Homework 8 Answers

Page 160 - 2. What is the term $a_8$ of the sequence $\{a_n\}$ if $a_n$ equals
a) $2^{n-1}$?
   \[ 2^7 = 128 \]

b) 7?
   \[ 7 \]

c) $1 + (-1)^n$?
   \[ 1 + (-1)^8 = 1 + 1 = 2 \]

d) $-(-2)^n$?
   \[ -(-2)^8 = -256 \]

Page 161 - 14. What are the values of these sums, where $S = \{1, 3, 5, 7\}$?

a) $\sum_{j \in S} j$
   \[ 1 + 3 + 5 + 7 = 16 \]

b) $\sum_{j \in S} j^2$
   \[ 1^2 + 3^2 + 5^2 + 7^2 = 1 + 9 + 25 + 49 = 84 \]

c) $\sum_{j \in S} \frac{1}{j}$
   \[ \frac{1}{1} + \frac{1}{3} + \frac{1}{5} + \frac{1}{7} = \frac{105}{105} + \frac{35}{105} + \frac{21}{105} + \frac{15}{105} = \frac{176}{105} \]

d) $\sum_{j \in S} 1$
   \[ 1 + 1 + 1 + 1 = 4 \]

Page 161 - 16. Find the value of each of these sums.

a) $\sum_{j=0}^{8} (1 + (-1)^j)$
   \[ 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 = 10 \]

b) $\sum_{j=0}^{8} (3^j - 2^j)$
   \[ 0 + 1 + 5 + 19 + 65 + 211 + 665 + 2059 + 6305 = 9330 \]

c) $\sum_{j=0}^{8} (2 \cdot 3^j - 3 \cdot 2^j)$
   \[ -1 + 0 + 6 + 30 + 114 + 390 + 1246 + 3990 + 12354 = 13149 \]

d) $\sum_{j=0}^{8} (2^{j+1} - 2^j)$
   \[ 1 + 2 + 4 + 8 + 16 + 32 + 64 + 128 + 256 = 511 \]

Page 161 - 18. Compute each of these double sums.

a) $\sum_{i=1}^{3} \sum_{j=1}^{2} (i - j)$
   \[ 0 - 1 + 1 + 0 + 2 + 1 = 3 \]
Page 177 - 8. Describe an algorithm that takes as input a list of \( n \) distinct integers and finds the location of the largest even integer in the list or returns 0 if there are no even integers in the list.

```c
int largest;
int position = 0;
for (int i = 1; i <= n; i++)
    if (list[i] is even)
        if (position == 0)
            largest = list[i];
            position = i;
        else if (list[i] > largest)
            largest = list[i];
            position = i;
return position
```

Page 178 - 12. Describe an algorithm that uses only assignment statements that replaces the triple \((x, y, z)\) with \((y, z, x)\). What is the minimum number of assignment statements needed?

```c
int temp = x;
x = y;
y = z;
z = temp;
```

Minimum of 4 assignment statements needed.

Page 178 - 14. List all the steps used to search for 7 in the sequence 1, 3, 4, 5, 6, 8, 9, 11 using

a) a linear search.
   
   Since the values are in order:
Page 178 - 18. Describe an algorithm that locates the last occurrence of the smallest element in a finite list of integers, where the integers in the list are not necessarily distinct.

```c
int smallest = list[1];
int position = 1;
for (int i = 1; i <= n; i++)
   if (list[i] <= smallest)
      {
         smallest = list[i];
         position = i;
      }
return position
```