1. General Computer Questions

1. What is meant by “computer hardware”? Give 2 examples.
   
   *Equipment used for computing. CPU, Hard disk*

2. What is meant by “computer software”? Give 2 examples.
   
   *Programs or instructions which a computer executes. Operating system, word processor.*

3. What is a “compiler”? 
   
   *A program that translates high-level programming language into machine code.*

4. What is a “flowchart”? 
   
   *A pictorial representation of a program.*

5. What is a “high-level language”? 
   
   *A programming language resembling English.*
6. What is a “Keyword”? Give two examples.

A reserved word in a programming language, e.g., it has special meaning. Int, main

7. What is the difference between a “constant” and a “variable”?

Constants may not change value in a program, variables may.

8. What is an “operating system”?

The main interface program between the operator and the computer.

2. Flowcharts

1. Develop a flowchart that determines the largest of three numbers using the following simple two-step method: (1) Compare the first number with the second number and select the larger of the two; (2) Compare the number chosen in step (1) with the third number and select the larger.

```
Max > y
Max = y
Max > z
Max = z
Print Max
```
3. Number Systems

1. Determine the decimal (base 10) integer representations of the following signed binary numbers:

   (a) 10101

   (b) 1101101

2. Determine the signed binary integer representations of the following decimal (base 10) integers:

   (a) 23

   (b) 360

3. Determine the decimal (base 10) integer representations of the following signed binary numbers:

   a. 0111001  (ANSWER = 1x2^5 + 1x2^4 + 1x2^3 + 1x2^0 = 57)

   b. 01101101 (ANSWER = 1x2^6 + 1x2^5 + 1x2^5 + 1x2^2 + 1x2^0 = 109)

4. Determine the binary representations of the following decimal (base 10) integers, state if my answer includes the sign bit or not :

   a. 42  (ANSWER = 101010)

   b. 1997 (ANSWER = 1111001101)

5. What is the binary (base two) equivalent of the decimal (base ten) integer 156?

<table>
<thead>
<tr>
<th>2^7=128</th>
<th>2^6=64</th>
<th>2^5=32</th>
<th>2^4=16</th>
<th>2^3=8</th>
<th>2^2=4</th>
<th>2^1=2</th>
<th>2^0=1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>128</td>
<td></td>
<td></td>
<td>+16</td>
<td>+8</td>
<td>+4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>128</td>
<td></td>
<td></td>
<td>+16</td>
<td>+8</td>
<td>+4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6. What is the decimal (base ten) equivalent of the binary (base two) integer 10100011?

<table>
<thead>
<tr>
<th>$2^7$</th>
<th>$2^6$</th>
<th>$2^5$</th>
<th>$2^4$</th>
<th>$2^3$</th>
<th>$2^2$</th>
<th>$2^1$</th>
<th>$2^0$</th>
</tr>
</thead>
<tbody>
<tr>
<td>128</td>
<td>64</td>
<td>32</td>
<td>16</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

163\textsubscript{10} = 10100011\textsubscript{2}

7. If a “nibble” is 4 bits, what is the largest integer that can be represented by a nibble?

<table>
<thead>
<tr>
<th>$2^3$</th>
<th>$2^2$</th>
<th>$2^1$</th>
<th>$2^0$</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

15\textsubscript{10} = 1111\textsubscript{2}

8. Perform the following binary addition: 01011101 + 00000011 = __________

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>1</th>
<th>0</th>
<th>1</th>
<th>1</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

So: 01011101 + 00000011 = 01100000

5. Programming Language Facts

1. Circle the valid constants:

<table>
<thead>
<tr>
<th>15</th>
<th>xyz</th>
<th>*</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.123</td>
<td>15.</td>
<td>-999</td>
<td>0.123</td>
</tr>
</tbody>
</table>
2. Circle the valid variable names:

3id  _ _yes  o_no_o_no  00_go  star*it
1_i_am  one_i_aren't  me_to-2  xYshouldI  int
MAX_ENTRIES  double  time  G  Sue's
this_is-_a_long_name  xyz123  part#2  char
string

