AP Computer Science Summer Assignment
Part A

Read selected sections of *The Cartoon Guide To Computer Science*
Accessing these will require you to login to the school website
Use the book and the web if necessary to find answer the questions. The book was originally written in 1983, so keep in mind that some of the terminology is a little archaic (but useful to know) and some of the numbers describing the capabilities of modern computers are dated to the early 1980's.

Part I : Ages of Information
Part I is a relatively easy read. It reads like a history lesson.

1. Who was Claude Shannon and why was he important? Where did he do his groundbreaking work?

2. What is Shannon's definition of information?

3. Why is "life itself" information?

4. What were the earliest examples of information storage?

5. What Chinese innovation made it easier for humans to do computation?

6. What Indian innovation made it easier for humans to do computation?

7. How long have humans used "calculators?"

8. Who was Al-Khwarismi and what important words/concepts live on as his legacy?

9. What does the Latin work "Calx" mean and what English words did this Latin root spawn?

10. Who was Isaac Newton and which classes at VHS exist to study his innovations?

11. Who was John Napier and what two major innovations did he bring to math/computation?

12. Blaise Pascal invented a computer called the "Pascaline". For what else is he remembered?

13. Who was Gottfried Leibniz and why did he get in a big fight with Newton?

14. What was Jacquard's Loom and why was it an important development?

15. Sketch a diagram of the four major part of Babbage's Analytical Engine and show the information flow between those parts with arrows

16. Who Ada Lovelace? Define three important programming concepts which she developed.

17. Herman Hollerith built one of the first "electromechanical" computers. What does that mean? Why did he build it and what modern technology company owes its birth to Hollerith?

18. Another of Hollerith's inventions was the "Hollerith String." What is a Hollerith String and why was that an important innovation?

19. What is the function of an electromechanical relay and vacuum tube?

20. What were the advantages and disadvantages of a vacuum tube over an electromechanical relay?

21. The Mark I was an "electromagnetic" computer. What does that mean?

22. ENIAC was the first "electronic" computer. What does that mean?

23. How did the US Army use ENIAC?

24. What key concept did John von Neumann have which streamlined the way computers work today?

25. Name three advantages of the "Von Neumann Architecture".

26. What work did von Neumann do which was instrumental to an Allied victory in World War II?

27. What innovation/development did von Neumann bring to the study of Economics?

28. The Transistor was an electrically-controlled switch, much like the vacuum tube or electromechanical relay. Why was it an improvement over the vacuum tube?

29. Page 83 incorrectly states that the transistor was developed by a team at Stanford. Where was the transistor developed?

30. What is an Integrated Circuit?

31. Mainframes and Minicomputers are somewhat archaic concepts in 2013. What generic term do we use today to refer to computers which provide data or computations to many users?

32. On page 86, the author says "there's talk of reducing components to molecular size using recombinant DNA Technology". In March of 2013, a team at Stanford built something called "The Transcriptor". What is it?

Part II : Logical Spaghetti
Some parts of Part II are a little more densely packed with detail (logic circuits, assembly language) than Part I and might be difficult for you to follow. Just do your best to understand and glean the key concepts from the reading.

33. What important contribution did George Boole make to the development of the computer?

34. What is a "Truth Table?" Write the truth tables for AND, OR, and NOT.

35. What is an "AND-gate" ?

36. Convert the binary number 101011101 to decimal by hand

37. What is a bit and how many possible values can it represent? What is a byte and how many possible values can it represent?

38. What is the difference between an integer and a floating point number?

39. Why was the development of ASCII important? What is the ASCII character for 1010111? What is the ASCII code for the number for the @ sign?

40. What is the job of an ALU?

41. What special capability does a "flip-flop" circuit have?

42. What is a register?

43. What is a clock circuit? What does it mean when you say that a computer has a "3 Gigahertz processor?"

44. What are the advantages and disadvantages of electronic and electromechanical memory devices? Which parts of a computer represent electronic memory and which represent electromechanical memory?

