4 Object-Oriented Programming (RKH)

A developer wishes to create a photo library application that can auto-detect faces in images to assist labelling. They wish to use some commercially available Java face detection software. The source to this software is unavailable—only the Java bytecode and documentation are supplied. The two key classes are as follows:

Class name	Method prototype

`Image`	// Constructor
	`public Image(byte[] imageData, int w, int h)`
	// Get the image value at pixel (x,y)
	`public byte getPixel(int x, int y)`
	// Set the image pixel at (x,y) to value val
	`public void setPixel(int x, int y, byte val)`
	// Get the image width
	`public int getWidth()`
	// Get the image height
	`public int getHeight()`

`Algorithm`	// Search for and mark the faces in Image im `public static void markFaces(Image im)`

(*a*) Explain what is meant by source code, machine code and Java bytecode. Give two advantages of distributing Java software as bytecode rather than source code. [5 marks]

(*b*) Explain why `markFaces()` is declared `static`. [1 mark]

(*c*) The developer wishes to add filename information in the form of a `String` to all of the `Image` instances. Show how to achieve this efficiently using inheritance. [4 marks]

(*d*) The developer wishes to know whether the `markFaces()` method visits every pixel in the image or uses a more intelligent search strategy. Provide a new class definition that can be used to determine the search sequence. Your class should be able to *temporarily* augment an `Image` object with logging capabilities while it is being processed by `markFaces()`.

[*Hint:* You may find it useful to apply a common design pattern.]

[10 marks]