



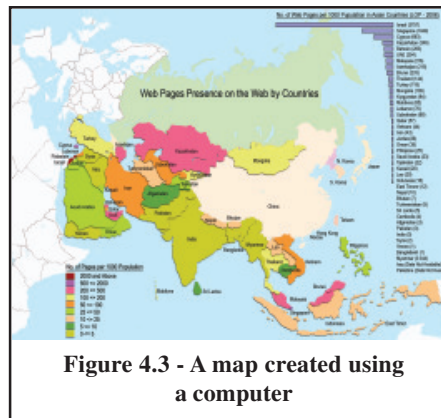
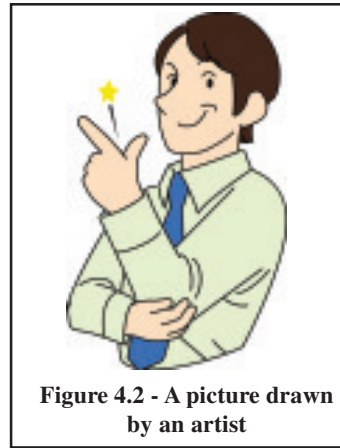
## Multimedia Applications for Effective Information Communication

After studying this lesson, you will have better understanding of,

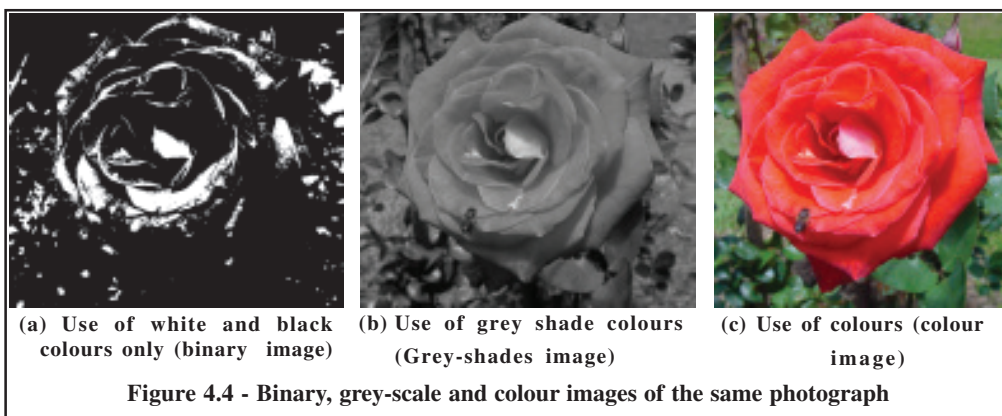
- Basic colour models
- Digital colour combination
- Picture editing and construction
- Tools of Adobe Photoshop

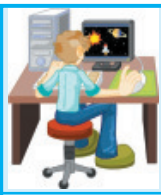
In multimedia technology, in addition to text the most widely used medium is a picture. You may have heard the saying “a picture worth a thousand words”. This saying indicates that a picture can present information given in a thousand words. Since in information communication more attention has been given to the picture, it is important to know how computers can be used for the creation of a picture or for the enhancement of a given picture.

The pictures which we see in our day - to - day life can be classified mainly into two categories. The real world pictures you have obtained using a camera during a trip or any other occasion can be classified into the first category and the pictures or graphics drawn by an artist or any other person belong to the second category. Figure 4.1 shows a photograph taken with a camera which belongs to the first category. Figures 4.2 and 4.3 show a picture drawn by an artist and a map prepared using the computer respectively, both belong to the second category. When a picture is represented in the computer it is referred to as an image.



In imaging, an image can be constructed using only full white or dark black colours (binary image) or using colours ranging from white to black (grey scale image). However, due to the advances taking place in technology, colour image construction has taken prominence. Figure 4.4 shows three images constructed using these three approaches.

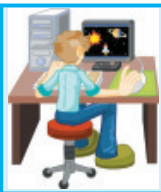




#### Activity 4.1

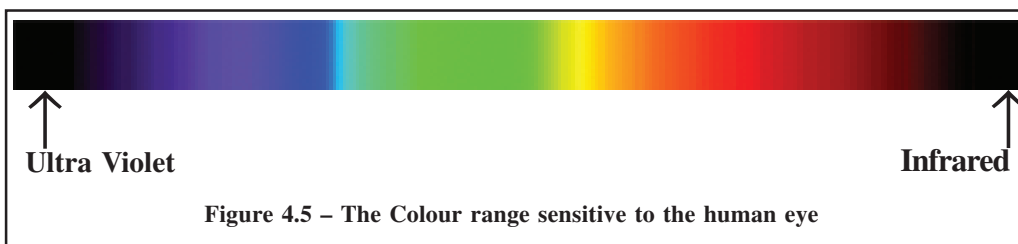
Explore the photographs or drawings used in newspapers, magazines or websites. Collect such photographs or drawings as much as you like. Separate them according to the classification discussed above.