45. What is a memory address?

46. What is the decimal equivalent of the hexadecimal number D7 ?

47. What is the difference between RAM and ROM?

48. What is volatile memory? What are some examples of volatile and non-volatile memory in devices you use?

49. What is "Moore's Law" ?

50. Page 163 talks of 256K memory chips (the year was 1983). In 2013, you can purchase memory chips with 8GB of capacity. To the closest power of 2, how much more information can be stored in an 8GB memory chips than in a 256K memory chip ?

51. What is the job of a "bus" in the computer?

52. Each CPU has an "instruction set". What is an instruction set?

Part III : Software
In this section, you will code and run the BASIC programs using either this BASIC Emulator (implemented in a Java Applet) . We won't write any BASIC during the course of the school year, but

53. Who was Alan Turing and what very important contribution did he make to the Allied efforts in World War II?

54. What is a Turing Machine and why is the concept important? What is a Universal Turing Machine?

55. How are von Neumann's self-reproducing machines like plant or animal cells? How does a computer virus fall under von Neumann's definition of a self-reproducing machine?

56. What is an algorithm?

57. How is a high-level language different than assembly language?

58. What source code? What is object code?

59. What is the difference between the way a compiler works and the way an interpreter works?

60. What was the first high-level language?

61. You should think of a variable as a _____ _____ in _____.

62. Code and run the examples on pages 208-218 (you can skip 219) in this BASIC Emulator. On page 211, the "arrow" will not work in the expression Q↑2, so instead, replace it with Q*Q. Type RUN to run your program or LIST to list the statements in your program. Email me if you need help

63. What is an operating system and what purposes does it serve?

64. What is UNIX? Where was it developed?

65. Of the four major computer operating systems, Windows 7/8, MacOS, Linux, and ChromeOS, which are descended from UNIX ?

66. Of the two major smartphone operating systems, iOS and Android, which are descended from UNIX?

67. Much of the world's data, such as your parent's bank account information, your grades, your Amazon.com order history, etc. is stored in a type of database called a "relational database". What is a relational database?

68. For scientists, one of the most useful capabilities of computer is simulation. What are some scientific problems for which simulation is used to model a real-world phenomenon?

69. Before the internet, what was the biggest computer system in the world?

70. What is The Turing Test? Find an iPhone and ask Siri if she passes the Turing test. What does she say?

AP Computer Science Summer Assignment
Part B

I. **Establish your Java Development Environment**

   (1) Create a new folder on your computer called *Java Development*

   (2) Inside your *Java Development* folder create two new folders, one called *Workspace* and one called *Eclipse*

   (3) Download *Eclipse Standard* on the [Eclipse Downloads Page](#) to your *Java Development\Eclipse* folder. Be sure to select the right version (32-bit or 64-bit) for your computer. Right-click on this file and select *Extract All* to extract the folder.   This may take a few minutes.

   (4) You should download the [current version of the Java Runtime Environment (JRE)](#). Eclipse will generally work well with this version.

   (5) Navigate to *Java Development->Eclipse->(Eclipse Download Folder Name)>eclipse->eclipse.* This is an application and the icon for this file should look like this: . Right-click on this file and select *Send to Desktop (create shortcut)*.   This will create a shortcut for eclipse on your desktop

   (6) Go you're your Desktop and double-click on your newly created Eclipse icon to start Eclipse

   (7) After Eclipse has initialized, it will present a *Select A Workspace* dialog box. Click on the *Browse* button and navigate to your *Java Development->Workspace* folder. Then click OK. Check the checkbox for *Use this as the default and do not ask again.* This click OK.

   (8) A Welcome Window is displayed. If you ever need to return to the Welcome window, select *Help->Welcome*

   (9) On the Welcome Window, select *Tutorials,* then select *Create a Hello World Application.*

   (10) Follow the tutorial instructions and complete all parts of the tutorial.

   (11) Use your mobile phone to take a picture of Eclipse running the Hello World program on your computer. Bring this with you on the first day of school.

If you have any questions, email me at rwertz@veronaschools.org