### Propositions

A proposition is a formal statement that is true or false (but not a matter of opinion).

Examples of propositions



Not a proposition:

x = 2

- Building blocks of propositions: primitive or atomic propositions.
  - Notation: p,q,r,...

#### Negation

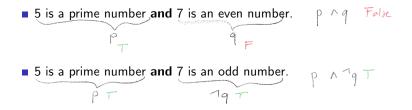
- We can negate a proposition: '37 is an odd number'  $\rightarrow$  37 is NOT an odd number
- The truth value is opposite: the negation of a true proposition is false, the negation of a false proposition is true.
- Notation: p → negation <u>p</u> not p ~ p
- Double negation:  $\neg (\neg \rho) = \rho$

## Conjunction (and)

#### and joins two propositions together.

- Notation: p ^ q p and q
- p and q is true if both p and q are true

#### Conjunction - example



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**Discrete Mathematics** 

# Disjunction (or)

#### • or joins two propositions together.

```
    Notation: p v q
    p or q is true if p is true q is true p and q are true
```

Discrete Mathematics

### Disjunction

- 5 is a prime number or 7 is an even number.
- 5 is a prime number **or** 7 is an odd number.
- 9 is a prime number **or** 7 is an even number *F*

#### **Brackets**

When joining many propositions, you need brackets to disambiguate. Example:

p: vis a prime number. F
q: 9 is divisible by 4. F
r: 1+1=2 T
(p ∧ q) ∨ r True
F T
p ∧ (q ∨ r) False
F T