Computer Science Answer Key
UIL Region 2014

1) A

2) C

3) B

4) D

5) D

6) E

7) D

8) B

9) C

10) D

11) C

12) D

13) A

14) D

15) B

16) A

17) E

18) B

19) A

20) D

21) C

22) D

23) C

24) D

25) C

26) D

27) B

28) E

29) A

30) D

31) C

32) B

33) E

34) E

35) D

36) E

37) B

38) C

39) D

40) A

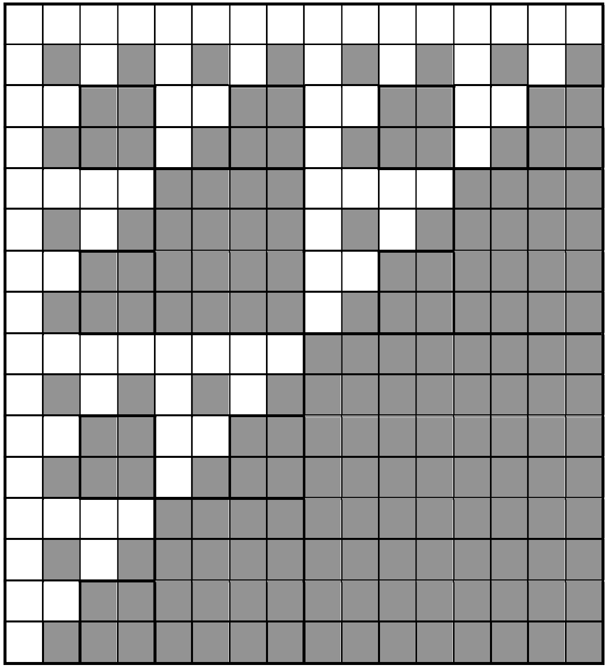
Note to Graders:

- All provided code segments are intended to be syntactically correct, unless otherwise stated (e.g. error is an answer). **Ignore any typographical errors**.
- Any necessary Standard Java 2 Packages are assumed to have been imported as needed.
- Assume any undefined (undeclared) variables have been defined as used.

