# Day 7: Branching

# Quiz

- 10 questions until 11:10a
- Turning mobile session: andersoncsf22

# Agenda

- Quiz (which is complete)
- Review Quiz questions
- In class assignment

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# Quiz questions

- 3.8.1.2
- 3.9.2.1
- 3.9.2.3
- 3.10.2.2
- 3.10.4.1
- 3.10.4.4
- 3.10.5.1

# Quiz questions

```c
#include <stdio.h>

int main(void) {

char branchAnswer1;
char branchAnswer2;
char branchAnswer3;
char branchAnswer4;
char branchAnswer5;
char branchAnswer6;

if (1) {
  branchAnswer1 = 'T';
} else {
  branchAnswer1 = 'F';
}

if (0) {
  branchAnswer2 = 'T';
} else {
  branchAnswer2 = 'F';
}
```

```c
if (-1) {
  branchAnswer3 = 'T';
} else {
  branchAnswer3 = 'F';
}

if (1 - 1) {
  branchAnswer4 = 'T';
} else {
  branchAnswer4 = 'F';
}

if (1 == 2) {
  branchAnswer5 = 'T';
} else {
  branchAnswer5 = 'F';
}

if (-6) {
  branchAnswer6 = 'T';
} else {
  branchAnswer6 = 'F';
}
```

```c
printf("Expression (1) is %c\n", branchAnswer1);
printf("Expression (0) is %c\n", branchAnswer2);
printf("Expression (-1) is %c\n", branchAnswer3);
printf("Expression (1-1) is %c\n", branchAnswer4);
printf("Expression (1==2) is %c\n", branchAnswer5);
printf("Expression (-6) is %c\n", branchAnswer6);

return 0;
}
```

```
● (base) monicaherzog@Monicas-MacBook-Pro CS1-F22 % gcc run-tf.c
● (base) monicaherzog@Monicas-MacBook-Pro CS1-F22 % ./a.out
  Expression (1) is T
  Expression (0) is F
  Expression (-1) is T
  Expression (1-1) is F
  Expression (1==2) is F
  Expression (-6) is T
○ (base) monicaherzog@Monicas-MacBook-Pro CS1-F22 % ☐
```

# Debugging conditionals



```c
#include <stdio.h>

int main(void) {

    char maritalStatus;
    double hourlyRate;
    double hoursWorked;
    const double MINIMUMWAGE = 7.25;
    double grosspay;
    double federalWithheld;
    double socialSecurityWithheld;
    double netpay;

    printf("\nEnter s if you are single and m if you are married\n");
    scanf("%c", &maritalStatus);
    if (maritalStatus != 's' && maritalStatus != 'm') {
        printf("ERROR: Marital status is not is not s or m\nExiting\n");
        return 0;
    }

    printf("\nEnter the hourly rate\n");
    scanf("%lf", &hourlyRate);
    if (hourlyRate < MINIMUMWAGE) {
        printf("ERROR: Hourly rate below minimum wages\nExiting\n");
        return 0;
    }

    printf("\nEnter the hours worked\n");
    scanf("%lf", &hoursWorked);
    if (hoursWorked <= 0) {
        printf("ERROR: Hours worked not valid\nExiting\n");
        return 0;
    }

    printf("\nDEBUG: status:%c rate:%lf hours:%lf\n\n", maritalStatus, hourlyRate,
        hoursWorked);
```

a. Gross pay is the total of regular and overtime pay.
b. Regular pay is the hourly rate * hours worked for up to 40 hours worked
c. Overtime pay is hourly rate * number of hours worked over 40 * 1.5
d. All employees have 6.2% of their check withheld for social security
e. For federal taxes, married employees will have no taxes withheld if their gross pay is less than or equal to $400, 11% if the gross pay is greater than $400 but less than $800 and 15% if the gross pay is $800 or more
f. For federal taxes, single employees will have no taxes withheld if their gross pay is less than or equal to $300, 12% if the gross pay is greater than $300 but less than $600 and 16% if the gross pay is $600 or more
g. Net pay is the gross pay minus the social security withheld and the federal taxes withheld
h. The hourly rate must be at or greater than the minimum wage (currently $7.25 in Alabama)
i. If the hour rate is too low, there are no hours worked (hours worked reported is not a positive number) or the marital status is not 's' or 'm', print an error and exit.

# Assignment/Announcements

- Assignment: Day 7
  - Debugging conditionals
- Friday
  - **CHANGE:** Quiz over Zybooks 2.13, 2.14, 3.13-3.15
- Project 1 due 9/5 @ 11:59pm

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End of class

# Knowledge

- Syntax and semantics of decision blocks:
    - if, if-else, if-else statement block construction
    - Use of braces to create multi-statement blocks
    - Incorporation of expressions to make decisions

- Relational operators: **== != < <= >= >**

- Logical operators: &&(and)  || (or)  !(not)

- Evaluation of Boolean and non-Boolean expressions

# Skills

- Identify the logic needed to implement the branching required in a problem

- Encode expressions (including compound expressions) that make decisions based on the values in numeric variables (integer or double)

- Structure program block so statements execute appropriately based on the expression

- Debug the execution of branching to identify logic errors

# Prework/External resources

- Zybooks 3.1-3.8
- Zybooks 3.9-3.12

# Day 6: Quiz Content

# Quiz-based review

- **Valid syntax -Simple expressions/**Compound expressions (If-elseif)