First, the Photographs or drawings which you have collected should be input to the computer. For this purpose you need a colour scanner. With the help of your teacher, using the scanner at the school, you can input one of them to the computer. Now you have computerized photograph or drawing and you also can download photographs or drawings from the Internet.



#### Activity 4.2

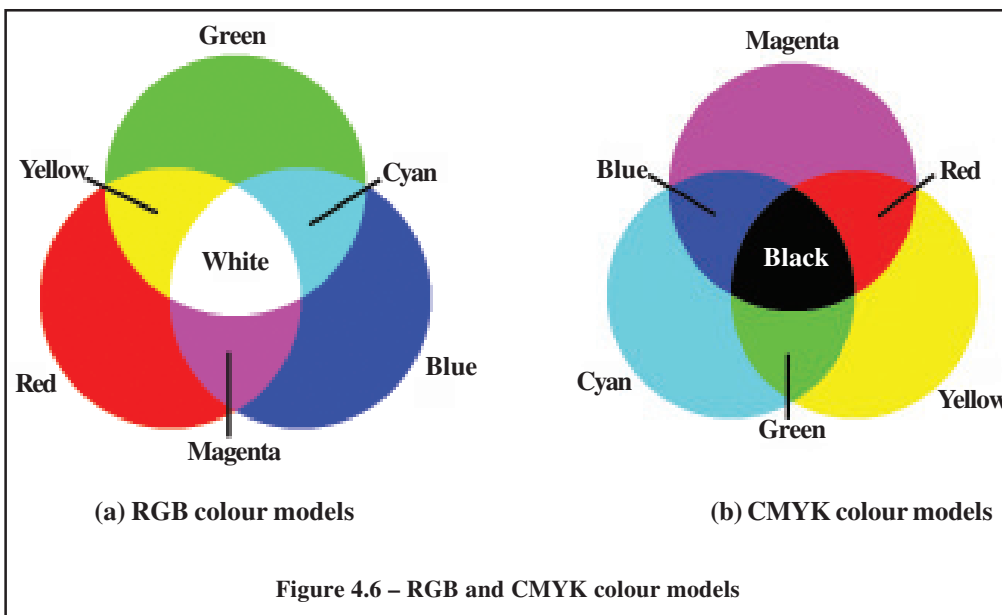
With the help of your teacher convert a colour photograph which you have computerized into the images represented in the figures 4.4(a) and 4.4(b). Also observe that a binary image or a grey-scale image cannot be converted to a colour image.



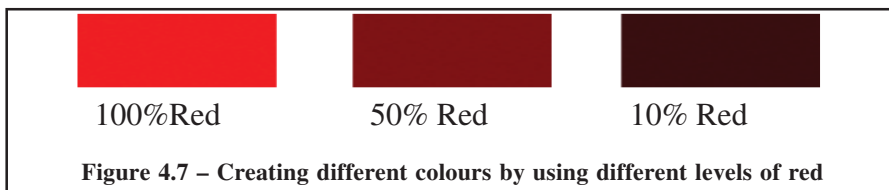
The number of colours sensed by the human eye is about 10 million. However, all these colours cannot be separately sensed by the human eye. You may have seen clearly the quality of the pictures created using these colours.

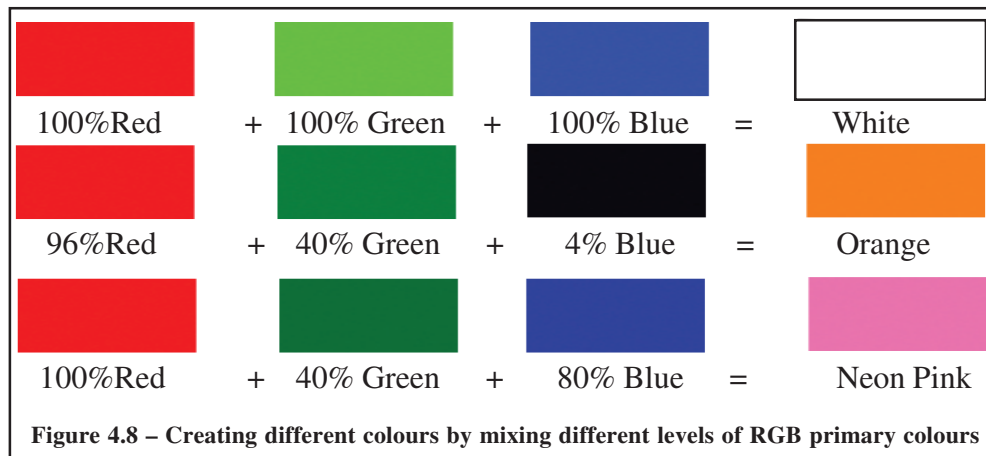
It is necessary to identify different colours and communicate the different colour shapes. Therefore, the importance of colour models was identified. Since the colour

models can represent the colours in digital form, the information about colours can be communicated easily. The RGB model and the CMYK model are the most commonly used colour models. The RGB images are constructed using coloured lights on TV or computer monitors. The CMYK model is used for printing of colour images on paper using four different colour inks. Every colour model uses different primary colours. The RGB model uses Red, Green and Blue as its primary colours and the primary colours used in the CMYK model are Cyan, Magenta, Yellow and Black. (See figure 4.6)



