Chapter 1

* + Data representation
    - Denary
    - Binary
    - One's compliment /unsigned integer
      * + 8 bit unsigned binary can only represent 256 values from 0 (00000000) to 255 (11111111) (9608 w21p12 Q10a)
    - Two's compliment
      * + 8 bit two's compliment integer can only represent 256 values from -128 (11111111) to 127 (0111111) (9608 w21p12 Q10b)
    - Hexadecimal
    - BCD
    - Can not be represent when each groups of 4 bits is greater than 9 (9618 w21p12 Q4d)
    - Examples of practical applications (9608 w21p13 Q1d)
      * + Calculator
        + Digital clock
        + Financial applications
    - Adding, subtracting and converting between denary, binary, hexadecimal and BCD (9618 s21p11/13 Q1c, 9618 w21p11/13 Q1b.i/c)
    - Overflow occurs when the result is greater than (denary value) 255 (for unsigned 8 bit binary) (9618 w21p11/13 Q1b.ii)
    - Ascii code
    - How words are represented by ASCII (9618 s21p12 Q6b)
      * + Each character has it own unique ASCII code
        + Each character is replaced by its ASCII code
        + The codes are stored in the order of the word
    - ASCII character set (9618 s21p12 Q6a)
      * + Can only represent 128 characters
    - Extended ASCII character set (9618 s21p12 Q6a)
      * + Can only represent 256 characters
    - Unicode (9618 s21p12 Q6c)
  + Multimedia
    - Bitmap image
    - Definition (9608 s18p11 Q2a)
      * + Made up of pixel
        + Each pixel has one colour
        + Colour of each pixel stored as a binary number
    - How computer stores bitmap image (9608 s18p11 Q2b)
      * + Each pixel needs *x* bits to store since there only *y* colour 一般会给你一张图然后问你怎么store，这里*x* bits决定于有*y*种颜色，如果图片里只有2种颜色（*y*）那么就只需1bit来储存（*x*）
        + 0 represent white (colour1), 1 represent black (colour2) 如题，把colour1当成白色，colour2当成黑色（也可以反过来）
        + Bit are stored for each pixel is in sequence 储存形式是连续的像素
        + E.g. 1011010001001 如题，把编码写出来算一分
    - Pixel 像素 (9618 s21p11/13 Q1a.i)
      * + Smallest addressable（可解读的）element in an (bit map) image
        + A single square of one colour
    - File header 图片属性 (9618 s21p11/13 Q1a.i)
      * + Information and data about the bitmap image
        + E.g. (9608 s21p12 Q7b, 9608 w21p11 Q1b)
        + File size (in Bytes)
        + Resolution (vertical heights and horizontal widths in pixel)
        + Bit depth
        + Number of colours
    - (image) Resolution
    - Bit depth
    - Features in bitmap graphics (image) software (9608 s20p13 Q7a)
      * + Colour select

Select all pixels of the same colour

* + - * + Add text

To show the name of the company

* + - * + Fill an area with colour
        + Selection

'Grab' a number of pixel to perform a task

* + - * + Copy

Reduplicate a number of pixels

* + - Vector graphic (9618 w21p12 Q5, 9608 s20p12 Q1b)
    - How computer stores vector graphic (9608 w20p13 Q7a)
      * + Each item is a drawing object
        + Drawing objected are created using mathematical calculations (instructions, commands)
        + Properties if each drawing object are stored e.g. positions, fill colour, line colour
        + Calculations for proportional size (not exact dimensions) for each object are stored
    - Property 图形属性 (9608 s21p11 Q1a, 9608 w21p11 Q1a)
      * + Information and data about the geometric shapes/ drawing objects
        + E.g. 考试的时候尽量按照所给的图片写e.g. black line, black fill, solid line

line colour

line style

fill colour

line width

position

* + - Drawing list (9608 s21p11 Q1a)
      * + The list of shapes involved in the (vector graphic) image
        + The list that stores the command/description of drawing object
        + E.g. 3 triangle (shapes), 2 capital letter R (letter)
    - Advantage & disadvantage
    - Bitmap image
      * + Advantage

Looks more realistic.

Can be compressed with large reduction of its origin file size.

