]]);  //  x+∞=∞
        }
    return a[k][n];
}
```

The algorithm runs in time $O(knm)$, where $m = \max(s[])$.

2.

```
p2(n, p[1..n])
{
     a[0] = 0;
     for (i = 1; i <= n; ++i)
     {
         a[i] = 0;
         for (j = 1; j <= i; ++j)
             a[i] = max(a[i], p[j] + a[i-j]);
     }
     return a[n];
}
```

The running time is $\sum_{i=1}^{n} \sum_{j=1}^{i} (1) = \Theta(n^2)$.