CSC165H1 – Problem Set 0 (SAMPLE SOLUTION)

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My Courses

- CSC165H1, Mathematical Expression and Reasoning, G. Baum
- CSC148H1, Introduction to Computer Science, D. Horton
- PHL206H1, Later Medieval Philosophy, D. Black
- USA300H1, Theories and Methods in American Studies, A. Rahr
- WGS370H1, Utopian Visions, Activist Realities, J. Taylor

Set notation

$$S_1 \cap S_2 = \{0, 1, 4, 5, 6, 9, 10, 11, 14\}$$

Note that $15 \in S_1$ but $15 \notin S_2$, since 15 is not less than 15.

A truth table

p	q	r	$(p \lor q) \Rightarrow (p \Leftrightarrow r)$
False	False	False	True
False	False	True	True
False	True	False	True
False	True	True	False
True	False	False	False
True	False	True	True
True	True	False	False
True	True	True	True

A calculation

First we simplify the summation using the given formula, and substituting $d = 2$ and $k = 3$:

$$\begin{aligned}\sum_{i=0}^{n-1}(2i+3) &= 3n + \frac{2n(n-1)}{2} \\ &= 3n + n^2 - n \\ &= n^2 + 2n\end{aligned}$$

Next, we need to solve this inequality:

$$\begin{aligned}\sum_{i=0}^{n-1}(2i+3) &> 165 \\ n^2 + 2n &> 165 \\ n^2 + 2n - 165 &> 0\end{aligned}$$

Using the quadratic formula, the zeros of the polynomial $n^2 + 2n - 165$ are $\frac{-2\pm\sqrt{4+660}}{2}$, or roughly $n_1 = -13.884\ldots$ and $n_2 = 11.884\ldots$.

Noting that this parabola "points up", its values are > 0 when $n < -13.884\ldots$ or $n > 11.884\ldots$.

So the smallest postitive integer value of n that makes $\sum_{i=0}^{n-1}(2i+3)$ greater than 165 is 12.