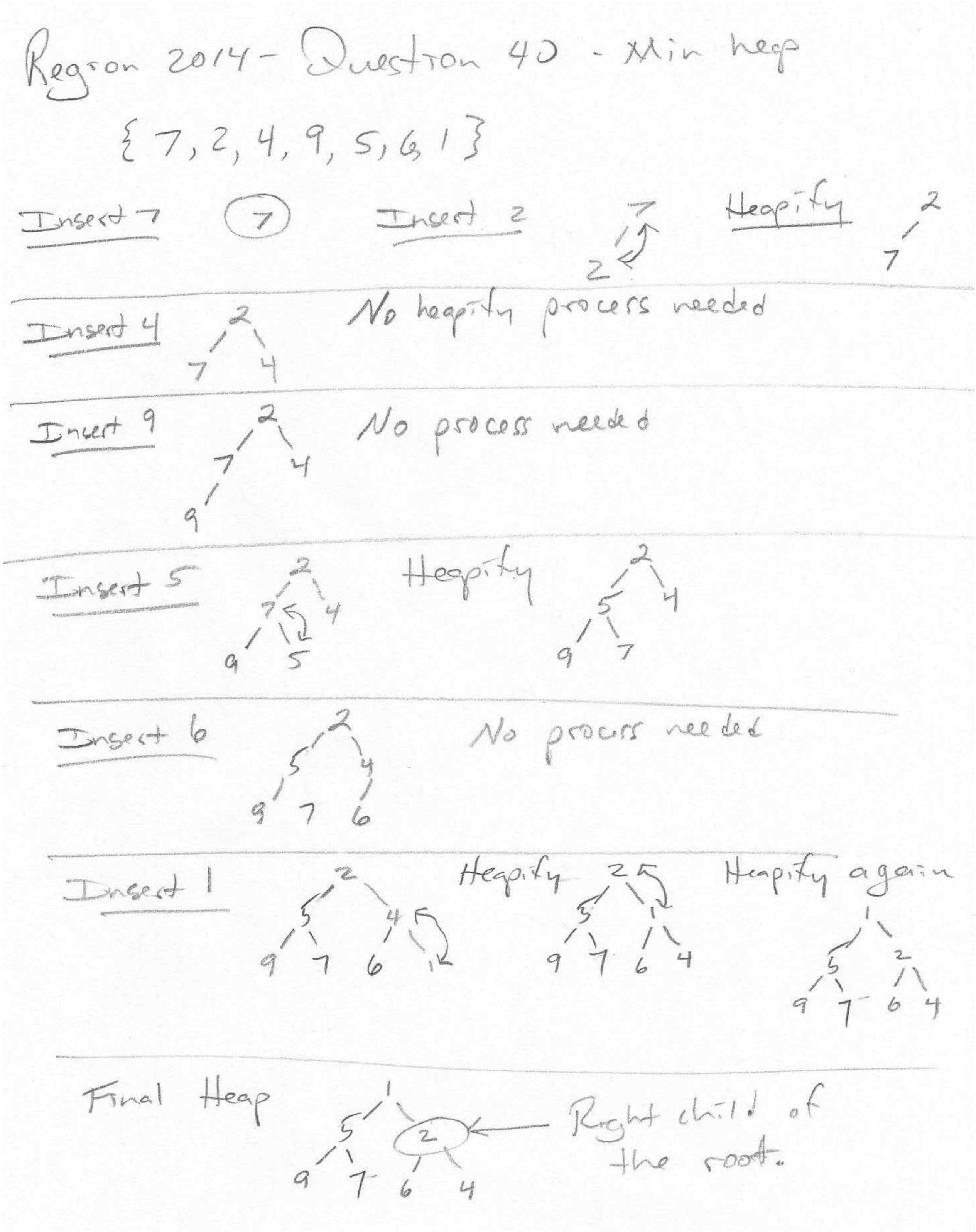
Explanations:

