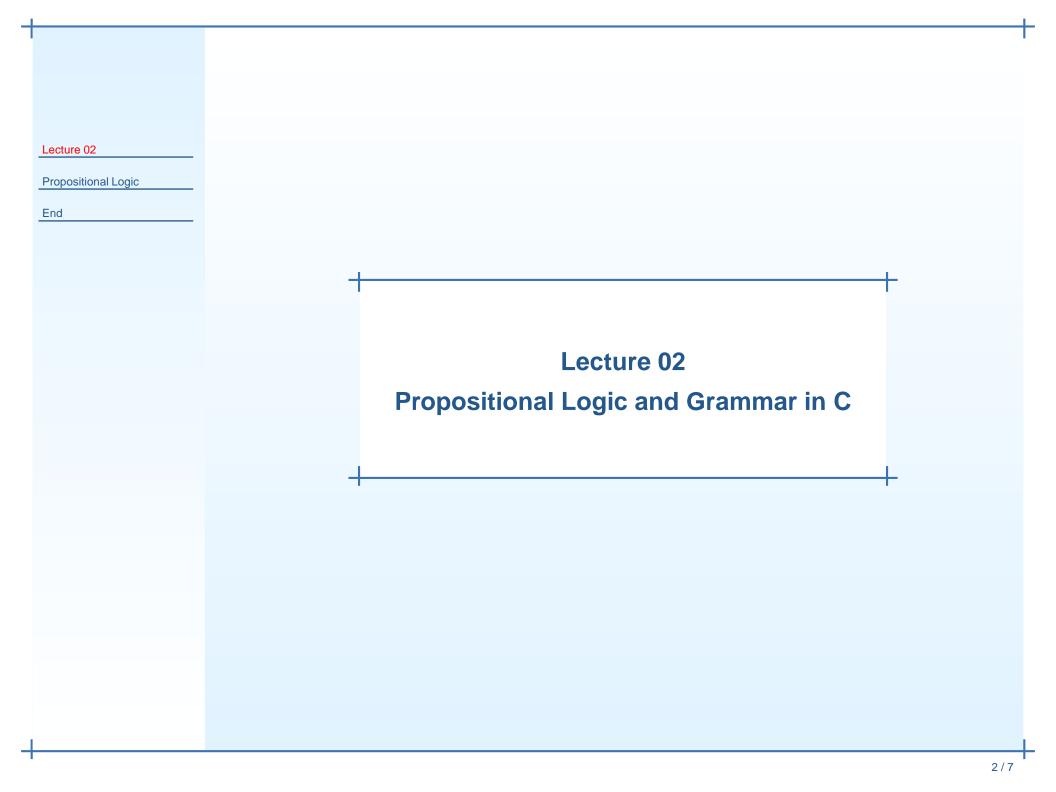
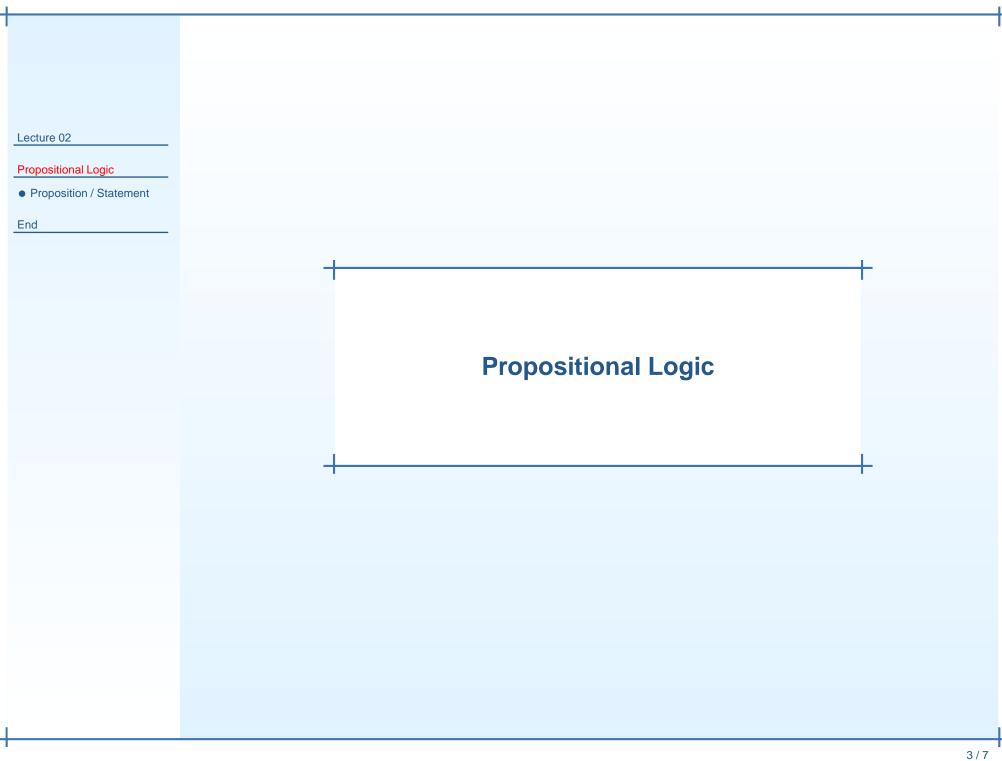
HKOI Training

 $ami \sim wkc$

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Lecture 02

Propositional Logic

Proposition / Statement

End

A statement / proposition is a sentence that has either an answer, "Yes" or "No".1

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Proposition / Statement

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A statement / proposition is a sentence that has either an answer, "Yes" or "No".1

For example, all the following are proposition.