Three secondary colours can be obtained by mixing any two primary colours. The yellow colour can be obtained by mixing similar amounts of red and green colours. Similarly, by mixing red and green colours magenta colour and by mixing red and green colours cyan colour can be obtained (see figure 4.6(a)). Millions of composite colours can be obtained by mixing different ratios of primary colours (see figures 4.7 and 4.8).





Since the RGB colour model is used in TV and computer monitors our main attention will be given to this model in this course. However, we will discuss the CMYK model whenever required.

The information or quality of an image can be given using the colour usage in it. Therefore, the width and height (number of pixels) of the image and the amount of colour information which can be stored in a pixel determines the quality of the image. We should consider that the size of a computerized image is determined by the number of pixels in its width and height (resolution). Similarly the quality of an image depends on the number of colours or grey-level which can be represented in a pixel. The image given in figure 4.4(a) a pixel can represent only white or black. Similarly the image given in figure 4.4(b) a pixel can take 256 levels of grey levels ranging from black to white and the colour image given in figure 4.4(c) a pixel can represent 16,777,216 RGB colours. In this situation, the image is considered as a 24-bit image. The three primary colours red, green and blue use 8 bits each, therefore, each primary colour can represent  $2^8$  or 256 levels of that colour. As you have seen in figure 4.7 three different red levels can be obtained using 100%, 50% and 10% of red amounts. The levels of primary colours are usually represented as a decimal number between 0 and 255 or a hexadecimal number between 00 and FF. Figure 4.8 shows orange which utilizes R=244 (96% of 255), G=102 (40% of 255) and B= 36 (14% of 255). This is referred to as the RGB Triplet and can be represented as RGB (254,102,36) or RGB(F5, 66,24). The figure 4.9 shows the way in which these numbers are used in Colour Picker of Adobe Photoshop and figure 4.10 shows how these numbers are shown as decimal numbers in the Colour Palette of Adobe Photoshop.

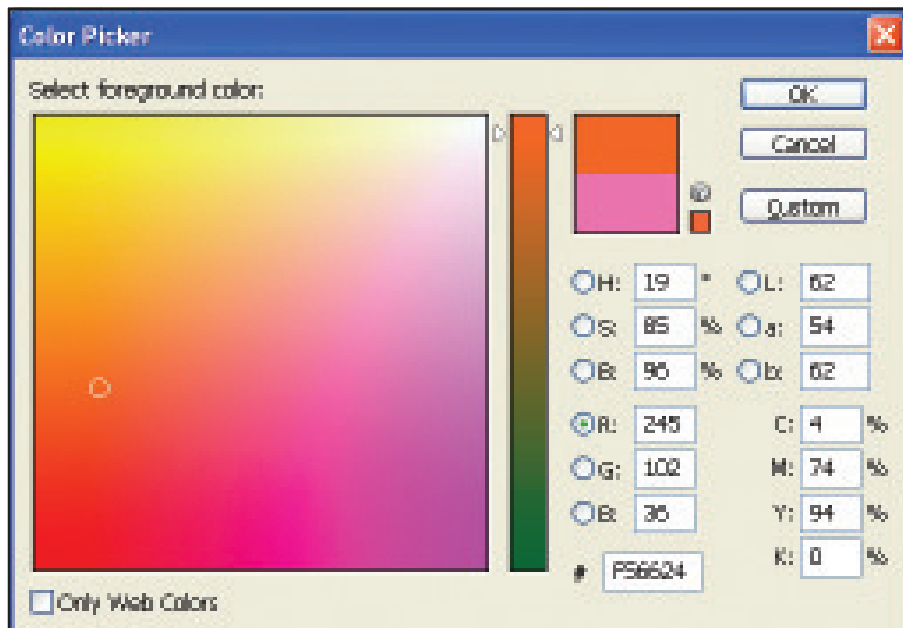
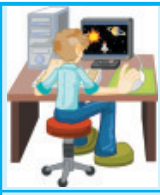


Figure 4.9 the representation of RGB Triplet values for orange colour in Adobe Photoshop Colour Picker



Figure 4.10 – The representation of RGB Triplet values for orange colour in Adobe Photoshop Colour Palette



### Activity 4.3

As shown in the figure 4.9, observe how different colours can be obtained by changing the different levels (decimal values) of primary colours. Use Adobe Photoshop or any other tool for this purpose. Get the help of the teacher for this work. Prepare a table of the levels of the three primary colours in decimal numbers for 16 of your favourite colours. When preparing this table, use the table features of a word processing package.

