## 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.

COBOL	_____2	hardware / software
large scale integration	_____4	hardware / software
magnetic tape drives	_____1	hardware / software
Object-Oriented Design	_____5	hardware / software
operating systems	_____3	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.
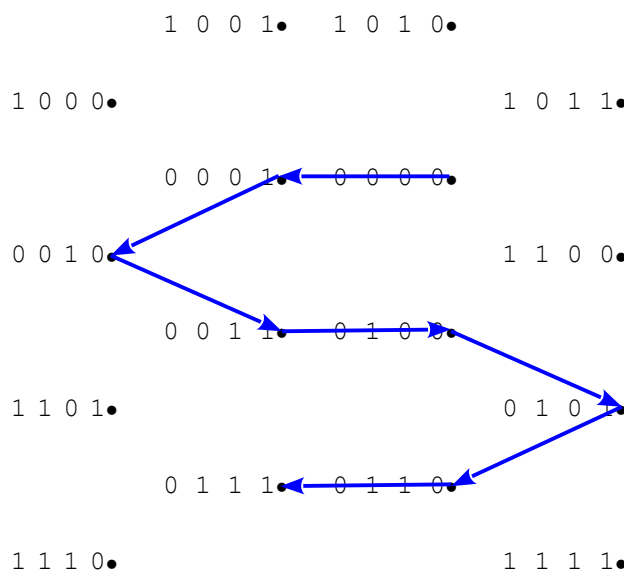
Part C [6 points] – Complete the table.

Show how the pattern **01011000** translates using each of the following interpretations. [1 each]

unsigned integer	88
integer in 2's complement notation	+88
integer in excess notation	-40
Hexadecimal notation	58
floating point notation	+1
ASCII	X (upper case)

Part D [8 points]

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

```
   0001.0101
 +0100.0011
   0101.1000
```

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

   5½

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

   01111011

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

29 / 9

29 converts to	00011101	1
9 converts to	00001001	
so negative 9 is	11110111	1

To 29
add negative 9
10100 > 1001 so
add negative 9

```
      00011101
   +11110111
  1 00010100        1
   +11110111
 10 00001011        1
```

1011 > 1001 so
add negative 9

```
   +11110111
 11 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?

XXX*W6*56S*N4
XXXWWWWWW555555SNNNN

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

"trace"
11110110010100

4. _____ looks for differences between consecutive frames.
   a) Huffman encoding
   b) keyword encoding
   c) run length encoding
   d) spatial compression
   e) temporal compression

5. A continuous representation, corresponding to the actual information it represents.
   a) analog data
   b) digital data

6. Some information may be discarded in the process of compression.
   a) lossless
   b) lossy

7. In general, the process of converting analog data 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 number of pixels used to represent an image?
resolution

9. _____ describes an image in terms of the colour of each picture element.
raster graphics

10. If an image's size is 600 X 500 pixels, and the colour is stored in 24 bits, how many **bytes** of memory are needed to store the image without compression?

600 * 500 = 300,000 pixels * 3 bytes/pixel = 900,000 bytes

Part F [6 points]

1. Which Excel function can be used to calculate the smallest 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 91?

   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 55?

   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(AND(Years>=10, Rating="good"),Rating="excellent"),"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]

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 **R_**. [4]

=INT(RAND() *13) +2

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

=IF(R_<11, R_, IF(R_=11, "Jack", IF(R_=12, "Queen", IF(R_=13, "King", "Ace"))))

A variety of answers will accomplish the task. The keys are:
3 IF functions nested inside the outer IF   2 points
conditions that uniquely identify 4 values of S and map the appropriate literal strings to each value   3 points
assignment of the fifth string   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 **Score**s showing the appropriate **Grade** for each.

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

=LOOKUP(Score, Lower_bound, Letter_Grade)