

Each solution shown below contains the following elements

Algebraic solution for the summation.

The C code that would solve the given equation.

The appropriate *Big "O"* notation for the resultant code.

$$1. \sum_{i=0}^3 (5 + \sqrt{4^i})$$

Solution

Using Rule 2

$$\begin{aligned} & (5 + \sqrt{4^0}) + (5 + \sqrt{4^1}) + (5 + \sqrt{4^2}) + (5 + \sqrt{4^3}) \\ & (5 + 1) + (5 + 2) + (5 + 4) + (5 + 8) \\ & 6 + 7 + 9 + 13 \\ & 35 \end{aligned}$$

Alternately - using Rule 3

$$\begin{aligned} & \sum_{i=0}^3 5 + \sum_{i=0}^3 \sqrt{4^i} \\ & (5 + 5 + 5 + 5) + \sqrt{4^0} + \sqrt{4^1} + \sqrt{4^2} + \sqrt{4^3} \\ & 20 + 1 + 2 + 4 + 8 \\ & 35 \end{aligned}$$

C Code

```
int i;
double dbli, x = 0.0;
double sumTotal = 0.0;

//Now for the summation from 0 to 3
for (i = 0; i <= 3; i++)
{
    dbli = (double) i; // cast i into a double

    //calculate:
    //      5 + square root of (4 to the power of i)
    x = sqrt( pow(4.0, dbli)); //square root of (4 to the power of i)
    // display the intermediate result for each
    // step of the summation
    printf("i = %d, x = %.2f\n", i, x);
    sumTotal += 5.0 + x;
}
printf("Summation: (int) = %d\n", (int)sumTotal);
```

Big "O" category

$O(n)$ because the calculation for the summation is a single calculation that occurs n times.