	Colour	Hexa Decimal Value			Decimal Value		
		Red	Green	Blue	Red	Green	Blue
1		FF	CC	33	255	204	51
2							
3							
4							
5							
6							
7							
8							

Previously, it was mentioned that width and height and the number of colours used determine the quality of an image. The quality of the image varies depending on the number of pixels that can be represented in a row or a column (usually in one inch). You must pay attention to what kind of application you are creating the images for. If you are creating images for a website, you must use low resolution images for communication reasons. If you are creating images for printing or desktop publishing you must use high resolution images to have high quality printed images. In a computer monitor or TV the unit used to measure the resolution is pixels per inch (ppi) and in printing it is dots per inch (dpi). For example, in computer display images 72ppi or 96ppi is widely used and in printing 300dpi, 600dpi, 1200dpi, 2400dpi or even larger values can be used.

According to this representation, a computer image of 1 inch height, 1 inch width and 72ppi resolution would have 5184 ( 72x72) pixels and a printed image of 1 inch height, 1 inch width and 300dpi would have 90,000 (300x300) pixels. If a low resolution image (eg, 72ppi) is used for printing purposes, its quality would be very low (see figure 4.11). Therefore, the resolution of the image you create would be determined by the type of application.

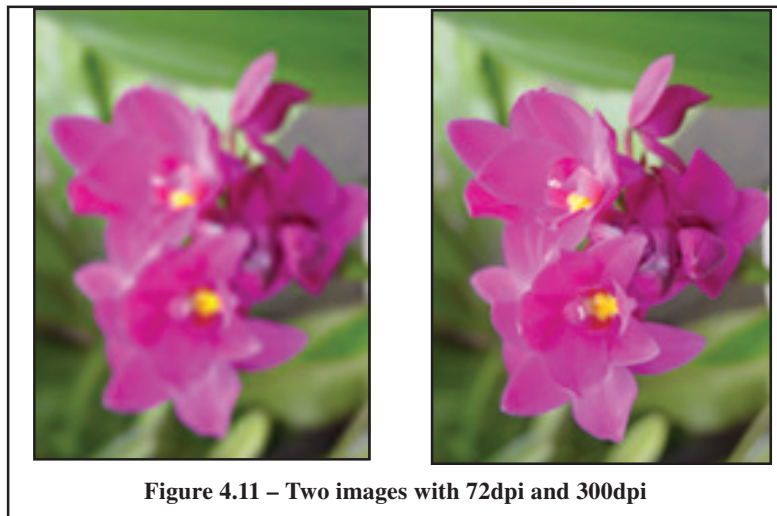


Figure 4.11 – Two images with 72dpi and 300dpi

If you use a package such as Adobe Photoshop, for image creation or edition, the above factors would be very important. The width, height, resolution and the colour model are very important factors and also you must use different name for different images. Figure 4.12 shows the ‘New’ dialogue window required to create a new image or edit an existing image using Adobe Photoshop. You can observe that the new image should be given a name according to the operating system recommendation in the ‘Name’ line. In addition to this the width of the image 640 pixels, height 480 pixels, colour model RGB, a pixel colour volume 8 bit and also the background colour white are indicated in the window. These values are used to suit your image and are not predefined values. This can be observed by ‘Custom’ in ‘Preset’.

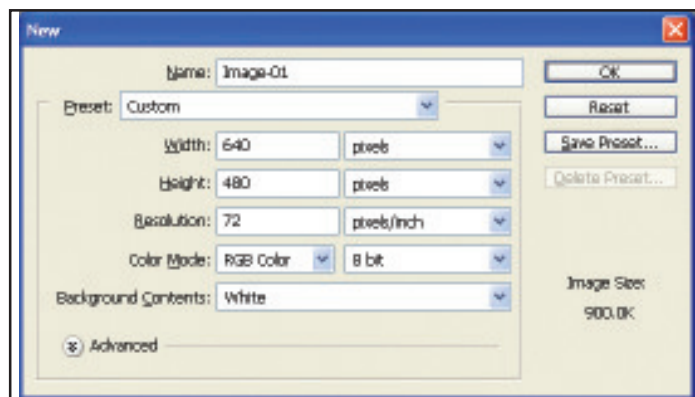


Figure 4.12 - The Adobe Photoshop Dialogue window shows the suitable values selected for an image



You can also use predefined values for this purpose. Figure 4.13 shows a window with predefined values.

