

NAME: **Answers**

**Closed book and closed notes. No calculators, no computer.
Write all answers on these sheets. Do not ask questions!**

question	1	2	3	4	5	total
points						
maximum	10	10	10	10	10	50

1. Compute the hexadecimal expansion of 415. Show all your work.

Answer:

n	$n/16$	$n \bmod 16$	
415	25	15	$415 = 25 \times 16 + 15$
25	1	9	$25 = 1 \times 16 + 9$
1	0	1	$1 = 0 \times 16 + 1$

Collecting the remainders gives 1, 9, 15 (or F).

So 415 turns into 19F in hexadecimal.

2. What is machine precision? Give a definition.

Why does a programmer need to know what machine precision is? Give an example.

Answer:

Machine precision is the largest number we can add to 1.0 and not make a difference with 1.0.

In a Python session, `1.0 + 2**(-53)` returns `1.0`.

The machine precision gives an upper bound on the accuracy of the result of numerical calculations with floating-point numbers.

In particular, we cannot guarantee to obtain results more accurate than `2**(-53)` when we compute with floats in Python.

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3. What is the difference between a syntax and a semantic error?

Explain the difference. Illustrate the difference with a good example in Python.

Answer:

A syntax error occurs when a statement is not a valid sentence in the language.

A semantic error occurs when a valid statement has no meaning.

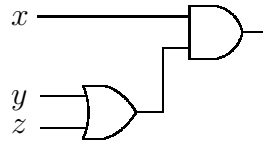
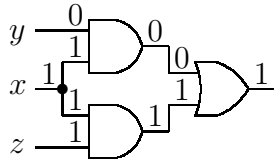
To illustrate the difference between a syntax and a semantic error, consider the conversion of a variable `x` to a float.

If we type `float(x)` then the spelling error is a syntax error.

If `x` is undefined, then `float(x)` is a semantic error.

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4. Consider the circuits drawn below:



(a) For the circuit on the left, and $x = 1, y = 0$ and $z = 1$, what is the output?
 Mark the results on the circuit drawing above. **Answer:** 1

(b) Write the logical expressions that represent both circuits.

Answer:

on the left: $(x \text{ and } y) \text{ or } (x \text{ and } z)$

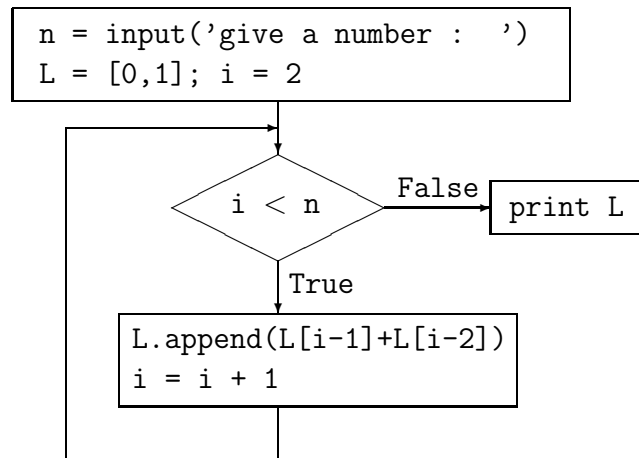
on the right: $x \text{ and } (y \text{ or } z)$

(c) Use truth tables to show that both circuits are equivalent.

Answer:

x	y	z	$x \text{ and } y$	$x \text{ and } z$	left	$y \text{ or } z$	right
0	0	0	0	0	0	0	0
0	0	1	0	0	0	1	0
0	1	0	0	0	0	1	0
0	1	1	0	0	0	1	0
1	0	0	0	0	0	0	0
1	0	1	0	1	1	1	1
1	1	0	1	0	1	1	1
1	1	1	1	1	1	1	1

5. Consider the flowchart:



- (a) Execute the algorithm defined by the flowchart for $n=5$.
Make a table to show the progress of the values for i and L .

Answer:

i	L
2	[0, 1]
3	[0, 1, 1]
4	[0, 1, 1, 2]
5	[0, 1, 1, 2, 3]

How many times is the body of the loop executed? **Answer:** 3 times.

What does the algorithm print? **Answer:** [0, 1, 1, 2, 3].

- (b) Write pseudocode for the algorithm defined by the flowchart.

Answer:

```

n = input('give a number : ')
L = [0, 1]; i = 2
while i < n:
    L.append(L[i-1] + L[i-2])
    i = i + 1
print L
  
```