

# Worksheet 14 Solution

March 25, 2020

## Question 1

a. **Inner Loop:**  $n$

**Outer Loop:**  $n - 5$

**Theta Expressions:**  $\Theta(n^2)$

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**Correct Solution:**

**Inner Loop:**  $n$

**Outer Loop:**  $n \cdot \left\lceil \frac{n}{5} \right\rceil$

**Theta Expressions:**  $\Theta(n^2)$

b. **Inner Loop:**  $\frac{n}{3} + (n - 2)$

**Outer Loop:**  $n - 4$

**Theta Expressions:**  $\Theta(n^2)$

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**Correct Solution:**

**Inner Loop:**  $\lceil \log_3 n \rceil + \left\lceil \frac{n}{2} \right\rceil$

**Outer Loop:**  $\max(0, n - 4) \cdot \left[ \lceil \log_3 n \rceil + \left\lceil \frac{n}{2} \right\rceil \right]$

**Theta Expressions:**  $\Theta(n^2)$

c. **Inner Loop #2:**  $\sum_{i=1}^n i = \frac{n(n+1)}{2}$

**Inner Loop #1:**  $n \cdot \frac{n(n+1)}{2} = \frac{n^3 + n^2}{2}$

**Outer Loop:**  $\frac{n^3 + n^2}{2} \cdot (n-4) = \frac{n^4 - 3n^3 + 4n^2}{2}$

**Theta Expressions:**  $\Theta(n^4)$

d. **Inner Loop:**  $2^n$

**Outer Loop:**  $\sum_{i=0}^{\frac{n}{2}-1} 2^i = 2^{\frac{n}{2}-1}$

**Theta Expressions:**  $\Theta(2^n)$

## Question 2