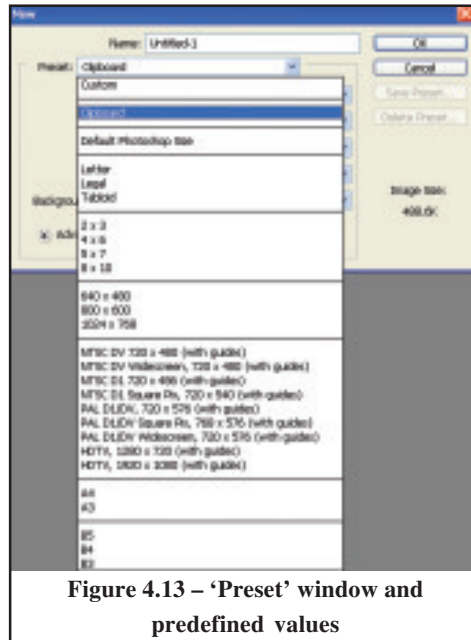


Figure 4.13 – ‘Preset’ window and predefined values



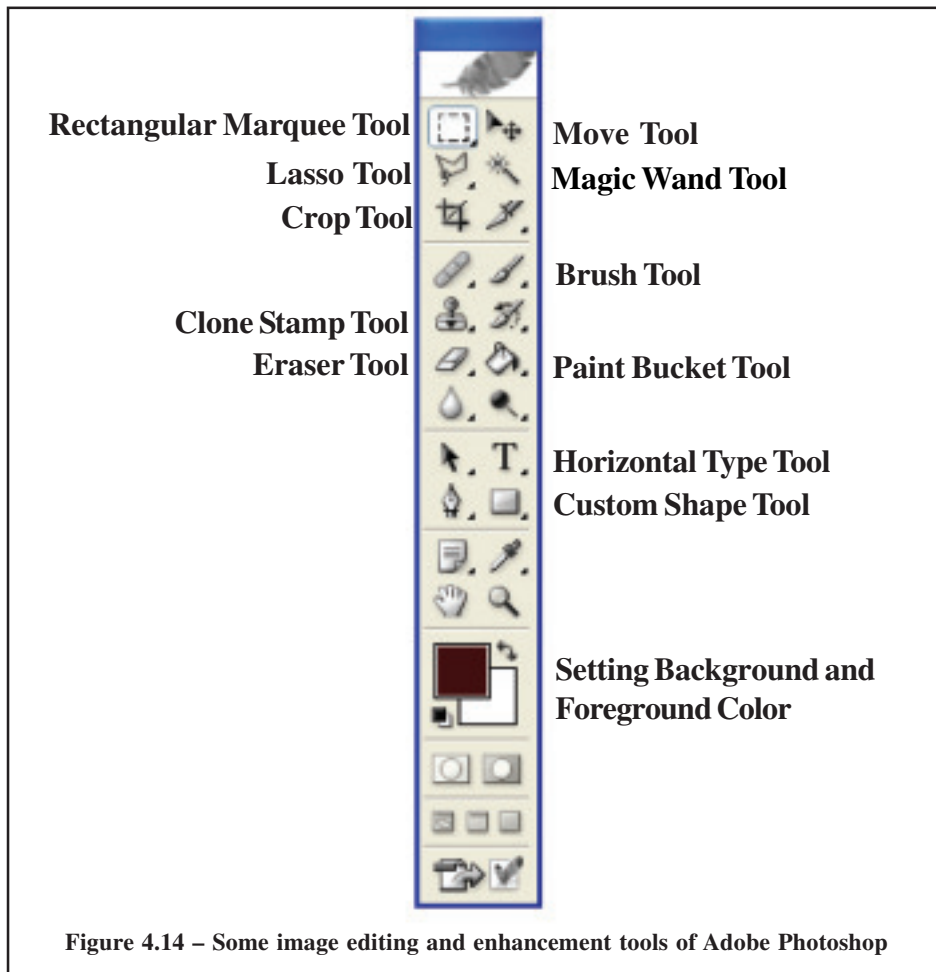
#### Activity 4.4

If an image with predefined value is given to such a Figure as 4.13 is selected, a dialogue window such as Figure 4.12 can be obtained. Observe this dialogue window. Create a table with values in the dialogue window. In that window indicate the width, height, colour model and number of bits per pixel.



