Closed book, closed notes, log out of computer! Cheat sheet on reverse. Please write neatly!

1. Which of the following instructions in a recipe best shows why recipes can be an imperfect analogy for an algorithm in a Computer Science context? [1 point]
   - Boil for 10 minutes
   - Cook onions till softened
   - Add 0.5 teaspoons of ground black pepper
   - Add 1 cup of granulated white sugar

2. Write the value of \( x \) after this code executes in the box? [2 points]

   \[
   \begin{align*}
   y &= 6 \\
   y + 2 \\
   x &= y \\
   \# x &= 2 \times x
   \end{align*}
   \]

3. What value should you assign to the variable \( n \) to so that \( \text{sum} \) has the specified value after this code executes. The value must be an integer that results in valid Python code (i.e., not cause an error). [3 points]

   \[
   \begin{align*}
   \text{sum} &= 0 \\
   \text{for } i \text{ in range}(n): \\
   &\quad \text{for } j \text{ in range}(2): \\
   &\quad \quad \text{sum} = \text{sum} + 1
   \end{align*}
   \]

   a) \( \text{sum} \) is 2
   b) \( \text{sum} \) is 10

4. Write a function \( \text{dice} \) with a single parameter \( n \) that returns the sum of \( n \) independent and random rolls of a traditional six-sided die (sides are 1, 2, 3, 4, 5, and 6). You do not need to include comments or docstrings. For example: [4 points]

   >>> \text{dice}(1)
   2
   >>> \text{dice}(2)
   10
   >>> \text{dice}(3)
   8
Numeric Operators
+ , - , / , *: Addition, subtraction, division, multiplication
//: Floor division: Round division result down to nearest whole number
%: Modulus: Evaluate to remainder of division
• Range
**range(stop)**: Equivalent to range(0, stop, 1)
**range(start, stop[, step])**: Create sequence of integers from inclusive **start** to exclusive **stop** by **step**

Strings
• The following functions are built-in
  len(string): Returns the number of characters in the string
  int(string), float(string): Converts numeric string to int or float
  str(object): Converts object, e.g. int or float, to a string
• String operators
  string1 + string2: Returns a new string that is the concatenation of string1 and string2
  string * int: Returns a new string that is string repeated int times

Modules
• turtle module
  forward(dist), backward(dist): Move the turtle forward/backward by the length dist. Doesn’t change heading.
  right(angle) left(angle): Turn the turtle right/left by angle (in degrees)
  goto(x, y): Move turtle to position x, y
  setheading(angle): Set the turtles heading to angle
  circle(radius): Draw a circle with specified radius; the center is radius units left of the turtle
  dot(size): Draw a filled circle with diameter size centered on current position of the turtle
  penup(): Pull the pen up – no drawing when moving
  pendown(): Put the pen down – drawing when moving
  fillcolor(color): Change the fill color to color, where color is a string
  begin_fill(), end_fill(): Start and end filling shapes with fill color
• random module
  randint(a, b): Return a random integer N such that a ≤ N ≤ b
  uniform(a, b): Return a random floating point number N such that a ≤ N ≤ b
• math module
  sqrt(num): Return the square root of num