CPSC 354 - REPORT

The first week of class:

In week 1 we leaned about Lean as a programming language, and it's correlation to discrete math. We also learnt about other proof assistants. We then shifted our focus to the nng practice questions as you can see below.

NNG Solutions

Level 5 / 8 : Adding zero

Active Goal

Objects:

a b c : ℕ

Goal:

$a + (b + 0) + (c + 0) = a + b + c$

```
rw [add_zero]
```

Active Goal

Objects:

a b c : ℕ

Goal:

$a + b + (c + 0) = a + b + c$

```
rw [add_zero]
```

Active Goal

Objects:

a b c : ℕ

Goal:

$a + b + c = a + b + c$

```
rfl
```

level completed! 🎉

Level 6 / 8 : Precision rewriting

Objects:

a b c : ℕ

Goal:

$a + (b + 0) + (c + 0) = a + b + c$

```
rw [add_zero c]
```

Active Goal

Objects:

a b c : ℕ

Goal:

$a + (b + 0) + c = a + b + c$

```
rw [add_zero b]
```

Active Goal

Objects:

a b c : ℕ

Goal:

$a + b + c = a + b + c$

```
rfl
```

level completed! 🎉

Level 7 / 8 : add_succ

Theorem `succ_eq_add_one`: For all natural numbers a, we have $\mathrm{succ}(a) = a + 1$.

Active Goal

Objects:

n : ℕ

Goal:

succ n = n + 1

```
rw [one_eq_succ_zero]
```

Active Goal

Objects:

n : ℕ

Goal:

succ n = n + succ 0

```
rw [add_succ]
```

Active Goal

Objects:

n : ℕ

Goal:

succ n = succ (n + 0)

```
rw [add_zero]
```

Level 8 / 8 : 2+2=4

$2 + 2 = 4$.

Active Goal

Goal:

2 + 2 = 4

```
rw[four_eq_succ_three]
```

Active Goal

Goal:

2 + 2 = succ 3

```
rw[three_eq_succ_two]
```

Active Goal

Goal:

2 + 2 = succ (succ 2)

```
rw[two_eq_succ_one]
```

Active Goal

Goal:

succ 1 + succ 1 = succ (succ (succ 1))

```
rw[one_eq_succ_zero]
```

Level 8 / 8 : 2+2=4

Active Goal

Goal:

succ (succ 0) + succ (succ 0) = succ (succ (succ (succ 0)))

```
rw[succ_eq_add_one]
```

Active Goal

Goal:

succ 0 + 1 + (succ 0 + 1) = succ (succ (succ 0 + 1))

```
rw[one_eq_succ_zero]
```

Active Goal

Goal:

succ 0 + succ 0 + (succ 0 + succ 0) = succ (succ (succ 0 + succ 0))

```
rw[add_succ]
```

Active Goal

Goal:

succ (succ 0 + 0) + succ (succ 0 + 0) = succ (succ (succ (succ 0 + 0)))

```
rw[add_zero]
```

Level 8 / 8 : 2+2=4

Active Goal

Goal:

succ (succ 0) + succ (succ 0) = succ (succ (succ (succ 0)))

```
rw[add_succ]
```

Active Goal

Goal:

succ (succ (succ 0) + succ 0) = succ (succ (succ (succ 0)))

```
rw[add_succ]
```

Active Goal

Goal:

succ (succ (succ (succ 0) + 0)) = succ (succ (succ (succ 0)))

```
rw[add_zero]
```

Active Goal

Goal:

succ (succ (succ (succ 0))) = succ (succ (succ (succ 0)))

```
rfl
```

level completed! 🎉