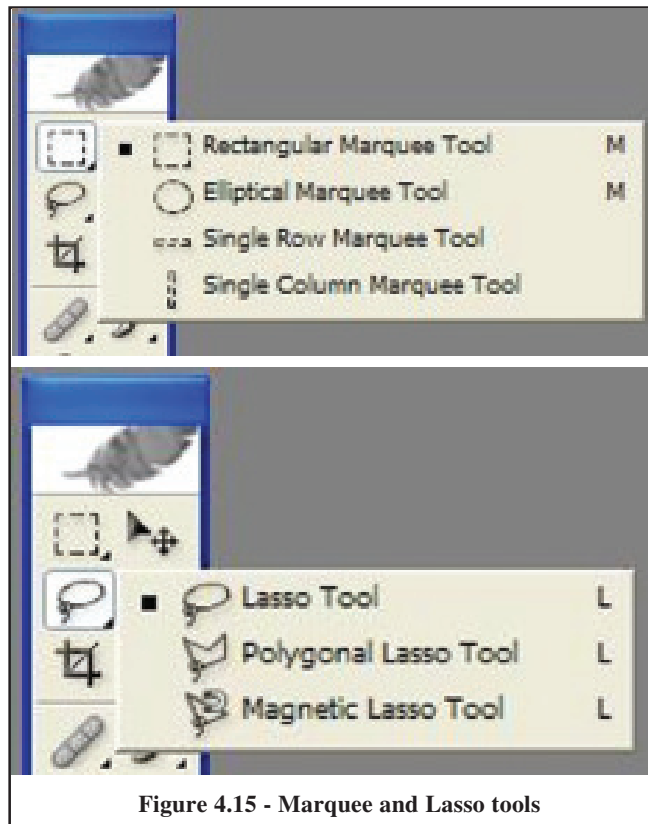
### Image Creation and Editing Tools

Now you may realize the next most important thing is to gather the knowledge required to create or edit an image using the computer. You may use an image processing tool such as Adobe Photoshop to improve the quality of a photograph or remove parts of it or add parts or text to it and by doing so enhance its appearance. Let us see some image editing and enhancement tools of Adobe Photoshop (see Figure 4.14).



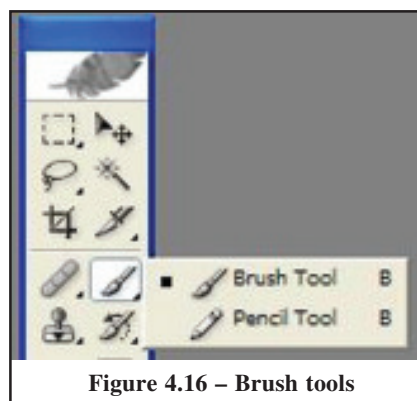
## Selection Tools

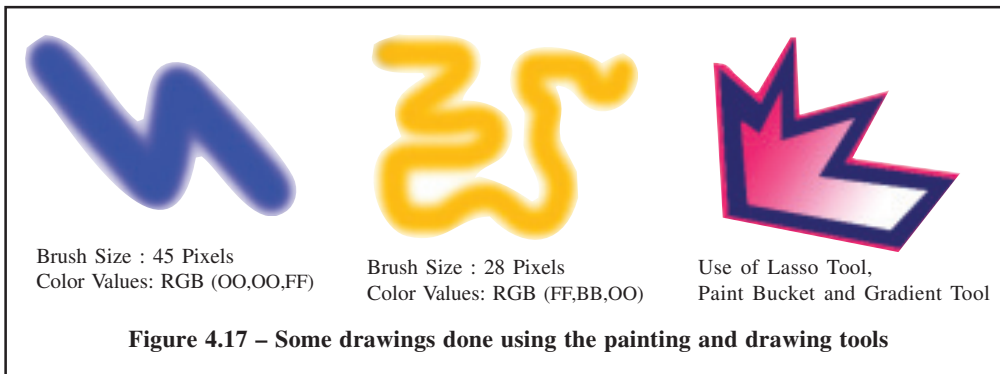
The 'Marquee' tool is one of the selection tools to select any part of the image and using this the selected part can be copied to get a new image or the selected part can be separately edited keeping it in the same image without copying it as a new image. The selection of the part can be done to a different shape. The 'Rectangular Marquee' tool can be used to select a rectangular or square section and the 'Elliptical Marquee' tool can be used to select a circular or elliptical section. Similarly, a section of a polygonal shape can be selected using the 'Lasso' tool and the 'Magnetic Lasso' tool can be used to select a section of any shape. If the selection is based on a certain colour, the 'Magic' tools can be used (see figure 4.15).



## Painting and Drawing Tools

The Painting and Drawing tools can be used to create drawings of any shape and of different colours. The painting for the drawings can be chosen using the 'Paint Bucket' tools. The 'Brush' tools can be used to draw pictures of any shape of different colours (see figure 4.16), Figure 4.17 shows some creations done using these tools.





## Text Tools

The Text tools can be used to draw text of different shape, size and colours. Attractive text with effects such as shadow, emboss or engrave can be created using this tool (see figure 4.18).