1. $111011110_2 – F2_{16} = 236_{10} = 354_8 = EC_{16} = 11101100_2$
2. Using order of operations, 16%9 goes first (7), then 4*0.2 (0.8), then 7-0.8, which equals 6.2.
3. Since every Java data type has a String representation, the "%s" printf format specifier can take any data type, and this code works, with `HelloGoodbye` on one line, and `4_true` on the next line.
4. This method calls returns a String in all lowercase, but does not change s (since Strings are immutable) and since it was not reassigned to s, the output is the original value of s, `BalloonBomb`.
5. This Boolean expression is equivalent to P or Q, which is false only when both P and Q are both false.
6. Since Math.round returns a long when a double parameter is given, long is the best data type to use, even though a double could take it.
7. 70 divided by 3 equals 23. Add that to 5.2 and you get 28.2.
8. Since 'B' and 'b' are different values in the ASCII character map, they are not equal.
9. When c has a value of 14, the next column (15) is the first time water will be detected.
10. Since the default value of char Arrays is the zero value space (not the 32 value space), the values added here are 65+0+50, for a total of 115.
11. File and Scanner are the two main classes used for input. FileWriter and PrintWriter are used for file output.
12. The a and b values for this loop sequence are: 0 2.4, 4 4.8, 13, 9.6, 32 19.2. The last pair causes the loop to terminate since the sum is not less than 25. Those values are the ones output.
13. This tests your knowledge of operator precedence, something you should study and know very well. Since the + operator precedes the <<, the 2 and 1 are added first, then a <<3 is applied to 5, in essence multiplying 5 by 2^3, or 8, which equals 40. The common error is to shift first, then add 1, which would result in 21.
14. The float data type uses 32 bits of memory.
15. This question is about how the remove method works. Does it remove the value 2, or the value in position 2? It is the latter, the value in position 2, which is the 3. The resulting list contains [4, 1, 2].
16. The best way to remember the Digital Electronic shapes is this: bullet shapes (flat back) are AND, arrow shapes (curved back) are OR, double arrows are XOR, and a small circle means NOT. The expression for this one is A XOR NOT(B AND C) OR NOT D.
17. This double ternary operator works just like a nested if else statement: if(a>50) if(a<75) output "red" else output "green" else output "blue". "red" will be output for 51 through 74 (24 times). "blue" is output for the values 45 through 50, and "green" for all the values 75 and beyond.
18. The first match is false. In the match string, ".[^WIN]+.*", the dot means a single character, which correctly matches the "U". "[^WIN]+" means match one of more characters NOT in "WIN". The "I" causes this to be false, therefore the match is false. The match string with all the dots is an exact match since the length is the same, and a dot matches any character, there it is true.
19. The object method is always called when it overrides the super class method, which in this case outputs, "The dog is a: dachshund". Since it is not possible to determine which show method will be called (Animal reference could be reassigned during the execution), the show method called is determined during run time, an example of late (dynamic) binding.
20. When both base and derived classes have member values of the same name, the base class member value is always called by default. This is an example of early (static) binding.
21. This code demonstrates the difference between early and late binding. Statement C is the only one that is true. Statements A and B are reversed. Early binding occurs at compile time, and question 20 is an example of this. Question 19 is an example of late, or dynamic binding.
22. The somesort method is first called with the values 0 and 5, which gives a middle value of 2. Subsequent calls and middle values produced are: (0,2)->1, (0,1)->0, (3,5)->4, (3,4)->3. The (2,2) and (5,5) calls result in no middle values output.
23. This is the merge sort.
24. The Big O rating for this is O(N log N).
25. The array sizes produced in this matrix are of size 2, 4, 6, 8, and 10, for a total of 30 slots.
26. The decimal value 75 in base 7 is 135.
27. The priority queue step-by-step sequence produce by this code is: ~~R,~~ ~~e~~g, ~~g~~io, ~~space~~ino, ~~I~~Uino, ~~space~~LUino, ~~0~~2LUino, ~~1~~24LUino, resulting in final queue of "24LUino".
28. Since the order of precedence for bitwise operators is AND, XOR, then OR, the 4 AND 7 goes first, resulting in 4. 13 XOR 4 is 9, and then 9 OR 6 is 15.
29. This Boolean expression simplifies to !P&!Q | P&!Q, which means 00 and 10 are the only two ordered pairs that result in true.
30. This expression simplifies to 196 – 12 * 2, which equals 172.
31. To the right is the recursion diagram for this question. →
32. Preorder traversal starts at the root and outputs each element in "touch left side" traversal order.
33. The array contents, step by step, are as follows: [], [4], [4 5], [4,5,1,3,5,6,7], and [4,5,1,3,6,7].
34. A, B, and C are correct as stated.
35. The Boat constructors include the default constructor, Boat(), and three one parameter constructors.
36. The toString method constructs and returns the String designed to output the member values of this boat.
37. Although all three code segments will accomplish the desired output, the most direct Option is II, where the parameter values match the required data types exactly. Option I works OK, but has to make a data type promotion in the call to the setDraft method.Option III works as well, but is just a terribly inefficient way to accomplish it.
38. This method simply adds the ASCII values of the characters in the given string, making negative any values that are odd. "bed" returns the sum of 98 – 101 + 100 = 97.
39. "MET" returns the sum -77 – 69 + 84 = -62.

Recursion Diagram – #31



40. Below is the step by step process for this min heap process.



Region 2014 - Question 40 - Min heap

{7, 2, 4, 9, 5, 6, 1}

Insert 7

Insert 2

Heapify

Insert 4

No heapify process needed

Insert 9

No process needed

Insert 5

Heapify

Insert 6

No process needed

Insert 1

Heapify

Heapify again

Final Heap

Right child of the root.