Logic and Boolean Expressions

CPSC 110

J. Michael Moore
Decision-Making With Multiple Expressions

- **Format:**
  
  if (Boolean-expression) logical-operator (Boolean-expression) then
  
  body;

- **Example:**

  if (x > 0) AND (y > 0) then
    writeln ('X is positive, Y is positive');

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Decision-Making With Multiple Expressions (2)

• Built-in logical operators in Pascal
  • _____
  • _____
  • _____
  • _____
  • (NAND and NOR can be constructed by combining _____ with _____ & _____ with _____)

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Compound Boolean Expressions With “OR” Operator

• **Format:**
  
  if (Boolean-expression) OR (Boolean-expression) then
  body;

• **Example:**

  if (gpa > 3.7) OR (yearsJobExperience > 5) then
  writeln(‘You are hired’);
Compound Boolean Expressions
With “AND” Operator

• **Format:**

  if (Boolean-expression) AND (Boolean-expression) then
  body;

• **Example:**

  if (yearsOnJob <= 2) AND (isGoofOff = True) then
  writeln(‘You are fired’);
Compound Boolean Expressions With “XOR” Operator

• Format:

if (Boolean expression) XOR (Boolean expression) then
  body;

• Example:

if (takesFirstJob = true) XOR (takesSecondJob = true) then
  isEmployed := true;

  OR

if (takesFirstJob) XOR (takesSecondJob) then
  isEmployed := true;
Compound Boolean Expressions
With “NOT” Operator

• **Format:**

```plaintext
if NOT (Boolean expression) then
  body;
```

• **Examples:**

```plaintext
if NOT (x AND y) then
  writeln('NAND');
if NOT (x OR y) then
  writeln('NOR');
```

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# Order Of The Operations

<table>
<thead>
<tr>
<th>Order/Priority</th>
<th>Operator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>___</td>
</tr>
<tr>
<td>2</td>
<td>___ ___ ___ ___ ___ ___</td>
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<tr>
<td>3</td>
<td>___ ___ ___</td>
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<tr>
<td>4</td>
<td>___ ___ ___ ___ ___ ___</td>
</tr>
</tbody>
</table>

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Why Bracket Boolean Expressions

• Compound Boolean expressions
  – e.g., if $x > 0 \text{ AND } y > 0$ then

  AND has ______ _______ so the ‘0’ and ‘y’ become operands for this operation
Range Checking

• What about doing $(x < y < z)$ to check if $y$ is in the proper range?
  – Use __________________________
Quick Summary: Using Multiple Expressions

- Use multiple expressions when multiple Boolean expressions must be asked and the result of each expression may have an effect on the other expressions:
  - **AND:**
    - All Boolean expressions must evaluate to **true** before the entire expression is **true**.
    - If any expression is **false** then whole expression evaluates to **false**.
  - **OR:**
    - If any Boolean expression evaluates to **true** then the entire expression evaluates to **true**.
    - All Boolean expressions must evaluate to **false** before the entire expression is **false**.

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