BYU
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Boolean Expressions

CS 124 – Intro to Software Development

Macbeth – Lesson 3.3

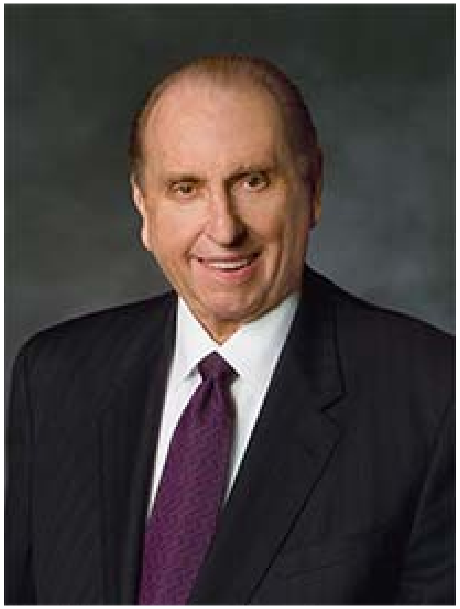
Agenda

- Opening Prayer
- Music Friday
- Q&A
  - Questions about Project
  - Questions about Functions
  - Review Assignment
- Boolean Expressions
- Looking Ahead

Music Friday

We Thank Thee, O God, for a Prophet (Hymns 19)

We thank thee, O God, for a prophet
To guide us in these latter days.
We thank thee for sending the gospel
To lighten our minds with its rays.
We thank thee for every blessing
Bestowed by thy bounteous hand.
We feel it a pleasure to serve thee
And love to obey they command.



Q&A

- Questions about Project
- Questions about Functions
- Review Assignment
  - What was the hardest part?
  - How did you solve it?

Boolean Expressions

- Boolean expressions will always result in `true` or `false`.
- Boolean expressions use boolean operators.

Boolean Operator	Example	Description
&& (and)	`x && y`	True when both x and y are true
|| (or)	`x || y`	True when either x or y are true
! (not)	`!x`	True when x is false
== (equivalent)	`x == y`	True when x and y are the same
!= (not equivalent)	`x != y`	True when x and y are different
< (less than)	`x < y`	True when x is less than y.
<= (less than or equal)	`x <= y`	True when x is less than or equal to y
> (greater than)	`x > y`	True when x is greater than y
>= (greater than or equal)	`x >= y`	True when x is greater than or equal to y

Important Note: == and = are different

Examples

Boolean Expression	True or False?
`bool a = true && (true || false);`	`true`
`bool b = (! true) || (! false);`	`true`
`bool c = (300 != 310) && (170 == 170);`	`true`
`bool d = (1 > 2) || (2 > 3) || (3 > 4);`	`false`

More Interesting Example

```
bool isEven(int number)
{
   bool result = ( number % 2 == 0 );
   return result;
}
```

Order of Operations

- Order of Operations has been expanded to include the boolean operators.
- Single operand operators first (unary), then two operand operators (binary), and then assignment operator.
- Math operators are done before boolean operators
- Unlike + (add) and – (subtract), the boolean operator && (and) is always done before the | | (or)

Operator	Description
( )	Parentheses
++ - -	Increment, Decrement
!	Not
* / %	Multiply, Divide, Modulo (Remainder after Dividing)
+ -	Add, Subtract
> >= < <=	Greater Than, Less Than
== ! =	Equality, No Equality
&&	And
| |	Or
= += - = * = /= %=	Assign

unary operators

binary operators

Looking Forward

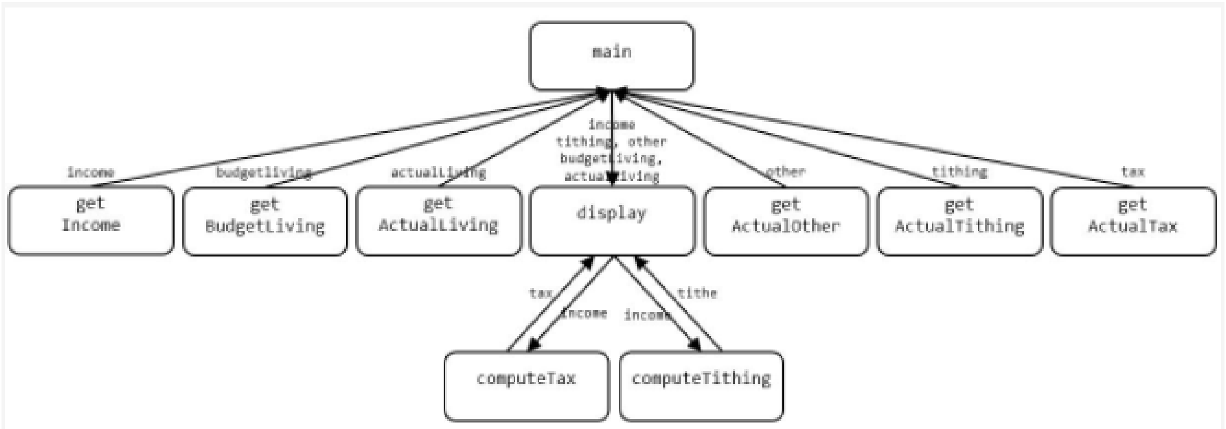
- End of Day Saturday
  - 03 Ponder – Submit project
  - Last chance to submit assign13, assign14, and assign15
- Before Class on Monday
  - 1.6 Prepare
    - Read Chapter 1.6 IF Statements
    - Submit assign16
- First Unit Test will be next Friday. We will be practicing on Wednesday together.
- Extra Practice (optional)
  - Write a function that determines if a number is multiple of a number. Here is the function interface:

    ```
    void isMultiple(int number, int multiple, bool &result)
    ```
  - The function should set result to True if `number` is a multiple of `multiple`. If not, then set to False.
  - Test the function by calling it in a main function.

Backup Slides for Project

Project 03

- Make a copy of project 02.
- Create functions to match the structure chart shown in the project



- Read (and re-read) all the instructions and notes in the project.

Project 03

- Create the following functions:
  - getIncome – Use cout and cin to return the income (budget and actual)
  - getBudgetLiving – Use cout and cin to obtain and return the living budget
  - getActualLiving – Use cout and cin to obtain and return the living actual
  - getActualOther – Use cout and cin to obtain and return the other actual
  - getActualTithing – Use cout and cin to obtain and return the tithing actual
  - getActualTax – Use cout and cin to obtain and return the tax actual
  - computeTax – Takes the income as an input. For this project, return 0.0
  - computeTithing – Takes the income as an input. Returns 10% of the income.
  - display –
    - Takes the income, living budget, living actual, tax actual, tithing actual, and other actual as inputs.
    - Calls computeTax and computeTithing.
    - Calculates the actual difference (the assignment has the formula). Note that the budget difference is still 0.0 for this project.
    - Display the table
  - main – Modify it to call the "get" functions above and then call the display function passing the values returned from the "get" functions.