

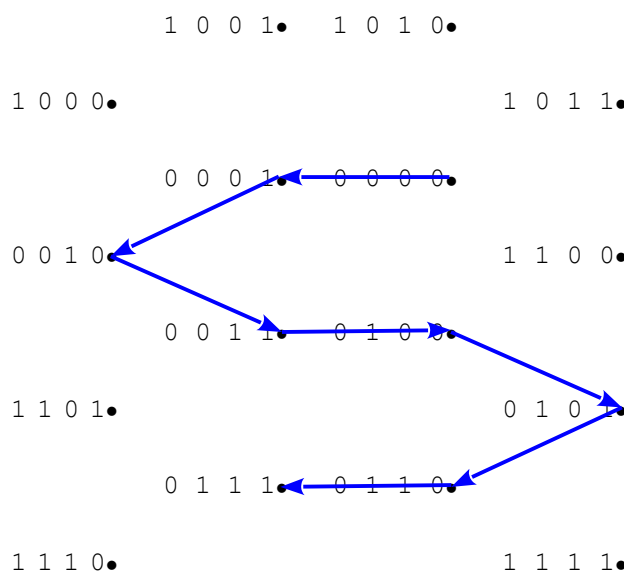
Part A [5 points]

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

assembly languages	_____1	hardware / software
magnetic disks	_____2	hardware / software
spreadsheets	_____4	hardware / software
transistors used as memory	_____3	hardware / software
World Wide Web	_____5	hardware / software

Part B [1 point] – Join the Dots

The dots below are labelled in **Excess** notation. The labels are to the left of the dots. Connect the dots that have **negative** numbers as labels. Start with the smallest value and proceed to the largest.



Part C [6 points] – Complete the table.

Show how the pattern **01111000** translates using each of the following interpretations. [1 each]

unsigned integer	120
integer in 2's complement notation	+120
integer in excess notation	-8
Hexadecimal notation	78
floating point notation	+4
ASCII	x (lower case)

Part D [8 points]

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

$$\begin{array}{r} 0001.0101 \\ +0101.0011 \\ \hline 0110.1000 \end{array}$$

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

$$6\frac{1}{2}$$

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

$$01111101$$

- 4) Show an **optimised** calculation for the following binary multiplication.
Show all your steps. [5]

$$29 * 36$$

29 * 36 can be expressed as

29 converts to

$$29 * (4 + 32)$$

$$11101$$

1

1

$$29 * 4 =$$

$$1110100$$

1

$$29 * 32 =$$

$$1110100000$$

1

$$29 * 32 + 29 * 4 =$$

$$10000010100$$

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?

XXX*M7*65S*N4

XXXMMMMMM6666SNNNN

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

13/20 or .65 or 65%

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

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

"trash"

1111011001101110

4. _____ removes redundant information from within a frame.

- 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. In general, the process of converting sound to digital data is called _____.

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

8. What is the term that refers to the amount of data that is used to represent a colour?

colour depth

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 largest 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. In Excel, the best style for formulas is to

- a) use relative cell addresses
- b) **use named ranges**
- c) use absolute cell addresses
- d) use a mixture of types of cell addresses
- e) avoid formulas

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

Part G [10 points]

S	Suit	R	Rank	Card
1	Clubs	11	Jack	Jack of Clubs
1	Clubs	9	9	9 of Clubs
3	Hearts	2	2	2 of Hearts
2	Diamonds	2	2	2 of Diamonds
4	Spades	13	King	King of Spades

The graphic to the left is from a workbook to analyze probability in card games.

This section "shuffles" cards.

S is one of the integers 1, 2, 3, or 4, and is randomly chosen.

Suit is assigned by a nested IF structure according to the corresponding value of **S**.

1. Clubs
2. Diamonds
3. Hearts
4. Spades

R is an integer in the range 2 to 14 inclusive, also chosen randomly.

Rank is assigned by a nested IF structure according to **R**, using the following mapping:

- Values in the range 2 to 10 are copied from R
- 11, 12, 13, and 14 are replaced by "Jack", "Queen", "King", and "Ace"

The formula in **Card** assembles the name as shown.

You are required to write ONLY SOME of the formulae.

Assume that other cells contain formulae that do what's required there.

1. Show the formula for **S**. [4]

`=INT(RAND() *4) +1`

2. Show the formula for **Suit**. [6]

`=IF(S=1, "Clubs", IF(S=2, "Diamonds", IF(S=3, "Hearts", "Spades"))))`

A variety of answers will accomplish the task. The keys are:

2 IF functions nested inside the outer IF

conditions that uniquely identify 3 values of S and map the appropriate literal strings to each value

assignment of the fourth string

2 points

3 points

1 point

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\(Score, Lower_bound, Letter_Grade\)](#)