CSC165H1: Problem Set 0

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My Courses

- CJH332H1, Cellular and Molecular Neurobiology of the Synapse, Jimmy Fraigne
- CSC148H1, Introduction to Computer Science, Jonathan Calver
- CSC165H1, Mathematical Expression and Reasoning for Computer Science, Thomas Fairgrieve
- HMB200H1, Introduction to Neuroscience, Paul Whissell
- IMM250H1, The Immune System and Infectious Disease, Matthew Buechler

Set notation

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

A truth table

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

A calculation

We will use the arithmetic series formula $\sum_{i=1}^{n-1}(di+k) = nk+\frac{dn(n-1)}{2}$ to simplify the equation.

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

Finally, we will find the smallest positive integer n such that $n^2 + 2n \geq 165$ using the quadratic formula.

$$\begin{aligned}n^2 + 2n &\geq 165 \\ n^2 + 2n - 165 &\geq 0 \\ n &\geq \frac{-2 \pm \sqrt{2^2 - 4 \cdot 1 \cdot -165}}{2 \cdot 1} \\ n &\geq \frac{-2 \pm \sqrt{664}}{2} \\ n &\geq \frac{-2 \pm 2\sqrt{166}}{2} \\ n &\geq -1 + \sqrt{166} \\ n &\approx 11.884 \\ n &= 12\end{aligned}$$

We can remove the negative case and round up to the positive integer 12 since $n \in \mathbb{Z}^+$, and we take the lowest possible n, which is $n = -1 + \sqrt{166}$, which is rounded to $n = 12$.