1. What is a compiler?

A compiler is a program which translates source code into an object, an executable program, provided the source code is free of errors.

2. View C2 as a number in the hexadecimal system. What is C2 in the decimal system?

\[ C_{16} = 12_{10} \]

C evaluates to 12 in the decimal system.

\[ C2 = 12 \times 16 + 2 = 194. \]
3. Consider the circuit drawn below:

(a) For $x = 0$ and $y = 1$, what is the outcome of this circuit? \textit{Answer: 0}
Mark the results on the circuit drawing above.

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

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

4. Given a natural number $t$ representing time in minutes.

Write Python code to print the value of $t$ in days, hours, and minutes.
The number representing the days, hours, and minutes is followed respectively by the characters d, h, and m.

For example: 123 = 2h 3m, 23 = 23m, 1442 = 1d 2m.

\[
(d,t) = \text{divmod}(t, 1440) \quad \# \text{ counts days in } d, \text{ remainder in } t \\
(h,t) = \text{divmod}(t, 60) \quad \# \text{ counts hours in } h, \text{ remainder in } t \\
r = '' \\
\text{if } d > 0: r = r + 'd' \% d + 'd' \\
\text{if } h > 0: r = r + 'h' \% h + 'h' \\
\text{if } t > 0: r = r + 'm' \% t + 'm' \\
\text{print } r
\]
5. Consider the flowchart:

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

\[ s = 1 + \sum_{k=0}^{11} 2 \]

(b) Write Python code to implement the algorithm.

```python
s = 1
p = 0.5
k = 0
while k < 11:
    p = p*(p-1)
    s = s+2
    k = k+1
print s
```

or alternatively:

```python
s = 1
p = 0.5
for k in range(0,11):
    p = p*(p-1)
    s = s+2
print s
```
6. Given a vector with coordinates \((v_1, v_2, v_3)\), its product is \(v_1 \times v_2 \times v_3\).

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

```python
def product(v1,v2,v3=1):
    p = v1*v2*v3
    return p
```

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.

```python
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)
```