

This is a closed book exam. No calculators, cellphones, laptops, or other aids are permitted. Answer every question in the space that has been provided. You must show all your work without skipping steps; correct answers that are presented without justification may receive a mark of zero.

Student Name _____

Student Number _____

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1. The circumference, c , and area, a , of a circle with a radius of r can be computed using the formulae $c = 2\pi r$ and $a = \pi r^2$, respectively. Write a program that starts by asking the user for the radii of two circles. Your program must then compute the circumference and area of each circle and then report which of the two circles has the larger circumference (or report if they happen to be the same). You must also import the math library in order to access the `math.pi` variable for performing this calculation.

2. In the space provided, write the printed output of the following program.

| | |
|---|--|
| <pre>a = 7 b = 8 if not (a < 5 or b < 2): if a == 8: print("X") else: print("Y") print("Z")</pre> | |
|---|--|

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3. Write a postcondition, event-controlled loop (i.e., a while loop), using a break statement, that prints the numbers 8, 14, 20, 26, 32, and 38 to the terminal (one per line).

4. In the space provided, write a program that uses nested loops to draw the pattern below. You are not allowed to use any of the formatting functions; your solution must use nested loops and must use calls to `print("*", end="")` and `print("-", end="")` to print characters to the screen (without moving to the next line) and calls to `print()` to move down to the next line.

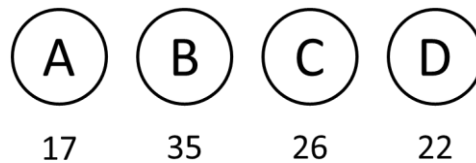
| | |
|--|--|
| <pre> * * * _ * * * _ _ * * * * _ _ _ * * * * * _ _ _ _ * * * * *</pre> | |
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5. Consider a text file in which the only characters that appear are the letters "A", "B", "C", and "D", with the distribution 17%, 35%, 26%, and 22%, respectively. (To clarify, this means that 17% of the characters in the file are the letter "A", 35% are the letter "B", etc.) Using the technique demonstrated in class, construct the Huffman tree for this file (and don't forget to label the edges with 0 or 1 such that a variable-length encoding could be produced). Show all your work as each new character is added to your tree. (n.b., The initial step has been completed for you, below.)



n.b., the technique required for solving this problem will be demonstrated during the next lecture

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