Basic Logical Operations (*Fascinating*)

In this section you will learn some basic logical operations and how to evaluate expressions

Logic

- Refers to statements that are true or false:
  - 2 + 3 = 5
  - 2 + 3 = 4
  - The number 5
  - lol!

- Logic operations pertinent to this course
  - AND
  - OR
  - NOT

Logical Operations

- There are many logical operations but the three that are used most common include:
  - Logical AND
  - Logical OR
  - Logical NOT

Logical AND

- The popular usage of the AND applies when *ALL* conditions must be met.
  - Example:
  - Pick up your son AND pick up your daughter after school today.

Condition I **Condition II**

- Logical AND can be specified more formally in the form of true table.

Truth table (AND)		
C1	**C2**	**C1 AND C2**
False	False	False
False	True	False
True	False	False
True	*True*	*True*

Logical AND: Three Input Truth Table

Truth table			
C1	**C2**	**C3**	**C1 AND C2 AND C3**
False	False	False	False
False	False	True	False
False	True	False	False
False	True	True	False
True	False	False	False
True	False	True	False
True	True	False	False
True	*True*	*True*	*True*

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Evaluating Logical AND Expressions

- True **AND** True **AND** True
- False **AND** True **AND** True
- True **AND** True **AND** True **AND** True
- True **AND** True **AND** True **AND** False
- False **AND** True **AND** False **AND** True **AND** True **AND** False **AND** False **AND** True **AND** True

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Logical OR

- The correct everyday usage of the OR applies when *ATLEAST* one condition must be met.
- Example:
  - You have asked for additional help in the course from: the course instructor OR the tutorial instructor.

Condition I **Condition II**

- Similar to AND, logical OR can be specified more formally in the form of true table.

Truth table		
C1	**C2**	**C1 OR C2**
False	*False*	*False*
False	True	True
True	False	True
True	True	True

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Logical OR: Three Input Truth Table

Truth table			
C1	**C2**	**C3**	**C1 OR C2 OR C3**
False	*False*	*False*	*False*
False	False	True	True
False	True	False	True
False	True	True	True
True	False	False	True
True	False	True	True
True	True	False	True
True	True	True	True

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Evaluating Logical OR Expressions

- True **OR** True **OR** True
- False **OR** True **OR** True
- False **OR** False **OR** False **OR** True
- False **OR** False **OR** False **OR** False
- False **OR** True **OR** False **OR** True **OR** True **OR** False **OR** False **OR** True **OR** True

Logical NOT

- The everyday usage of logical NOT negates (or reverses) a statement.
- Example:
  - I am finding this class quite stimulating and exciting.....*NOT!!!*

Logical Statement **Negation of the condition**

- The truth table for logical NOT is quite simple:

Truth table	
S	**Not S**
False	True
True	False

Evaluating More Complex Logical Expressions

- True **OR** True **AND** True
- **NOT** (False **OR** True) **OR** True
- (False **AND** False) **OR** (False **AND** True)
- False **OR** (False **OR** True) **AND** False
- **NOT NOT NOT NOT** True
- **NOT NOT NOT NOT** False
- **NOT NOT NOT** False

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Why Learn About Logic

- Using programs
  - Logical operations are often used in searches (database queries – next slide).
- Writing programs
  - The results of logical expressions can determine what happens when a program is running (more on this later).

(Has quest object) AND (player is alive)

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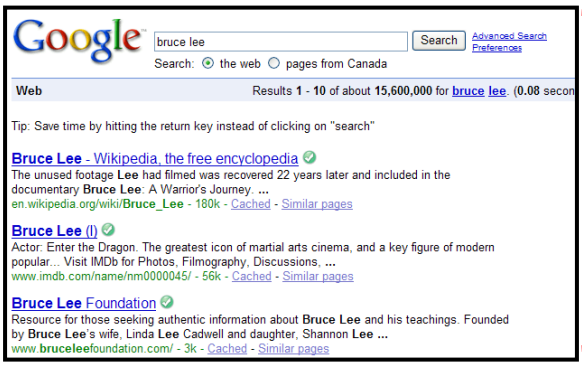
Application Of Logical AND: Using Programs

- Search for all documents that contain the name '*Bruce*' AND the name '*Lee*'



Pages must have both words to show up as a search result

You Should Now Know

- The different types of logical operations that a computer may perform:
  - AND
  - OR
  - NOT
- The role of logic in software
- How to trace the output or outcome of logical expressions