

# Practical Optional Types for Clojure

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# Outline

# Make Titles Informative. Use Uppercase Letters.

Subtitles are optional.

- ▶ Use `itemize` a lot.
- ▶ Use very short sentences or short phrases.

# Make Titles Informative.

You can create overlays...

- ▶ using the pause command:
  - ▶ First item.
  - ▶ Second item.
- ▶ using overlay specifications:
  - ▶ First item.
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- ▶ using the general uncover command:
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# What Are Prime Numbers?

## Definition

A **prime number** is a number that has exactly two divisors.

## Example

- ▶ 2 is prime (two divisors: 1 and 2).
- ▶ 3 is prime (two divisors: 1 and 3).
- ▶ 4 is not prime (**three** divisors: 1, 2, and 4).

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# There Is No Largest Prime Number

The proof uses *reductio ad absurdum*.

## Theorem

*There is no largest prime number.*

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## Proof.

1. Suppose  $p$  were the largest prime number.
2. Let  $q$  be the product of the first  $p$  numbers.
3. Then  $q + 1$  is not divisible by any of them.
4. But  $q + 1$  is greater than 1, thus divisible by some prime number not in the first  $p$  numbers. □

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# What's Still To Do?

## Answered Questions

*How many primes are there?*

## Open Questions

*Is every even number the sum of two primes?*

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## An Algorithm For Finding Prime Numbers.

```
int main (void)
{
    std::vector<bool> is_prime (100, true);
    for (int i = 2; i < 100; i++)
        if (is_prime[i])
        {
            std::cout << i << " ";
            for (int j = i; j < 100; is_prime [j] = false, j+=i);
        }
    return 0; }
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Note the use of `std::`.

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# Summary

- ▶ The **first main message** of your talk in one or two lines.
  - ▶ The **second main message** of your talk in one or two lines.
  - ▶ Perhaps a **third message**, but not more than that.
- 
- ▶ Outlook
    - ▶ Something you haven't solved.
    - ▶ Something else you haven't solved.

## For Further Reading I



A. Author.

*Handbook of Everything.*

Some Press, 1990.



S. Someone.

On this and that.

*Journal of This and That*, 2(1):50–100, 2000.



[Goldbach, 1742] Christian Goldbach.

A problem we should try to solve before the ISPN '43 deadline,

*Letter to Leonhard Euler, 1742.*