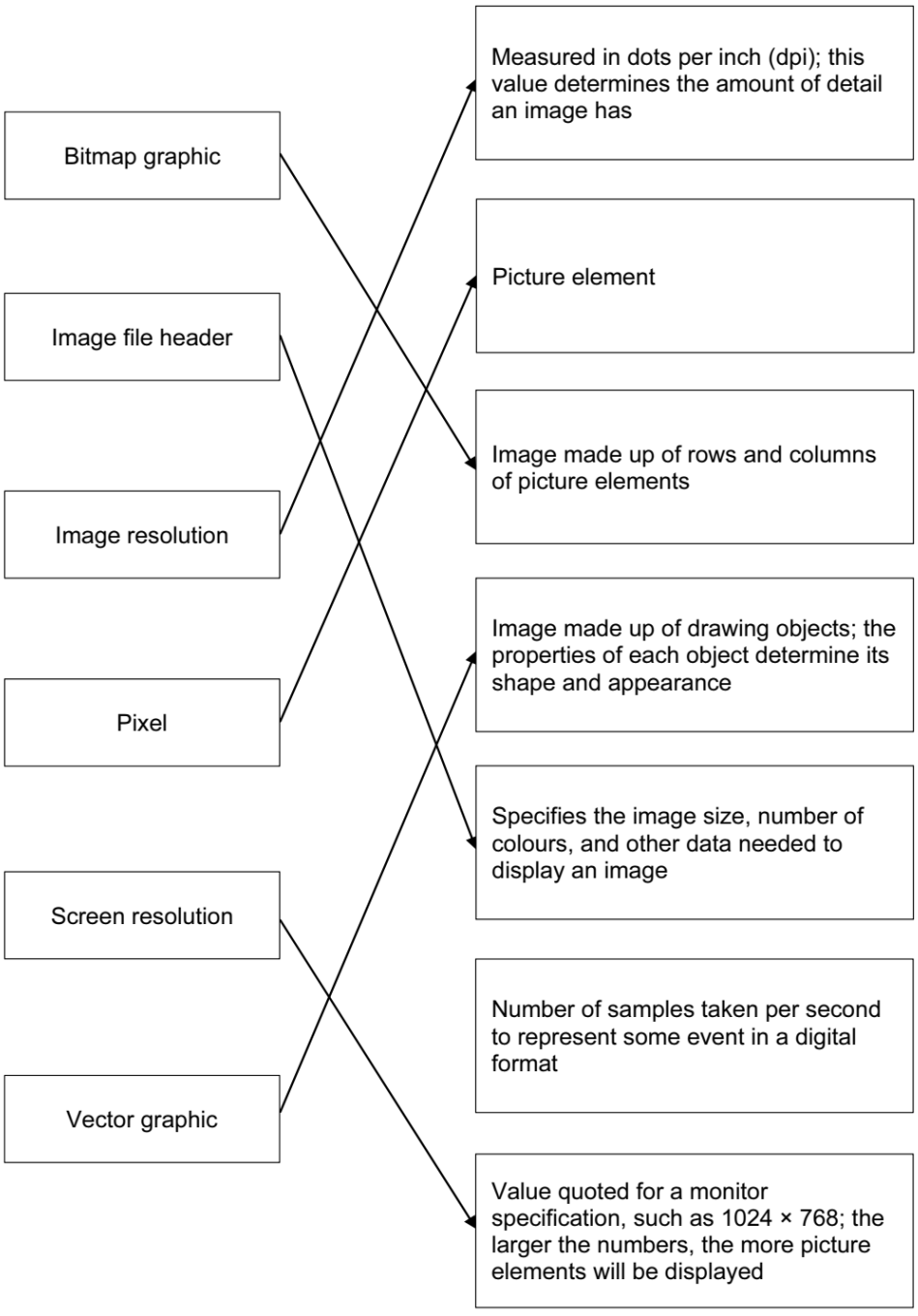
Q1

1(a)(i)	119	**1**
1(a)(ii)	–120	**1**
1(a)(iii)	1 1 1 0 1 1 1 1	**1**
1(a)(iv)	Lowest value: −128 Highest value: +127	**1**
1(b)(i)	0110 0101 0011	**1**
1(b)(ii)	The second block of four binary digits represents a digit larger than 9 // 14	**1**
1(b)(iii)	A string of digits on any electronic device displaying numeric values	**1**

Q2

(a)



1 mark for each correct line, two lines from one box is incorrect [6]