Which ones are valid syntax?

```
if (1) {print ("Expression is true");} else {print ("Expression is true");}
if (1) {print ("Expression is true");} else if (1) {print ("Expression is true");} {print ("Expression is true");}
if (1) {print ("Expression is true");} elsif (1) {print ("Expression is true");} then {print ("Expression is true");}
```

**Valid syntax and simple expressions**

Valid syntax? If so, what is printed?

```
int value=29;

if (value = 1) print ("Expression is true");

if value== 0 print ("Expression is true");

if ( 0 != value) print ("Expression is true");

if (!value) print ("Expression is true");

if (value+2 <= 26) print ("Expression is true") Dealing with equality

if (value != value) {

printf("value = %d",value)

};
```

**Multiple blocks and compound expression**

What is printed given the variables assignments?

a. bonusVal=0, numItems=16;   b. bonusVal=11, numItems=45;

c. bonusVal=10.5, numItems=40;              d. bonusVal=26, numItems=-13;

```
If (bonusVal > 1 && bonusVal < 10){numItems = numItems + 1; } elseif (bonusVal == 10) {numItems = numItems + 3;  } elseif (bonusVal > 11){numItems = numItems %10; } printf("numitems = %d",numItems);
```

**Logical operators (what's printed)**

```
if (1 && 0) {printf("Option 1");}

if (1 || 0) {printf("Option 2");}

if (0 && 1) {printf("Option 3");}

if (-1 || 2) {printf("Option 4");
```

**Assignments vs equality**

What is printed if value is

a. 0 b. 10 c. -1
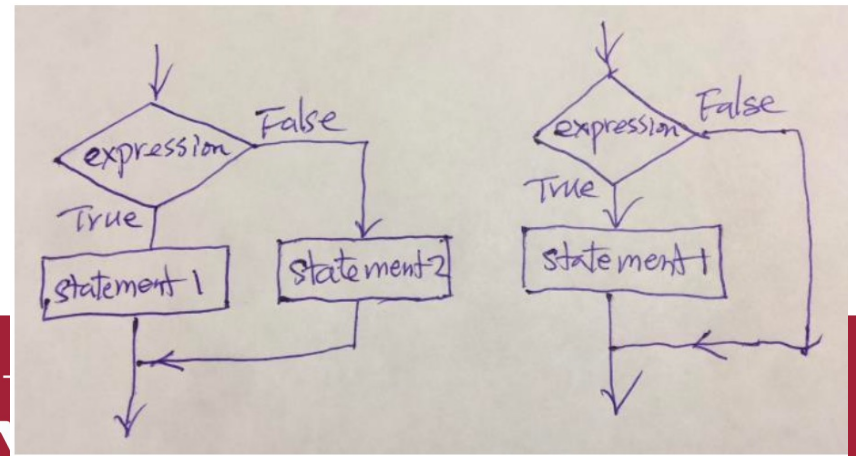
```
int value=<value>; if (1 && (value=0)) { printf("Option 5 %d",value); } printf("Value %d",value);}
```

# Day 6: Questions of logic

A program reads a score and prints pass or fail based on its value

- What expression would be needed to print pass?
- Which flowchart represents the program branching? if-then or if-then-else



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# Day 6: Questions of logic

A program reads a score and prints A, B, C, D, F based on its value

- How many expressions need to be checked?  How do you know?

- What would the expressions be?

# Day 6: Questions of logic

A program reads in an integer and prints whether it is odd or even

- Which flowchart structure represents the branching needed?
- What expression can identify an even number?
- Do you need an expression to identify an odd number?
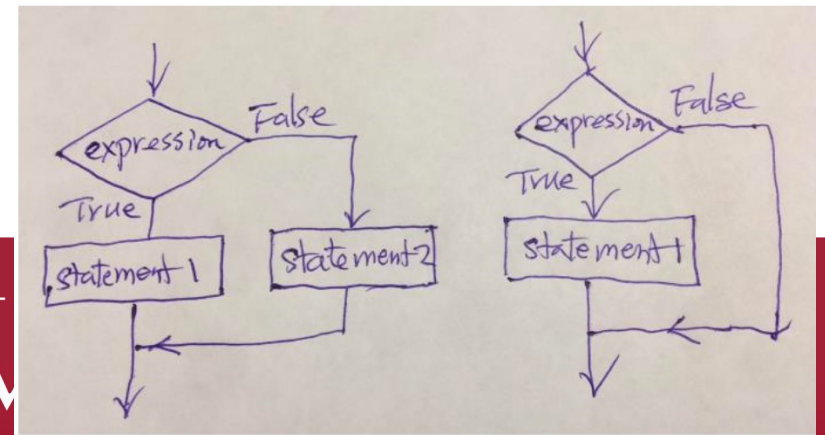
# Day 6: Team exercise

Write and submit the following programs:

- A program that reads in an integer from the user and prints whether it is odd or even

- A program reads in three values and prints the largest value

- A program that reads a score from the user prints A if the score is 90 or above, B if below 90 but 80 or greater, C if below 80 but 70 or greater, D if below 70 but 60 or above and E if the score is below 60

# Day 7: Team exercise

Write and submit the following programs:

- Reads three integers and prints the range

- Read three integers and print a how many of them are the same (print "all three match" or "two match" or "no matches")

- Reads three numbers and prints "ascending" if they are in strictly ascending order and "descending" if they are in strictly descending order and "no order" otherwise