Type contracts; algorithm to Python code

(1-3) An approximation for the square root of \( n \) can be generated using the following equation:

\[ x_{k+1} = \frac{1}{2} \left( x_k + \frac{n}{x_k} \right), \text{where } x_0 = 1 \]

Each value of \( x \) should be a better approximation for the square root of \( n \).

Given function `approx_sqrt`:

```python
def approx_sqrt(num, iterations):
    '''TYPE CONTRACT GOES HERE
    Generates an approximate square root of num, a positive integer, via an iterative process that runs iterations times. The approximate square root is returned.
    >>> approx_sqrt(1, 1)
    1.0
    >>> approx_sqrt(4, 1)
    2.5
    >>> approx_sqrt(4, 5)
    2.000000000000002
    '''
    value = ??-1
    for ctr in range(??-2):
        value = .5 * (value + num/value)
    return value
```

(1) supply the type contract that is consistent with the equation:

a) `(int, int) -> float`  
b) `(float, float) -> int`

c) `(int, int) -> None`  
d) `(str, int) -> float`

(2) Replace `??-1` with the code needed to implement the approximation.

a) .5  
b) `iterations`  
c) `num`  
d) 1

(3) Replace `??-2` with the code needed to implement the approximation.

a) .5  
b) `iterations`  
c) `num`  
d) 1
Binary representation of numbers
(4) The binary representation of decimal 27 is

a) 11011  b) 11010  c) 1010  d) 1101

Expressions are evaluated and return a value; data types.
(5) What is the result of executing the following Python code:

```python
>>> isinstance(101, float)
```

??

a) 101  b) int  c) True  d) False  e) update __main__

Python assignment (closer look); objects are stored in memory.
(6-8) Given the following Python code:

```python
>>> x = 'CIS 210'
>>> id(x)
4391509160
>>> y = x
>>> id(y)
??-1
>>> x = 'the end'
>>> id(x)
??-2
>>> y
??-3
```

(6) 4391509160 refers to a(n)

a) assignment statement  b) function  c) None type  d) keyword  e) memory location

(7) The value printed at ??-1 will also be 4391509160 (yes or no); the value printed at ??-2 will also be 4391509160 (yes or no).

a) yes/yes  b) no/no  c) yes/no  d) no/yes

(8) The value printed at ??-3 will be

a) 4391509160  b) 'CIS 210'  c) 'the end'  d) None

(9-10) Reading code; accumulator pattern
(9) What will be printed when the following Python code is executed?

```python
n = 5
mysum = 0
for ctr in range(1, n):
    mysum += ctr
print(mysum)
```

a) 0  b) 5  c) 10  d) 15  e) None
This code is an example of

a) accumulator pattern  b) TypeError  c) conditional  d) indefinite iteration  e) infinite loop

Python order of operations; data types

Given the following Python code:

1 - >>> ftemp = 212
2 - >>> ctemp = (ftemp - 32) * 5/9
3 - >>> ctemp = ftemp - 32 * 5/9

The value of ctemp will [??] from line 2 to line 3; the type of ctemp will [??] from line 2 to line 3

a) stay the same/change  b) change/stay the same  c) stay the same/stay the same  d) change/change

(12-13) Given the following Python code:

```python
0    import math
1
2    def isInCircle(x, y, r):
3      '''(number, number, number) -> ??
4
5      Quiz.
6
7      ...
8      d = math.sqrt(x**2 + y**2)
9      isIn = (d <= r)
10     return isIn
```

type contracts; data types; return

(12) Complete the type contract:

a) int  b) float  c) number  d) bool  e) str

functions calling functions; revising code; parameter passing

(13) Indicate which lines of code would need to be changed for isInCircle to check whether point (x, y) were inside a circle with a radius of any length.

a) 0, 10  b) 2, 3, 9  c) 2, 9, 10  d) 2, 9  e) 8, 9

variable scope

(14-15) Given the following Python code:

```python
def twice(x):
    ''' quiz '''
    result = 2 * x
    return result
```
>>> x = 99
>>> twice(10)    (14) Replace ??-1 with the expected result:
???-1
>>> x
???-2

Python conditional statements
(16) Given the following Python code:

```python
def q30(score):
    '''exam function'''
    gradepoint = 0
    if score >= 90:
        gradepoint = 4
    elif score >= 80:
        gradepoint = 3
    elif score >= 70:
        gradepoint = 2
    elif score >= 60:
        gradepoint = 1
    return gradepoint
```

What is the result of executing `>>> q30(80)`?

a) 4       b) 3       c) 2       d) 1       e) NameError