* + - * + Disadvantage

When enlarge or zoom in, image will be pixelized

Usually has larger file size, because every pixel is needed to be stored

Hard to edit, because every pixel need to be edit separately

* + - Vector graphic
      * + Advantage (9608 s18p11 Q2d)

can resize without getting pixelized, because shapes will get recalculated when resize

Usually have smaller file size, because it only contains instruction or function to create shapes)

* + - * + Disadvantage

Do not compress well because of little data redundant重复的数据很少所以很难压缩

Vector graphics need to be 'rasterised'（转化成打格式）to display or print

* + - Difference (9618 w21p12 Q5b.i)
    - Bitmap is made of pixels || Vector graphic stores sets of instruction/commands about drawing objects /shapes
    - Bitmap images are suitable for photographs/ scanned picture || Vector graphics are suitable for geometric shapes
    - When bitmap image is enlarged, pixel get bigger, image get pixelized || When vector graphic is enlarged, shapes get recalculated, image does not get pixelized
    - Vector graphics need to be 'rasterised'（转化成打格式） to display or print, bitmap image don't
    - Sound files
    - Sampling
      * + Measuring the amplitude of sound wave at set time intervals（间隔）
    - Sampling rate
      * + Definition (9608 w21p11 Q2a)

The number of samples taken per unit time

* + - * + Why sound is better (closer to the original) when higher sampling rate is used? (9618 w21p11/13 Q7a.i, 9608 w20p11 Q7)

Smaller time gaps between samples

The digital sound wave is more accurate

Smaller quantisation error

* + - * + Why sound file size increases when higher sampling rate is used? (9618 w21p11/13 Q7a.ii, 9608 w20p11 Q7)

More samples are taken, so more bits are used to stored altogether

* + - Sampling resolution
      * + Definition (9608 w21p11 Q2a)

The number of bits used to represent/encode each sample

* + - File size (9618 s21p11/13 Q1a.ii, 9618 w21p11/13 Q1a)
    - For image files
      * + = image resolution x bit depth
    - For sound files
      * + = sampling resolution x sampling rate
    - 1 bit = either 0 or 1
    - 1 byte (B) = 8 bit
    - Estimate
      * + 1 kilobyte (KB) = 1024 B = 103 B
        + 1 megabyte (MB) = 1000 KiB = 106 B
        + 1 gigabyte (GB) = 1000 MiB = 109 B
        + 1 terabyte (TB) = 1000 byte = 1012 B
    - Accurate
      * + 1 kibibyte (KiB) = 1024 B = 210 B
        + 1 mebibyte (MiB) = 1024 KiB = 220B
        + 1 gibibyte (GiB) = 1024 MiB = 230 B
        + 1 tebibyte (TiB) = 1024 byte = 240 B
  + File compression
    - Purpose of using file compression (9618 w21p11/13 Q7b.i, 9608 s21p11 Q8b.i, 9608 s19p11 Q1d.i)
    - To reduce storage space required/needed to store the file (because of the file size decreases)
    - To reduce the time for transmit (upload and download) the file (because of the file size decreases)
    - (To reduce file size) because emails have limit file size for sending or receiving (transmit) || original file is too large for email storage/attachment
    - Lossless compression
    - Purpose of using lossless compression (9608 s21p11 Q8b.ii)
      * + Because all the data needs to be recoverable (after decompression), otherwise the file content will not make sense.
    - Run-length encoding (RLE) 考试一定要写全称 (9618 s21p11/13 Q1b, 9618 w21p11/13 Q7b.ii, 9608 s18p11 Q2b.ii)
      * + Replace a sequence of same colour pixel with colour code and number of the sequence.
        + E.g. 3 black pixels and 4 white pixels can be encode to B3W4 如果考试给了一张图务必要吧那张图精确的编写出来
    - Lossy compression (9618 w21p12 Q5b.ii)
    - Definition (9608 s19p11 Q1d.ii)
      * + A way of compression that data will be loss
        + The decompressed file is not the same as the original file
    - Purpose of using lossy compression (9608 s19p11 Q1d.iii)
      * + Lossy compression compresses further than lossless compression, which produce smaller file size
        + A very large file needs significant reduction in its size
        + Lossy removes details which can be lost without people notice
    - On image
      * + Reduce image resolution

Reduces the number pixel in width and height, which means fewer bits is need to store the image (all of the pixels), this decreases the file size

* + - * + Reduce number of colours

Reduces the colour types which means fewer bits is need to store each colour, this decreases the file size

* + - * + Reduce bit depth

Reduces the number of bits per pixel which means each pixel has fewer bits, this decreases the file size

* + - On sound file
      * + Reduce sampling rate

Reduce sampling rate means fewer samples are taken per unit time (e.g. seconds) so less data is stored, so less bit is stored, this decreases the file size

* + - * + Reduce sample resolution

Reduce sampling resolution means fewer bit are used to represent teach sample, so less data is stored, so less bit is stored, this decreases the file size