

Data, Logic, and Computing

ECS 17 (Winter 2025)

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Homework 8

Exercise 1

Using induction, show that $\forall n \in \mathbb{N}, \sum_{i=1}^n i^2 = \frac{n(n+1)(2n+1)}{6}$.

Exercise 2

Using induction, show that $\forall n \in \mathbb{N}, \sum_{i=1}^n i(i+1)(i+2) = \frac{n(n+1)(n+2)(n+3)}{4}$.

Exercise 3

Show that $\forall n \in \mathbb{N}, n > 1, \sum_{i=1}^n \frac{1}{i^2} < 2 - \frac{1}{n}$.

Exercise 4

Use a proof by induction to show that $\forall n \in \mathbb{N}, n > 3, n^2 - 7n + 12 \geq 0$.

Exercise 5

A sequence a_0, a_1, \dots, a_n of natural numbers is defined by $a_0 = 2$ and $a_{n+1} = (a_n)^2$, $\forall n \in \mathbb{N}$. Find a closed form formula for the term a_n and prove that your formula is correct.

Exercise 6

Use the method of proof by induction to show that any amount of postage of 24 cents or more can be formed using just 5-cent and 7-cent stamps.