

### Problem 1

One of the best web sites to learn about the development of computers is the History of Computers Museum (<http://www.computerhistory.org/revolution/timeline>). Look at the Museum timeline and briefly answer the following questions:

a) In two sentences explain what is virtual memory and name the first computer to have such memory.

Virtual memory permitted a computer to use its storage capacity to switch rapidly among multiple programs or users and was a key requirement for timesharing. The Atlas computer was the first one with this capability.

b) Magnetic tapes were used in early computers to store and backup data. Name the company that introduced the first magnetic tape drives for computers. By the way, magnetic tapes are still in use today to perform backups.

UNIVAC company introduces the "UNISERVO" tape drive for the UNIVAC I computer.

c) Name the British computer pioneers that developed the Bombe machine. In a sentence explain the purpose of the Bombe.

The Bombe machine was developed by Alan Turing and Harold Keen. It was used to decrypt German messages.

d) This early smart phone was perhaps the first one with a web browser application. Name the company that produced this device around 1997.

Nokia 9000 Communicator phone via the Sonera and Radiolinja networks.

e) The Apollo Domain DN100 was one of the earliest workstations. Name the operating system used by this workstation.

Apollo workstations ran Aegis (later replaced by Domain/OS), a proprietary operating system with a POSIX-compliant Unix alternative shell.

f) Name two contributions of the Xerox Palo Alto Research Center (PARC).

Laser printers

Computer-generated bitmap graphics.

The graphical user interface, featuring windows and icons, operated with a mouse.

Text editor.

g) Name the physicist and the laboratory that developed hypertext and paved the way for the development of the World Wide Web.

Tim Berners Lee from the CERN lab invented the world wide web.

h) Name the California-based company that developed the first relational database.

Oracle Corporation.

i) Name the computer that defeated famous chess player Garry Kasparov. How many positions per second could the computer do?

IBM's Deep Blue chess supercomputer- 200 million positions per second.

j) One of the most popular scripting languages across the Internet is Java script. Name the company and the person who developed this important language.

In September 1995, a Netscape programmer named Brandan Eich developed a new scripting language in just 10 days. It was originally named Mocha, but quickly became known as Live Script and later, JavaScript.

### **Problem 2**

For your own personal computer find the following:

- a) Number and model of CPU processor used
- b) CPU clock speed
- c) Computer Random Access Memory (RAM) size
- d) Graphics processing unit if any (GPU)
- e) Name and version of the operating system used in your computer

**It is a personal set of questions.**

### **Problem 3**

a) An algorithm is a series of steps to solve a problem. Describe in a couple of paragraphs an algorithm that you implemented using Excel, an engineering tool (like Matlab or Mathematica) or any programming language (i.e., Python, Java).

b) The Top500 site lists the largest supercomputers worldwide (<https://en.wikipedia.org/wiki/TOP500>). Look at the top 5 supercomputers and tell me what kind and how many of microprocessors are used in the construction of the supercomputers.

1) 158,976 × 48 A64FX @2.2 GHz

2) 9,216 × 22 POWER9 @3.07 GHz

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3) 8,640 × 22 POWER9 @3.1 GHz

4) 40,960 × 260 SW26010 @1.45 GHz

5) 1,120 × 64 Epyc 7742 @2.25 GHz

c) The second fastest supercomputer in the world (named Sierra) can perform 2.9 petaflops (flop = floating- point operation). If a human takes 3 seconds to do a floating- point operation, find how many years will a human have to perform calculations to match one second of the top supercomputer computing power.

2.9 peta flops=  $2.9 \times 10^{15}$  flops

Time to do 2.9 peta flops=  $2.9 \times 10^{15} \times \frac{3 \text{ seconds}}{1 \text{ flop}} = 8.7 \times 10^{15}$  seconds

$8.7 \times 10^{15} \times \frac{1 \text{ hour}}{3600 \text{ seconds}} \times \frac{1 \text{ day}}{24 \text{ hour}} \times \frac{1 \text{ year}}{365 \text{ day}} = 275 \times 10^6$  years

It is about 275 million years.

#### **Problem 4**

Use the Car Data file posted on Week 1 of our syllabus web page to answer the following questions.

a) Import the data into an Excel file.

b) Create a new column in the spreadsheet to assign the category of each car according to the engine horsepower. For this exercise use IF statements in each cell to determine the class for each vehicle.

a. Class 1 if the vehicle horsepower is less than 80 HP.

b. Class 2 if the vehicle horsepower is between 81 and 130 HP.

c. Class 3 if the vehicle horsepower is between 131 and 200 HP.

d. Class 4 if the vehicle horsepower is greater than 200 HP.

c) Count how many cars belong to each engine power class using the Excel COUNT or COUNTA function (as applicable).

d) Use Excel conditional formatting to color code the values based on car weight. Assign red to the highest weights and green to the lowest weights.

