1. **HOW CAN YOU TELL** that a declaration statement declares a named constant?

2. **HOW CAN YOU TELL** that a declaration statement declares a variable?

3. **WHAT IS THE DIFFERENCE** between a constant and a variable? **NOTE:** This question is **NOT** about how can you tell what a declaration statement declares.

4. **WHAT IS THE DIFFERENCE** between a named constant and a literal constant? **NOTE:** This question is **NOT** about how can you tell what a declaration statement declares.

5. **WHY** are numeric literal constants in the body of a program BAD BAD BAD?

6. **WHY** are named constants in the body of a program GOOD?

7. For each of the following, **WRITE A DECLARATION STATEMENT** for a named constant representing this quantity. For each, you should choose an appropriate data type and initialization value. The name should comply with the “favorite professor” rule, and should also be a valid C identifier. Assume that **int** variables and **float** variables take 4 bytes (32 bits) each.
   (a) normal human body temperature in degrees Fahrenheit

   (b) boiling temperature of water in degrees Celsius (at sea level on Earth, in case you’re picky)

   (c) length of a day in hours

8. **YES OR NO:** Are literal constants declared?

9. **WRITE** the shortest possible **VALID** C program. (Here, **valid** means acceptable to the compiler. The program does not have to be useful, nor does it have to follow any of this course’s rules for programming projects.) What does it do when you run it?
10. **WHY** can C only **approximate** most (mathematical) real numbers?

11. On a Linux PC under the GNU gcc compiler (the compiler being used in this course), **HOW MANY BITS** are in an int? Therefore, **HOW MANY DIFFERENT POSSIBLE VALUES** could an int variable represent?

12. On a Linux PC under the GNU gcc compiler (the compiler being used in this course), **HOW MANY BITS** are in a float by default? Therefore, **HOW MANY DIFFERENT POSSIBLE VALUES** could a float variable of the default number of bits exactly represent?

13. Consider each of these values. **MATHEMATICALLY**, does it represent an integer? **EXPLAIN.**
   (a) 344513.0000000000000000000000000000000000000
   (b) 344513.000000000000000000000000000000000001
   (c) −1281023984
   (d) −6/3
   (e) +9/5
   (f) 1 · 10^{18}

14. Consider each of these numeric literal constants. **COMPUTATIONALLY**, does it represent an integer? **EXPLAIN.**
   (a) 344513.000000000000000000000000000000000000
   (b) 344513.000000000000000000000000000000000001
   (c) −5281023984
   (d) 1E+15

15. **NAME THREE REASONS** why computers use both integers and real numbers.
   (a)
   (b)
   (c)
16. **GIVE TWO EXAMPLES** of unary arithmetic operations (NOT operators).
   
   (a) 
   
   (b) 

17. For the two examples of unary arithmetic operations, above, **WHAT ARE THE ASSOCIATED OPERATORS?**

   (a) 
   
   (b) 

18. **GIVE TWO EXAMPLES** of binary arithmetic operations (NOT operators).

   (a) 
   
   (b) 

19. For the two examples of binary arithmetic operations, above, **WHAT ARE THE ASSOCIATED OPERATORS?**

   (a) 
   
   (b) 

20. **WHAT IS THE DIFFERENCE** between dividing an int by an int and dividing a float by a float? **BE SPECIFIC AND USE THE CORRECT TERMINOLOGY.**

21. **WHAT IS THE DIFFERENCE** between dividing an int by a float and dividing a float by a float? **BE SPECIFIC AND USE THE CORRECT TERMINOLOGY.**

22. **WHY** is the use of numeric literal constants in the body (execution section) of a program considered to be bad programming practice?
23. **WHAT IS THE DATA TYPE** of each of the following literal constants? If the item ISN’T a valid literal constant, mark it INVALID and EXPLAIN.

(a) 2004982098

(b) 2004982098.0

(c) 2,004,982,098

(d) −2004982098

(e) --2004982098

(f) 2004982098-

(g) −3529.3098e+10

(h) −3529.3098e−10

(i) 2e−05

(j) 2.0e−05

(k) 0

(l) 0.0

(m) "Howdy do!"

