Semester roadmap:

Ch 1 & 2: Raw materials
Ch 3: Formal logic
—Test 1, Sept 25 —
Ch 4: Proofs
Ch 5: Relations
— Test 2, Oct 27 —
Ch 6: Self reference
Ch 7: Functions
— Test 3, Nov 29 —

Chapter 3 roadmap:

Today: Logical equivalences (Game 1)

Wednesday: Conditionals (SML)

Friday: Arguments (Game 2)

Next week Monday: Predicates and quantification (SML)

Next week Wednesday: Quantified arguments (Game 3)

Next week Friday: Review for test

Chapter 3 outline:

▶ Propositions, boolean logic, logical equivalences. **Game 1** (Monday)
▶ Conditional propositions. **SML** (Today)
▶ Arguments. **Game 2** (Friday)
▶ Predicates and quantification. **SML** (next week Monday)
▶ Quantified arguments. **Game 3** (next week Wednesday)
▶ Review for test (next week Friday)

So far:

- $\mathbb{B} = \{T, F\}$, $\wedge$, $\vee$, $\sim$, propositional calculus
- Verifying logical equivalences between propositional forms (Game 1)

Today—how to model propositional forms that have an if/then structure (§3.(5–7)):

- Highlight the most important parts
- Highlight the most confusing parts
- Work on some SML examples

p	q	$p \wedge q$	$p \vee q$	$\sim p$	$\sim p \vee q$	$p \rightarrow q$
T	T	T	T	F	T	T
T	F	F	T	F	F	F
F	T	F	T	T	T	T
F	F	F	F	T	T	T

	p		*q*
If	12 divides 36 evenly,	then	3 divides 72 evenly.
If	$3 < 72$,	then	3 divides 72 evenly.
If	12 divides 36 evenly,	then	$72 < 3$.
If	$72 < 3$,	then	3 divides 72 evenly.
If	$72 < 3$,	then	12 divides 3 evenly.

T	S	R	Q	P
K	L	M	N	O
J	I	H	G	F
E	D	C	B	A

1. Bob passed through *P*.

2. Bob passed through *N*.

3. Bob passed through *M*.

4. If Bob passed through *O*, then Bob passed through *F*.

5. If Bob passed through *K*, then Bob passed through *L*.

6. If Bob passed through *L*, then Bob passed through *K*.

"If Fred was at the dock at midnight, then he's the murderer."

"If it's raining at home and the windows are still open, then water is coming in."

"If I were John and John were me, then he'd be six and I'd be three." — A. A. Milne

"If the dryer is finished, then unload it."

"If you finish your spinach, then I will give you some cake."

"If it rains tomorrow, the zucchini will sprout."

An even degree is a necessary condition for a polynomial to have no real roots .
means
If a polynomial function has no real roots, then it has an even degree.

A positive global minimum is a sufficient condition for a polynomial to have no real roots
means
If a polynomial function has a positive global minimum, then it has no real roots.

Values all of the same sign is a necessary and sufficient condition for a polynomial to have no real roots.
means
A polynomial function has values all of the same sign if and only if the function has no real roots.

		(original) conditional	converse	inverse	contrapositive	negation	biconditional
p	q	$p \rightarrow q$	$q \rightarrow p$	$\sim p \rightarrow \sim q$	$\sim q \rightarrow \sim p$	$p \land \sim q$	$p \leftrightarrow q$
T	T	T	T	T	T	F	T
T	F	F	T	T	F	T	F
F	T	T	F	F	T	F	F
F	F	T	T	T	T	F	T

With respect to the conditional proposition
  If the jar is open, then the cookies are gone.

identify each of the following propositions.

- ▶ The jar is open.
- ▶ The cookies are gone.
- ▶ If the cookies are gone, then the jar is open.
- ▶ If the jar is not open, then the cookies are not gone.
- ▶ If the cookies are not gone, then the jar is not open.

Conditional expression:

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if (expr1) then (expr2) else (expr3)
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For next time:
  Pg 108: 3.5.(1 & 2)
  Pg 114: 3.7.(1, 2, 7, 8, 9, 12, 13)

  Read 3.(8 & 9)

  Take quiz