

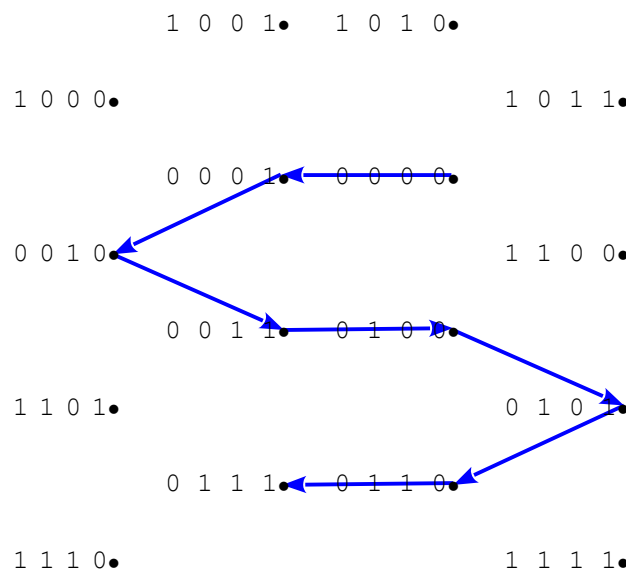
Part A [5 points]

For each of these concepts, indicate the **generation** in which it was **first used** and to which history (**hardware** or **software**) it belongs.

FORTRAN	_____2	hardware / software
integrated circuits	_____3	hardware / software
card readers	_____1	hardware / software
C++	_____4	hardware / software
operating systems	_____3	hardware / software

Part B [1 point] – Join the Dots

The dots below are labelled in **2's Complement** notation. The labels are to the left of the dots. Connect the dots that have **positive** numbers as labels. Start with the smallest value and proceed to the largest.



Part C [6 points] – Complete the table.

Show how the pattern **01001100** translates using each of the following interpretations. [1 each]

unsigned integer	76
integer in 2's complement notation	+76
integer in excess notation	-52
Hexadecimal notation	4C
floating point notation	+3/4
ASCII	L

Part D [8 points]

- 1) Perform the following calculation in Binary: [1]

$$\begin{array}{r} 0001.0101 \\ +0001.0111 \\ \hline 0010.1100 \end{array}$$

- 2) Express the answer for 1) as a **proper fraction**. [1]

$$2\frac{3}{4}$$

- 3) Show how this value would be coded in 8-bit Floating Point Notation. [1]

$$01101011$$

- 4) Show how a computer would process this division in 8-bit binary.
Show all your steps. [5]

28 / 13

13 converts to	00001101	1
So -13 is	11110011	1
28 converts to	<u>00011100</u>	1
Add 28 and -13	1 00001111	1
The remainder is larger than the divisor so add -13 again	<u>11110011</u>	
	10 00000010	1

Part E [10 points] – Short!! Answer

1. If the "*" is the flag character in run-length encoding, how would the following string be decoded?

YYY*N6*24CA*N5
 YYYNNNNNN2222CANNNNN

2. What compression ratio was achieved by encoding the string?

14/20 or .7 or 70%

3. Use the following Huffman alphabet to encode the string.

e = 00 t = 1111 s = 110 h = 1110 r = 01 a = 100 c = 101

"haste"

1110100110111100

4. _____ replaces long strings of characters with a flag/character/count sequence.

- a) Huffman encoding
- b) keyword encoding
- c) run length encoding
- d) spatial compression
- e) temporal compression

5. A discrete representation, breaking the information up into separate elements.

- a) analog data
- b) digital data

6. Data can be retrieved without any loss of the original information.

- a) lossless
- b) lossy

7. The signal behaviour that jumps sharply between 2 extremes is called _____.

- a) digitizing
- b) encoding
- c) re-clocking
- d) pulse-code modulation
- e) sampling

8. Our retinas have three types of colour photoreceptor cells that respond to different sets of frequencies. To what colours do the photoreceptor categories correspond?

red, green, blue

9. _____ describes an image in terms of lines and geometric shapes.

vector graphics

10. If an image's size is 200 X 250 pixels, and the colour is stored in 16 bits, how many **bytes** of memory are needed to store the image without compression?

$200 * 250 = 50,000 \text{ pixels} * 2 \text{ bytes/pixel} = 100,000 \text{ bytes}$

Part F [6 points]

1. Which Excel function can be used to calculate the mean value of a list?
 - a) **AVERAGE**
 - b) MAX
 - c) MEDIAN
 - d) MIN
 - e) SUM
2. Which of the following is not a function category in Excel?
 - a) Date & Time
 - b) Information
 - c) Math & Trig
 - d) **Random**
 - e) Text
3. A worksheet that contains an explanation or instructions of the model would usually be called:
 - a) **Comments**
 - b) Graph
 - c) Main Data
 - d) Parameters
 - e) Summary

4. A column in an Excel worksheet named **Letter Grade** contains the formula

=IF(Score<80,"B",IF(Score<70,"C",IF(Score<60,"D",IF(Score<50,"F","A"))))

What will appear in **Letter Grade** when **Score** is 88?

- a) **A**
 - b) B
 - c) C
 - d) D
 - e) F
5. Referring to the formula in the previous question, what will appear in **Letter Grade** when **Score** is 45?
 - a) A
 - b) **B**
 - c) C
 - d) D
 - e) F
 6. A company decides to give some of its employees a holiday bonus. Those who have been employed at the company for at least 10 years get a bonus if their performance is considered either *good* or *excellent*. Those who have not been employed at the company that long get a bonus only if their performance is considered *excellent*. Assume the columns are named as shown.

Years	Rating	Bonus
3	excellent	YES
15	poor	NO
12	acceptable	NO
2	good	NO
10	good	YES

Which formula could have been used to calculate the values in the **Bonus** column.

- a) =IF(OR(AND(Years<10, Rating="good"),Rating="excellent"),"YES","NO")
- b) =IF(OR(Rating="excellent",AND(Years>=10, Rating="good")), "YES", "NO")
- c) =IF(Rating="good" AND IF (Years>=10," YES ", " NO"))
- d) =IF(Rating>="good",IF(Years>=10,"YES", "NO"),"NO"))
- e) =IF(Years>=10 AND (Rating>="good"),"Yes","No")

Part G [10 points]

The rows have been named with the labels in the left column.

Colour Component	RED	GREEN	BLUE
Intensity	12	25	6
Brightness	Medium	High	Low

1. **Intensity** is a randomly chosen integer in the range 0 - 31 (inclusive).
Show a single formula to calculate all 3 values. [3]

= [INT\(RAND\(\) * 32\)](#)

2. **Brightness** is "Low" when **Intensity** is less than 12, "Medium" when **Intensity** is greater than 11 but less than 23, and "High" otherwise.
Write a formula for the **Brightness** row. [7]

= [IF\(Intensity<12, "Low", IF\(Intensity<23, "Medium", "High"\)](#)

Part H [4 points]

All ranges have been named.

Lower bound	Letter Grade
0	F
40	E
50	D
55	D+
60	C
65	C+
70	B
75	B+
80	A
90	A+

Score	Grade
40	E
61	C
44	E
52	D
33	F
69	C+
57	D+
33	F
64	C
55	D+

Use this table to assign a **Grade** for each **Score**.

This is a partial list of **Scores** showing the appropriate **Grade** for each.

Write the formula for the **Grade** column.

=[LOOKUP\(Score, Lower_bound, Letter_Grade\)](#)