(n) "Huh?

(o) What do you want?"
24. **WHAT IS THE OUTPUT** of each of these programs? Examine the programs **CAREFULLY**. If a program won’t compile, mark **WON’T COMPILe** and **EXPLAIN**. If a program compiles and runs but does not produce any output, mark **NO OUTPUT** and **EXPLAIN**. If a program compiles and runs but produces garbage output, mark **GARBAGE** and **EXPLAIN**. If you are not confident of an answer, type in, compile and run the program.

(a) #include <stdio.h>
    int main ()
    { /* main */
        int x = 5, y = 7, z;
        
        x = x + 5;
        z = x * y;
        printf("x = %d, y = %d, z = %d\n", x, y, z);
    } /* main */

(b) #include <stdio.h>
    int main ()
    { /* main */
        int x = 5, y = 7, z;
        
        y = y * 5;
        z = x + y;
        printf("%d %d %d\n", x, y, z);
    } /* main */
25. A C program has the following declarations:

```c
float x = 10.0, y = 5.5, z = 2.1;
int  i = 3, j = 5, k = 7, m;
```

Evaluate each of the following expressions. **Show Your Work**, including the type of each subexpression (indicating a `float` with a decimal point). If the expression would compile and runs but would produce garbage output, mark **Garbage** and **Explain**. If you are not confident of your answer, type in, compile and run an appropriate program.

(a) `y / x`

(b) `i % j`

(c) `k + z`

(d) `100 / i - x`

(e) `324 / m - 12`

(f) `i % (j - 3) % 3`
26. **WHAT IS THE OUTPUT** of each of these programs, for each of the following inputs? (You do not need to show the output of the greeting nor the prompt message.) Examine the programs **CAREFULLY.** If you are not confident of your answer, type in, compile and run the programs.

(a) #include <stdio.h>

```c
int main ()
{ /* main */
    const float standard_deduction = 4150.0;
    const float single_exemption  = 2650.0;
    const float tax_rate         = 0.15;
    const int  tax_year          = 1997;

    float income, tax;

    printf("I'm going to calculate the federal income tax\n");
    printf(" on your %d income.\n", tax_year);
    printf("What was your %d income in dollars?\n", tax_year);
    scanf("%f", &income);
    tax = (income -
           (standard_deduction + single_exemption)) *
           tax_rate;
    printf("The %d federal income tax on $%2.2f\n", tax_year, income);
    printf(" was $%2.2f.\n", tax);
} /* main */
```

i. 30000

ii. 40000

iii. 100000
(b) #include <stdio.h>

int main ()
{
    /* main */
    const float standard_deduction = 4300.0;
    const float single_exemption = 2750.0;
    const float tax_rate = 0.15;
    const int tax_year = 1999;

    float income, tax;

    printf("I'm going to calculate the federal income tax\n");
    printf(" on your %d income.\n", tax_year);
    printf("What was your %d income in dollars?\n", tax_year);
    scanf("%f", &income);
    tax = (income -
          (standard_deduction + single_exemption)) * tax_rate;
    printf("The %d federal income tax on $%2.2f\n", tax_year, income);
    printf(" was $%2.2f.\n", tax);
} /* main */

i. 30000

ii. 40000

iii. 100000

27. Numeric literal constants can be used in several ways, some of which are good programming practice and some of which are bad programming practice. **MARK** each of the following uses as either **GOOD** or **BAD**.

(a) const int feet_per_fathom = 6;
(b) float height_in_m = 1.6;
(c) snow_depth_in_inches = 2;
(d) degrees_fahrenheit = degrees_celsius * (9.0 / 5.0) + 32.0;

If you use **ANY** resources other than Dr. Neeman, the TAs (Badre, Borah, Lee, Sadri), the course textbook or the materials posted on the course webpage, you **MUST** reference them on the quiz. **THIS INCLUDES CLASSMATES, FRIENDS, PROFESSORS, ONLINE RESOURCES, ETC.**