CSC165H1 - Problem Set 0

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My Courses

- CSC148H1: Intro to Comp Sci by Prof. Diane Horton
- CSC165H1: Math Expr & Rsng for Cs by Prof. Gary Baumgartner
- MAT137Y1: Calculus with Proofs by Prof. Clovis Hamel Ascanio
- MAT224H1: Linear Algebra 2 by Prof. Denis Gorodkov
- STA130H1: STAT Reasoning by Prof. Joshua Speagle

Set notation

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

A truth table

p	q	r	$(p \vee q) \Rightarrow (p \Leftrightarrow r)$
T	T	T	T
T	T	F	F
T	F	T	T
T	F	F	F
F	T	T	F
F	T	F	T
F	F	T	T
F	F	F	T

A calculation

Part 1

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

Part 2 According to the result of Part 1:

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

According to the quadratic formula, when $n^2 + 2n - 165 = 0$, gives:

$$n = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a},\ where\ a = 1,\ b = 2,\ c = -165$$

Therefore,

$$\begin{aligned}n &= \frac{-2 \pm \sqrt{(-2)^2 - 4 \times 1 \times (-165)}}{2 \times 1} \\ n &= \frac{(-1) \pm 2\sqrt{166}}{2} \\ n &= -1 \pm \sqrt{166}\end{aligned}$$

Since $a = 1 > 0$, when $n \leq -1 - \sqrt{166}$ *or* $n \geq -1 + \sqrt{166}$, $n^2 + 2n - 165 \geq 0$
Since $n \geq 0$, when $n \geq -1 + \sqrt{166} \approx 11.88$, $n^2 + 2n - 165 \geq 0$, which,

$$n = 12$$