2(a)	**1 mark** per bullet, **max 2** ∞ Made up of pixels ∞ Each pixel has one colour ∞ Colour of each pixel stored as a binary number	**2**
2(b)(i)	**1 mark** per bullet, **max 2** ∞ Each pixel requires only one bit (as there are only two colours) ∞ Black represented by 1 and white by 0 (or vice versa) ∞ Bits are stored for each pixel in sequence ∞ 11111 01010 01010 01010 01010	**2**
2(b)(ii)	**1 mark** for the explanation ∞ Stores the colour and the number of times it occurs **1 mark** for example from ∞ An example from the bitmap given e.g. B5, W1, B1 and so on	**2**
2(c)	**1 mark** per bullet ∞ Number of pixels 500*1000 (= 500 000) ∞ 35 colours require 6 bits per pixel ∞ Number of bytes (500 000 * 6) / 8 = 3 000 000 / 8 (= 375 000) ∞ = **375 Kb**	**4**

2(d)	**1 mark** per bullet to **max 2** marks per benefit ∞ Can resize it without pixilation ∞ Image is redrawn/recalculated with each adjustment ∞ Smaller file size ∞ Storing points/equations/commands etc., not individual pixels	**4**

Q3

(a) (i) Any **one** from:

- amplitude of sound wave taken at different points in time
- measurement of value of analogue signal at regular time intervals/a point in time **[1]**

(ii) Any **one** from:

- bit depth/sampling resolution sufficient for good quality sound
- higher bit depth/sampling resolution would mean bigger files
- ...hence less (music) content on each CD
- can represent dynamic range of about 90 dB
- 90 dB is basically the maximum dynamic range of human hearing
- compromise between quality and reasonable file size **[1]**

(iii) Any **two** from:

- resolution is the number of distinct values available to encode/represent each sample
- specified by the number of bits used to store/record each sample
- sometimes referred to as bit depth
- the higher the sampling resolution, the smaller the quantization error
- a higher sampling resolution results in less distortion of the sound
- usually 8 bit, 16 bit, 24 bit or 32 bit **[2]**

(iv) **1 mark** for benefit and **1 mark** for drawback.

benefit

- allows for larger dynamic ranges
- ...as dynamic range is approximately six times the bit depth
- more accurate representation/crisper sound quality

drawback

- bigger files/occupies more memory/storage
- longer to transmit data/download music
- greater processing power needed **[2]**

(b) Any **two** from:

- edit start time, stop time and duration of any sound/timeline
- extract/delete/save part of a clip
- frequency, amplitude, pitch alteration
- fade in/out of a clip
- mix/merge multiple sound sources/tracks
- combine different sources at various volume levels
- pan between tracks/channels
- use of filters
- playback to speakers, processors or recording medium
- conversion between different audio file formats
- etc... **[2]**

(c) Any **three** from:
For full marks both techniques must be mentioned.

- lossless designed to lose none of the original detail/lossless allows original file to be recreated exactly
- lossless technique based on some form of replacement
- mention of type of replacement, for example RLE, FLAC etc.
- by example: e.g. 000–1111–222222–333 = 3–0, 4–1, 6–2, 3–3 etc.
- maximum compression about 50%
- lossy may result in loss of detail compared to original file/lossy does not allow original file to be re-created exactly
- lossy techniques make decision about what parts of sound/sound file are important and discards other information
- only keeps sounds human ear can process/discards sounds most people cannot hear
- ... then applies lossless technique, for further reduction
- lossy compression can reduce to about 10%
- an example of jpeg, mp3 or other correct examples of compressed formats.

No double credit to opposite answers, e.g. lossless maintains detail, but lossy loses detail just one mark.

[3]

Q4

(a) The number of images / frames recorded per second / unit time.
// The frequency with which the images/frames are recorded.

[1]

(b) **ONE** mark per bullet point below. **MAX THREE** marks per type of encoding.

Interlaced encoding

- The data from a single frame are encoded as two separate **fields**.
- One containing the data for the even numbered rows / lines and the other has the data for the odd numbered rows / lines.
- The image is rendered by alternating between the even field and the odd field (of each successive frame).
- The viewer sees data from two frames simultaneously
- The rate of picture display (the field rate) is twice the rate of image frame display (the frame rate).
- Originally used in television broadcasting and adapted for video recordings.
- Produces what appears to the eye to be a high refresh rate.
- Halves the transmission bandwidth requirements.

Progressive encoding

- Stores the data for an entire frame and displays all the frame data at the same time.
- The rate of picture display is the same as the frame rate.
- Used by traditional film / video digitised from a film camera / computer displays progressive encoding.
- High bandwidth requirements.

[4]

(c) **(i)** **ONE** mark per term.

Description	Term
Pixels in two video frames have the same value in the same location. There is duplication of data between frames.	**Temporal redundancy**
A sequence of pixels in a single video frame have the same value.	**Spatial redundancy**

[2]

(ii) (File) compression

[1]