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Proposition / Statement

End

A *statement / proposition* is a sentence that has either an answer, "Yes" or "No". ¹ For example, all the following are proposition.

• Today is hot.

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Propositional Logic

Proposition / Statement

End

- Today is hot.
- $1+2+3=\frac{1}{2}(3)(4)$.

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Proposition / Statement

End

- Today is hot.
- $1+2+3=\frac{1}{2}(3)(4)$. (Yes)

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Proposition / Statement

End

- Today is hot.
- $1+2+3=\frac{1}{2}(3)(4)$. (Yes)
- There are infinitely many prime numbers.

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• Proposition / Statement

End

- Today is hot.
- $1+2+3=\frac{1}{2}(3)(4)$. (Yes)
- There are infinitely many prime numbers. (Yes)

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• Proposition / Statement

End

- Today is hot.
- $1+2+3=\frac{1}{2}(3)(4)$. (Yes)
- There are infinitely many prime numbers. (Yes)

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• Proposition / Statement

End

- Today is hot.
- $1+2+3=\frac{1}{2}(3)(4)$. (Yes)
- There are infinitely many prime numbers. (Yes)
- $\bullet \ \left(\sqrt{x^2}\right)^2 = x. \text{ (No)}$

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End

- Today is hot.
- $1+2+3=\frac{1}{2}(3)(4)$. (Yes)
- There are infinitely many prime numbers. (Yes)
- $x \geq 3$.

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Propositional Logic

• Proposition / Statement

End

- Today is hot.
- $1+2+3=\frac{1}{2}(3)(4)$. (Yes)
- There are infinitely many prime numbers. (Yes)
- $\bullet \ \left(\sqrt{x^2}\right)^2 = x. \text{ (No)}$
- $x \geq 3$.
- If n is a 5-digit square integer, then n = 29929.

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Propositional Logic

• Proposition / Statement

End

- Today is hot.
- $1+2+3=\frac{1}{2}(3)(4)$. (Yes)
- There are infinitely many prime numbers. (Yes)
- $\bullet \left(\sqrt{x^2}\right)^2 = x. \text{ (No)}$
- $x \geq 3$.
- If n is a 5-digit square integer, then n=29929. (Yes)
- x = 2 only if $x^2 = 4$.

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Propositional Logic

• Proposition / Statement

End

- Today is hot.
- $1+2+3=\frac{1}{2}(3)(4)$. (Yes)
- There are infinitely many prime numbers. (Yes)
- $\bullet \left(\sqrt{x^2}\right)^2 = x. \text{ (No)}$
- $x \ge 3$.
- If n is a 5-digit square integer, then n=29929. (Yes)
- x=2 only if $x^2=4$. (Yes)
- x = 2 if $x^2 = 4$.

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End

- Today is hot.
- $1+2+3=\frac{1}{2}(3)(4)$. (Yes)
- There are infinitely many prime numbers. (Yes)
- $\bullet \ \left(\sqrt{x^2}\right)^2 = x. \text{ (No)}$
- $x \ge 3$.
- If n is a 5-digit square integer, then n=29929. (Yes)
- x = 2 only if $x^2 = 4$. (Yes)
- x = 2 if $x^2 = 4$. (No)
- n=2 and n is a prime.

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Propositional Logic

Proposition / Statement

End

- Today is hot.
- $1+2+3=\frac{1}{2}(3)(4)$. (Yes)
- There are infinitely many prime numbers. (Yes)
- $\bullet \left(\sqrt{x^2}\right)^2 = x. \text{ (No)}$
- $x \ge 3$.
- If n is a 5-digit square integer, then n=29929. (Yes)
- x = 2 only if $x^2 = 4$. (Yes)
- x = 2 if $x^2 = 4$. (No)
- n=2 and n is a prime. (Yes)

¹We skip a bit by using "common sense" to determine whether a sentence is a proposition or not.

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End

The following are not propositions or we won't discuss the following kind of sentences.

• What time is it now?

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End

- What time is it now?

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End

- What time is it now?
- (empty string)²

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Proposition / Statement

End

- What time is it now?
- (empty string)²
- This statement is false.

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End

- What time is it now?
- (empty string)²
- This statement is false.
- I am lying. ³

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End

- What time is it now?
- (empty string)²
- This statement is false.
- I am lying. ³
- The second unique child of God is a female.

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Propositional Logic

• Proposition / Statement

End

The following are not propositions or we won't discuss the following kind of sentences.

- What time is it now?
- (empty string)²
- This statement is false.
- I am lying. ³
- The second unique child of God is a female.

Actually, some of them can be considered as statements.

However, for simplicity, we shall avoid them at this moment.

 $^{^2}$ This is usually called the ϵ -string

³The Liar paradox

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End

Given some propositions, we can construct another proposition from them.

• What time is it now?

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Proposition / Statement

End

Given some propositions, we can construct another proposition from them.

• What time is it now?

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Proposition / Statement

End

- What time is it now?
- (empty sentence)

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Proposition / Statement

End

- What time is it now?
- (empty sentence)
- This statement is false.

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Propositional Logic

Proposition / Statement

End

- What time is it now?
- (empty sentence)
- This statement is false.
- I am lying.

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Proposition / Statement

End

- What time is it now?
- (empty sentence)
- This statement is false.
- I am lying.
- The second unique child of God is a female.

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Propositional Logic

Proposition / Statement

End

- What time is it now?
- (empty sentence)
- This statement is false.
- I am lying.
- The second unique child of God is a female.