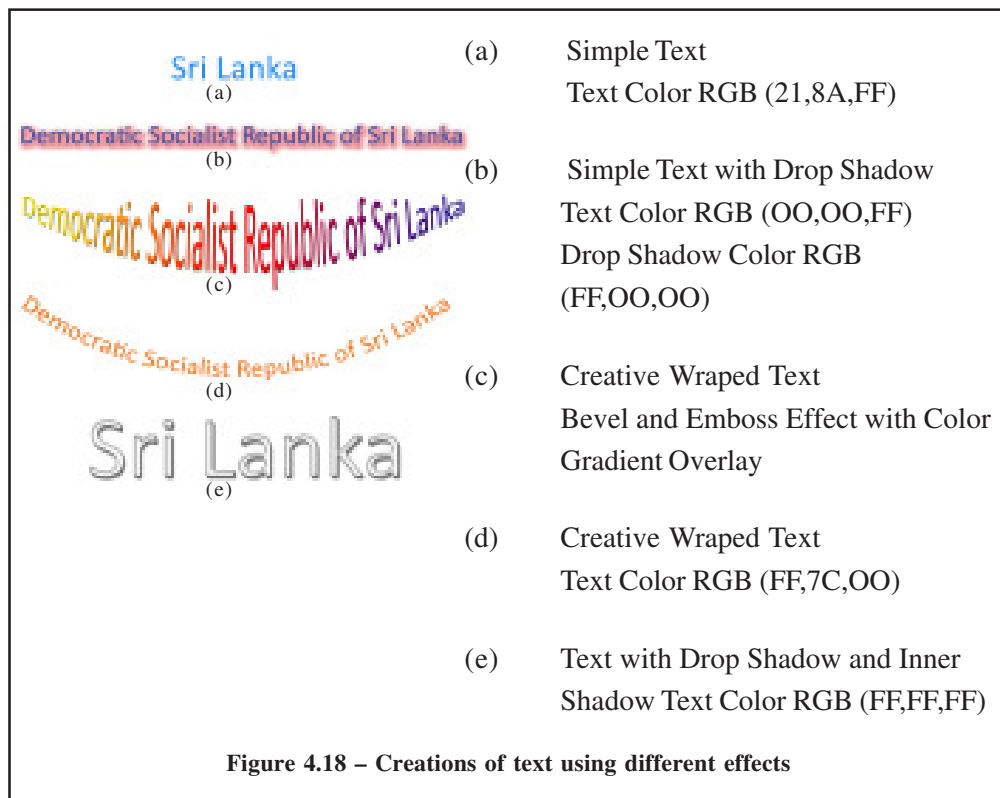


Figure 4.19 shows some text tools of Adobe Photoshop which can be used to create text which is incorporated in your operating system with different variations. According to this table, setting of various text features such as font family, font style, anti-aliasing, text alignment, font colour, wrap text or text orientation can be done using these text tools.

