1. What is garbage collection?

*Garbage collection is the mechanism to deallocate memory for objects no longer being used.*

2. View B3 as a number in the hexadecimal system. What is B3 in the decimal system?

\[ B_{16} = 11_{10} \]

B *evaluates to 11 in the decimal system.*

\[ B3 = 11 \times 16 + 3 = 179. \]
3. Consider the circuit drawn below:

![Circuit Diagram]

(a) For \( x = 1 \) and \( y = 1 \), what is the outcome of this circuit? *ANSWER: 0*

Mark the results on the circuit drawing above.

(b) What is the logical expression that represents this circuit?

\[
(x \text{ OR } y) \text{ AND NOT } x
\]

4. Let \( A \) be a given float representing an annual salary.

Suppose tax is computed along the following scale: for \( A \) less than \$5,000.00, the tax equals \( 0.5 \times A \), for \( A \) between \$5,000.00 and \$59,999.00, the tax equals \( 0.9 \times A \), and the tax is \( 0.17 \times A \) for \( A \) equal to \$60,000.00 and higher.

Write Python code that prints the tax with two places after the decimal point.

```python
if A < 5000:
    tax = 0.5*A
elif A <= 59999.00:
    tax = 0.9*A
else:
    tax = 0.17*A
print '{:.2f}'.format(tax)
```
5. Consider the flowchart:

(a) What *expression* does the algorithm in the flowchart compute? (Do NOT evaluate the expression into one number.)

\[ s = \sum_{k=0}^{10} \frac{1}{k+1} \]

(b) Write Python code to implement the algorithm.

```python
s = 1
p = 2.0
k = 0
while k < 10:
    s = s + 1/p
    p = p + 1
    k = k + 1
print s
```

or alternatively

```python
s = 1
p = 2.0
for k in range(0,10):
    s = s + 1/p
    p = p + 1
print s
```
6. The 1-norm of a vector with coordinates \((v_1, v_2, v_3)\) is \(|v_1| + |v_2| + |v_3|\), where \(\cdot\) is the absolute value function, available in Python as \texttt{math.fabs()}.

Write a Python function (call it \texttt{norm1}) which takes on input the coordinates of a vector and returns the 1-norm of the vector. Make sure the function works also for planar vectors, so the user can enter only two coordinates.

\begin{verbatim}
def norm1(v1, v2, v3=0):
    import math
    s = math.fabs(v1) + math.fabs(v2) + math.fabs(v3)
    return s
\end{verbatim}

7. Give the Python commands to generate a random 10-letter word.
   Use \texttt{random.randint()} to uniformly generate letters.
   The final result is a string of 10 characters.

\begin{verbatim}
import random
r = range(0,10)
u = lambda i: random.randint(ord('a'),ord('z'))
N = map(u,r)
L = map(chr,N)
s = reduce(lambda x,y: x+y,L)
\end{verbatim}