(Q3)

We are required to find and prove a formula for the sum $\sum_{i=1}^{n} i$.

This can be explicitly stated as:

$$m + (m + 1) + (m + 2) + (m + 3) + \ldots + (n - 1) + n$$

We observe that this is equivalent to:

$$1+2+\ldots+m+(m+1)+\ldots+(n-1)+n-(1+2+\ldots+(m-1))$$

The summation of which can be expressed as:

$$\sum_{i=1}^{n} i - \sum_{i=1}^{m-1} i \quad (1)$$

We assume the following:

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

We can thus express (1) as:

$$\frac{n(n+1)}{2} - \frac{m(m-1)}{2} = \frac{n(n+1) - m(m-1)}{2}$$