Virginia Tech
1 8 7 2

READ THIS NOW!

- Print your name in the space provided below.

- There are 8 short-answer questions, priced as marked. The maximum score is 100.

- When you have finished, sign the pledge at the bottom of this page and turn in the test.

- This is a closed-book, closed-notes examination.

- No laptops, calculators, cell phones or other electronic devices may be used during this examination.

- Until solutions are posted, you may not discuss this examination with any student who has not taken it.

- Failure to adhere to any of these restrictions is an Honor Code violation.

Name (Last, First) _____

printed

Pledge: On my honor, I have neither given nor received unauthorized aid on this examination.

signed

1. [16 points] The VT LP Fanatics Club decides to hold a silent auction of their surplus LPs to raise money to provide direct-drive turntables to deserving youths. In order to get the auction off the ground, the officers of the club bring their donations to the next meeting of the Club. Altogether, the officers donated 51 blues LPs, 19 folk LPs, 33 rock LPs and 17 classical LPs.

Bud, who has a fairly large collection of LPs, donated 30 LPs, including 23 blues LPs and no rock LPs.

Bill, who has the largest collection, donated the most LPs, including, 17 blues LPs, 13 rock LPs and 9 classical LPs.

Dwight, whose musical tastes are somewhat limited, made a donation of 33 LPs, including 8 blues LPs, 20 rock LPs and no classical LPs.

Sean, who only recently began collecting LPs, donated a collection of 10 LPs that included 5 folk LPs.

How many LPs of each type did each of the officers donate? Use an appropriate table to externalize and show work to support your answers!
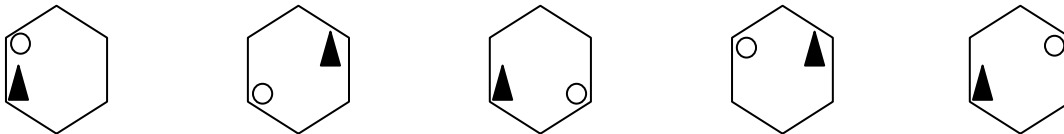
2. [16 points] Four sisters, Prudence, Chastity, Temperance and Hope, have jobs in the big city as a lawyer, a surgeon, a chef and a detective (not necessarily in that order). Prudence shares a duplex with her sisters the surgeon and the lawyer. Chastity goes to the same gym as her sisters the lawyer and the detective. The detective lives alone. Hope envies her sister the lawyer. Which sister has which career? Externalize, and justify your conclusions.

3. [12 points] In the language of the Wahoo tribe, the phrase *gabba oofa do* means "pass the beer", *guzzla oofa* means "drink beer", *og gabba unno* means "I passed math", and *og goppa ubba* means "I eat nuts". Moreover, in the Wahoo language, verbs always begin with a consonant and nouns always begin with a vowel.

In the Wahoo language, how would you say "Pass the nuts"? Explain your logic.

4. [12 points] In each part, state what (other) facts, if any, you can <u>validly</u> infer from the given facts:

a)   If Captain Jack drinks too much rum, then he will set the wrong course. Captain Jack set the wrong course.

b)   If Captain Jack sailed to the wrong island, then the natives there murdered and ate his crew. All the members of Captain Jack's crew lived long lives and died peacefully of old age.

c)   All cats are mammals. Some cats eat mice. Cirrus is a cat.

d)   All whales are mammals. All mammals have lungs.

5. [10 points] Five bricklayers can lay a total of 100 bricks in 40 minutes. How many bricklayers would be required to lay a total of 60 bricks in 20 minutes? Externalize and justify your conclusion.

6. [10 points] A machine shop produces brass couplings, each of which must be marked with an integer serial number before being shipped. Serial numbers are assigned as consecutive integers, starting at 1. A serial number is marked onto a coupling by a worker who has ten steel dies that she can use to stamp a single digit onto the coupling. For example, to mark a coupling with the serial number 732, the worker would use the dies for the digits '7', '3' and '2', striking each with a hammer one time to emboss the corresponding digit on the coupling. When the worker finishes marking a shipment of couplings, she realizes that she has used her hammer exactly 558 times. What was the serial number that she marked on the last coupling? Externalize and justify your conclusion.

7. [8 points] The following sequence of figures suggests a pattern of changes:

Describe the pattern of changes and draw a single figure that continues that pattern.

8. [16 points] Design and write pseudo-code (see the test supplement) for an algorithm that counts how many pairs of successive integers in a list differ by 5 or more. For example, the algorithm should report 6 when given the following list of values:

<div align="center">
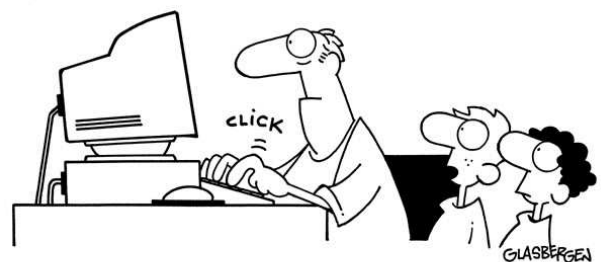
17 14 23 11 13 7 41 37 34 21 26

</div>

```
get sizeofA          # get number of elements in the list
get A                # get values for the list variable A
Counter := 0         # number of successive pairs differing by 5 or more


# . . . this part is up to you
```

```
display Counter    # report results
halt               # end algorithm
```