

- (c) If $3 + 4 = 5$ then $3^2 + 4^2 = 7^2$.
- (d) If $3 + 4 = 7$ then $3^2 + 4^2 = 7^2$.
- (e) If any of this semester's CS 70 students are award-winning violinists, then $1 + 1 = 2$.
- (f) If Los Angeles is the state capital of California, then the trillionth digit of π is 7.

In part 6, $\pi = 3.14159\dots$ denotes the ratio of the circumference of a circle to its diameter.

3. (30 pts.) Practice with quantifiers

Which of the following propositions is true? ($\mathbb{N} = \{0, 1, 2, \dots\}$ denotes the set of natural numbers.)

- (a) $(\forall x \in \mathbb{N})(x^2 < 9) \implies (\forall x \in \mathbb{N})(x^2 < 10)$.
- (b) $(\forall x \in \mathbb{N})(x^2 < 10) \implies (\forall x \in \mathbb{N})(x^2 < 9)$.
- (c) $(\forall x \in \mathbb{N})(x^2 < 9 \implies x^2 < 10)$.
- (d) $(\forall x \in \mathbb{N})(x^2 < 10 \implies x^2 < 9)$.
- (e) $(\forall x \in \mathbb{N})(\exists y \in \mathbb{N})(x^2 < y)$.
- (f) $(\exists y \in \mathbb{N})(\forall x \in \mathbb{N})(x^2 < y)$.
- (g) $(\forall x \in \mathbb{N})(\exists y \in \mathbb{N})(x^2 < y \implies x < y)$.
- (h) $(\exists y \in \mathbb{N})(\forall x \in \mathbb{N})(x^2 < y \implies x < y)$.
- (i) $(\forall x \in \mathbb{N})(\exists y \in \mathbb{N})(x < y \implies x^2 < y)$.
- (j) $(\exists y \in \mathbb{N})(\forall x \in \mathbb{N})(x < y \implies x^2 < y)$.