4. Evaluate the expressions (a) - (d):

m and n are integer variables
x and y are double variables
m = 5, n = 2
x = 10.5, y = 7.2;

a) x / m
b) n*m
c) n / m + y
d) n / m

5. What value is assigned to x if y is 15.0?

a) x = 25.0
   if (y != (x - 10.0)) then
   {
      x = x - 10.0
   }else
   {
      x = x / 2.0
   }

b) if (y < 15.0) then
   {
      if (y = 0.0) then
      {
      }
x = 5 * y
} else
{
  x = 2 * y
}
} else
{
  x = 3 * y
}

6. If $x = 15.0$ and $y = 25.0$, what are the values of the following conditions?

a) $x \neq y$

b) $x < y$

c) $x = y - x$

d) $x = x + y - y$

8. If $a$ and $b$ are integers and $a = 10$ and $b = 7$, compute the values of each of the following expressions:

a. $a \mod 5 * b \mod 5$ (ANSWER = 2)

b. $1.5 \mod b * a + 4.0$ (ANSWER = 4 or 6)

9. Give equivalent logical expressions without using the negation sign:
(a) $!(a + 1 == b + 1)$
(b) $!(a <= b && c <= d)$
(c) $!(a < 1 || b < 2 && c < 3)$

10. Complete the following table when $a$, $b$, and $c$ are integer variables and $x$ is a double variable

<table>
<thead>
<tr>
<th>Expression</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$a &amp;&amp; c &lt; d$</td>
<td></td>
</tr>
<tr>
<td>$a &lt; ! b</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>a = 1, b = 2, c = 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>x = 1.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>a = 1, b = 2, c = 3</th>
</tr>
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<tbody>
<tr>
<td>x = 1.0</td>
</tr>
</tbody>
</table>
15.

d. Write the first line of a function that takes three type string arguments and returns a type double to the calling program.

e. Write a function that receives two numbers as arguments. The function should divide the first number by the second, but not if the second number is zero.

16.

a. What is the index value of the first element in an array? 0 or 1

b. Can I use a subscript on an array that is larger than the number of elements in the array? Yes or No

c. Can I use an array without initializing it? Yes or No

d. How many dimensions can an array have? 1 2 3 or more

e. Write a declaration for an array that will hold 50 type "double" values.

f. Write a program that initializes an array of 10 elements. Each element should have a value equal to its subscript. The program should then print each of the 10 elements.

17. Write a program to print the message “Hello World!” on the computer screen.

18. Name three “relational operators”.

19. Name two “logical operators”.

20. True ___ or False ___ : The following integer type variables are legal:

    1cat, 2dogs, 3pears, %area

21. True ___ or False ___ : The following double type variables are legal:

    cat, dogs2, pears3, cat_number
22. Circle the valid variable names

lotus123, A+B23, A(b)c, AaBbCc, Else, αβχ, pi, π

23. Mark as correct or incorrect the following assignment statements:

Correct ___ Incorrect ___  year = 1967
Correct ___ Incorrect ___  1967 = oldYear;
Correct ___ Incorrect ___  day = 24 hours;
Correct ___ Incorrect ___  while = 32;

24. True ___ or False ___ : The term 5 Mod 3 is equal to 2, and 3 Mod 5 is equal to 3.

25. Mark as correct or incorrect the following statements where a, b, and c are integers
variables and x, y, and z are double variables:

Correct ___ Incorrect ___  a+b = c;
Correct ___ Incorrect ___  a+x = y;
Correct ___ Incorrect ___  c = a%b;
Correct ___ Incorrect ___  a/b = x+y;
Correct ___ Incorrect ___  x = a*3;
Correct ___ Incorrect ___  z = x+y;

26. Write the following text in the computer language: if $b^2 - 4ac < 0$

27. Write a program that will read an integer value from a file, compute its square, and print the result on the computer screen. The program must repeat this process for all 1000 integer values in the file.