ECS30: Homework #3 – Written part *(100 pts)*

- Due before **11:59pm, Friday February 9ᵗʰ, 2017**
- You are to work with a partner for this homework

Partner #1:
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1. Which of the following identifiers are **not** legal variable names in C. Briefly explain why. *(15pts)*

   ```
   x              formula1       average_rainfall   %correct
   short          tiny           total output       aReasonablyLongVariableName
   12MonthTotal   marginal-cost  b4hand             _stk_depth
   ```

   > Invalid:
   > %correct :identifier can't begin with %
   > 12MonthTotal: identifier can't begin with numbers
   > marginal-cost: identifier can't contain -
   > _stk_depth: identifier can't start with _
   >
   > Ambiguous:
   > x : not descriptive, but can use as a temporary variable

2. By applying the appropriate precedence rules, calculate the result of each of the following expressions: *(4pts)*

   ```
   1. 6 + 5 / 4 - 3
   2. 2 + 2 * (2 * 2 - 2) % 2 / 2
   3. 10 + 9 * ((8 + 7) % 6) + 5 * 4 % 3 * 2 + 1
   4. 1 + 2 + (3 + 4) * ((5 * 6 % 7 * 8) - 9) - 10
   ```

   > 1. result: 4.25
   > 2. result: 2
   > 3. result: 42
   > 4. result: 42

3. Given the constants and variable definitions:

```
#define PI 3.14159
#define MAX_I 1000
...
double x, y;
int a, b, i;
...
y = -1.0; a = 3; b = 4;
```

Indicate which of the following (independent) statements are valid and find the value stored by each valid statement. For invalid statements, briefly explain why they are invalid. *(24pts)*

```
i = a % b;
```
        i=3

```
i = (989 - MAX_I) / a;
```
        i=-3

```
i = b % a;
```
   i=1

```
x = PI * y;
```
   x=-3.141590

```
i = a / -b;
```
   i=0

```
x = a / b;
```
     invalid because x is double but a/b is int

```
x = a % (a / b);
```
     invalid because x is double but a%(a/b) is int

```
i = b /0;
```
     invalid because numbers can't be divided by 0

4. What is the output of the following fragment of code? *(15pts)*

```
char z1, z2, z3, z4, z5, z6, z7;
z1 = 'z';
z2 = '\n';
z3 = 'Z';
z4 = '\\';
z5 = '\t';
z6 = '\'';
z7 = 'y';
printf("%c%c%c%c%c%c%c", z1, z2, z3, z4, z5, z6, z7);
```

```
z
Z\	'y
```

5. Evaluate each of the following expression if variable a is 6, variable b is 9, variable c is 14, and variable flag is 1. In case some parts of these expressions are not evaluated due to short-circuit evaluation, circle them out. *(14pts)*

`c == a + b || !flag`	ture
`a != 7 && flag || (c >= 6)`	true
`!(b <= 12) && (a % 2 == 0)`	false
`!(a > 5 ||(c < a + b))`	false

6. Implement the flow diagram using a nested `if` structure. Use a multiple-alternative `if` for intermediate decisions where possible. *(20pts)*
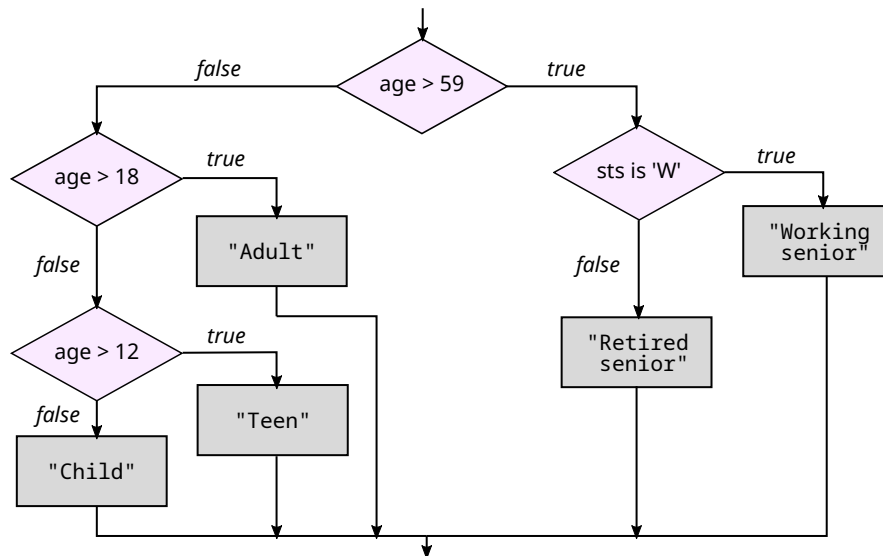

```
    if(age>59){
      if(sts=='W'){
        "Working senior"
      }else{
        "Retired"
      }

      if(age>18){
        "Adult"
      }else if(age>12){
        "Teen"
      }else {
        "Child"
      }
    }
```

7. What output value is displayed by the following while loop for a data value
   of 5? Of 6? Of 7? *(8pts)*

```
scanf("%d", &x);
product = x;
count = 0;
while (count < 4) {
    product *= x;
    count += 1;
}
printf("%d\n", product);
```

In general, for a data value of any number n, what does this loop display?

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x=5 output: 5^5
x=6 output: 6^5
x=7 output: 7^5
x=n output: n^5