Solutions

Each answer shows the steps, then the **result**.

2.1 any **three** of:

- the file format or file type; the width of the image in pixels; the height in pixels; the **colour depth** (bits per pixel); the colour palette

2.2

- **image resolution** is the number of pixels in the **image** itself, for example 1920×1080
- **screen resolution** is the number of pixels the **display** has, so the same image looks smaller on a higher-resolution screen, and an image with more pixels than the screen cannot be shown at full detail

2.3

- a **drawing object** is one shape in the picture – here, the circle itself
- a **property** is a value stored for that object which is needed to draw it
- for a circle the properties are its **centre** and **radius**, together with its fill colour and its line colour and thickness

2.4

- **analogue** data varies **continuously** and may take any value – the pressure wave arriving at the microphone
- **digital** data is stored as a fixed set of discrete binary values – the numbers written into the sound file

2.5

- the number of **bits used to store each sample**
- which fixes how many different amplitude levels a measurement may be rounded to: n bits give 2^n levels

3.1 B

- the number of bits per sample is the **sampling resolution**
- the sampling **rate** (**A**) is samples per second; **C** and **D** are image terms

3.2

(a)

- the drawing list is the file: every **drawing object** in the picture, each with its **properties**
- stored in the order in which they are drawn, which decides which shape appears on top

(b)

- the drawing objects are a **circle** and a **square** (or rectangle)

- two properties of the circle, from: its **centre** coordinates; its **radius**; its fill colour; its line colour; its line thickness
- (a property must be a stored *value*, not "it is round")

(c)

- a vector stores **instructions**, so enlarging it redraws the circle and the square at the new size and the edges are recalculated – they stay sharp
- a bitmap stores a fixed grid of pixels, so enlarging it only makes each stored pixel bigger; no extra detail exists to show, and the image looks blocky

3.3

(a)

- the amplitude of the wave is measured at **regular intervals** – this is **sampling**
- each measurement is **rounded** to the nearest level that the available number of bits can represent
- and stored as a **binary number**; the device that does this is an analogue-to-digital converter

(b)

- the sampling rate is the number of samples taken **per second**
- measured in **hertz** (Hz)

(c)

- **accuracy**: 44 100 samples a second captures far more of the wave's changes over time than 8 000, and 16 bits allows 65 536 amplitude levels instead of 256, so each measurement is closer to the true value – the playback is noticeably more faithful
- both effects together make the recording follow the original wave much more closely
- **file size**: the rate rises by a factor of about 5.5 and the resolution by a factor of 2, so the file is about **11 times larger** for the same length of recording

(d)

- a higher sampling rate stores proportionally more samples per second, so the file grows in exact proportion
- but human hearing has an upper frequency limit, and once the rate is high enough to capture every frequency a listener can hear, the extra samples record nothing that can be heard