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CSIS 213-3941

Assignment 7&8 Quiz Part 2

**Question 2**

Prove or disprove that, if we add three consecutive integers, their sum is divisible by 3.

**Proof:**

Let [(*n*) + (*n*+1) + (*n*+2)] / 3 for all integers *n* >= 0 be the functions for the sentence “if we add three consecutive integers, their sum is divisible by 3.”

Let *P(n)* be the property for the function “[(*n*) + (*n*+1) + (*n*+2)] / 3 for all integers *n* >= 0”.

To establish *P(0)*, we must show that

[(0) + (0+1) + (0+2)] / 3

(0 + 1 + 2) / 3

3 / 3 = 1

Because there is no remainder, *P(0)* is true.

Let *k* be any integer with *k* >= 0, and suppose that

[(*k*) + (*k*+1) + (*k*+2)] / 3

By mathematical induction, this means that

[(*k*) + (*k*+1) + (*k*+2)] / 3 = *k* + 1

We must show that

[(*k+1*) + ((*k*+1) + 1) + ((*k+1)* +2)] / 3

[3*k* + 3] / 3

(3*k* / 3) + (3 / 3)

*k* + 1 = *k* + 1

Because *P(k)* and *P(k+1)* are true for all *k* >= 0, the sentence “if we add three consecutive integers, their sum is divisible by 3” is true.