### Problem 5

Formula Bar: =IF([@Horsepower]<=80,"Class 1",IF([@Horsepower]<=130,"Class 2",IF([@Horsepower]<=200,"Class 3","Class 4"))

	A	B	C	D	E	F	G	H	I	J	K	L	M
	Model	Country	Type	Weight	Turning Circle	Displacement	Horsepower	Gas Tank Size	Class	Number of Class 1	Number of Class 2	Number of Class 3	Number of Class 4
2	Acura Integra	Japan	Small	2700	37	112	130	13.2	Class 2	5	59	46	6
3	Acura Legend V6	Japan	Medium	3265	42	163	160	18	Class 3				
4	Audi 100	Other	Medium	2935	39	141	130	21.1	Class 2				
5	Audi 80	Other	Compact	2670	35	121	108	15.9	Class 2				
6	Audi 90	Other	Compact	2790	35	141	130	15.9	Class 2				
7	BMW 325i	Other	Compact	2895	35	152	168	16.4	Class 3				
8	BMW 535i	Other	Medium	3640	39	209	208	21.1	Class 4				
9	Buick Century	USA	Medium	2880	41	151	110	15.7	Class 2				
10	Buick Electra V6	USA	Large	3350	43	231	165	18	Class 3				
11	Buick Le Sabre V6	USA	Large	3325	42	231	165	18	Class 3				
12	Buick Riviera V6	USA	Medium	3465	41	231	165	18.8	Class 3				
13	Buick Skylark	USA	Compact	2640	39	151	110	13.6	Class 2				
14	Cadillac Brougham V8	USA	Large	4285	44	307	140	25	Class 3				
15	Cadillac De Ville V8	USA	Large	3545	43	273	180	18	Class 3				
16	Cadillac Eldorado V8	USA	Medium	3480	42	273	180	18.8	Class 3				
17	Chevrolet Astro V6	USA	Large	4025	42	262	150	27	Class 3				
18	Chevrolet Beretta	USA	Compact	2655	38	133	95	15.6	Class 2				
19	Chevrolet Camaro V6	USA	Sporty	3110	41	191	140	15.5	Class 3				
20	Chevrolet Camaro V8	USA	Sporty	3320	41	305	170	15.5	Class 3				
21	Chevrolet Caprice V8	USA	Large	3855	42	305	170	25	Class 3				
22	Chevrolet Cavalier	USA	Compact	2485	38	133	95	13.6	Class 2				
23	Chevrolet Corvette V8	USA	Sporty	3280	42	350	250	20	Class 4				
24	Chevrolet Lumina	USA	Medium	3195	42	151	110	17.1	Class 2				
25	Chevrolet Lumina APV V6	USA	Large	3630	42	191	120	20	Class 2				
26	Chrysler Imperial V6	USA	Medium	3570	43	202	150	16	Class 3				
27	Chrysler Le Baron Coupe	USA	Medium	2975	39	153	150	14	Class 3				
28	Chrysler Le Baron V6	USA	Compact	3065	41	181	141	16	Class 3				
29	Chrysler New Yorker V6	USA	Medium	3450	42	202	147	16	Class 3				
30	Dodge Caravan	USA	Large	3385	42	153	100	20	Class 2				
31	Dodge Colt	Japan	Small	2270	32	90	81	13.2	Class 2				
32	Dodge Daytona	USA	Sporty	2885	38	153	100	14	Class 2				
33	Dodge Daytona Turbo	USA	Sporty	2935	38	135	150	14	Class 3				
34	Dodge Dynasty	USA	Medium	3080	42	153	100	16	Class 2				
35	Dodge Grand Caravan V6	USA	Large	3735	47	202	150	20	Class 3				
36	Dodge Omni	USA	Small	2300	40	135	93	13	Class 2				
37	Dodge Shadow Turbo	USA	Compact	2670	38	153	150	14	Class 3				
38	Eagle Premier V6	USA	Medium	3145	39	180	150	17	Class 3				

J2      =COUNTIF(I:I,"Class 1")

	A	B	C	D	E	F	G	H	I	J	K	L	M
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