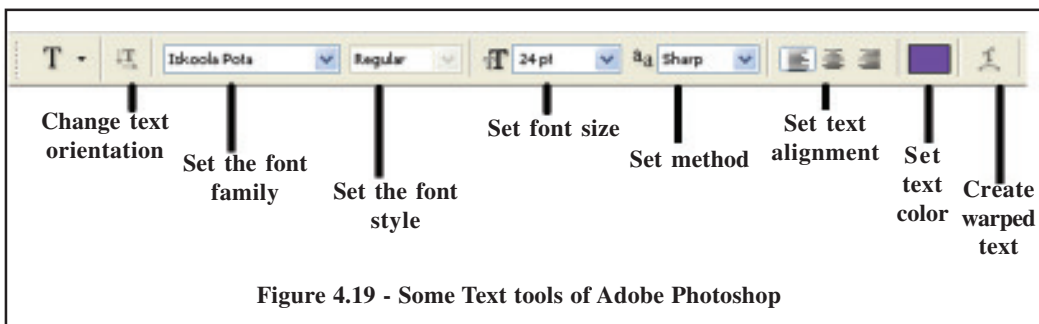


Figure 4.19 - Some Text tools of Adobe Photoshop



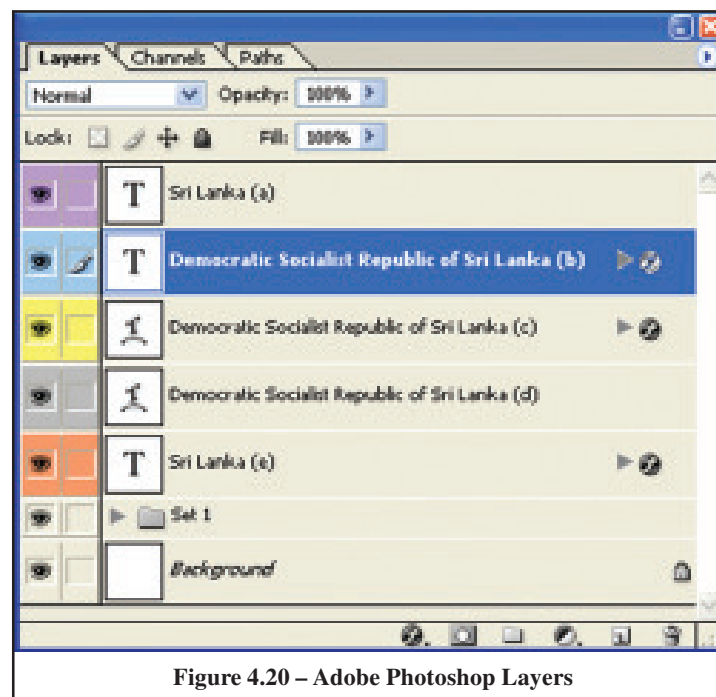
## Modifying Characteristics of Images

The images accessed using image processing software can be subjected to modification of their image characteristics and can be stored on any storage media. For example a document image can be modified in this way. The most common document image type is JPEG (Joint Photographers Expert Group). If the resolution of an image is reduced and the original image on the disk is replaced by the low resolution image, a high resolution image cannot be recovered. For example if a document image has 96ppi and is reduced to 72dpi using image processing software, the recovery of a high resolution image back is impossible. The reason for this is that some useful properties of a high resolution image will be lost in this process. Using an image processing software package such as Adobe Photoshop, changing of image dimension, applying other effects, changing the colour model, changing the pixel colour volume can be performed. Once the original image is replaced by the modified image on the storage device, it is not possible to recover the features of the original image.



## Layers

One of the attractive feature of an image processing package such as Adobe Photoshop is their ability to keep several images on top of each other as layers and create of new images. The transparency feature of top layers should be reduced so that the bottom images or their parts can appear. The layers can be edited separately and various effects added to make the final image attractive. For example the sentences in the image shown in figure 4.18 are created as separate layers and each layer is given different affects and colours. Figure 4.20 shows these layers as given in Adobe Photoshop.



All layers created are displayed in the final image and you can hide a layer (Hide Layers) or display a layer (Show Layers) as you wish. The ‘eye’ symbol in front of a layer indicates the visibility of the layer. By removing the ‘eye’ symbol you can hide the layer. The effects of a layer are indicated below a layer and these effects can be activated or inactivated. You may observe that in figure 4.21, some of the effects of the layer “Democratic Socialist Republic of Sri Lanka (c)” are activated as the ‘eye’ sign is visible and some effects are inactivated as the ‘eye’ symbol is removed.

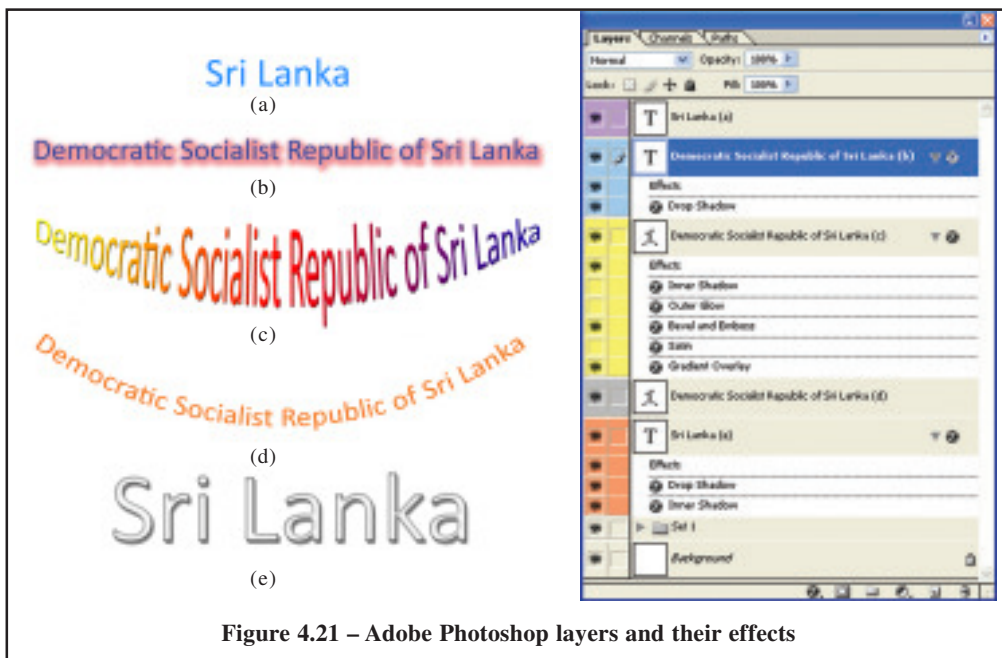


Figure 4.21 – Adobe Photoshop layers and their effects

The transparency of a layer can be controlled by the opacity level. The colour level of a picture is controlled by the Fill Handle. For example if you keep layers on top of each other, only the layer on the top is visible (see Figure 4.22(a)). If the opacity level of the top layer gives a low opacity percentage, the lower layers can be made visible (see figures 4.22(b) and 4.22(c)).

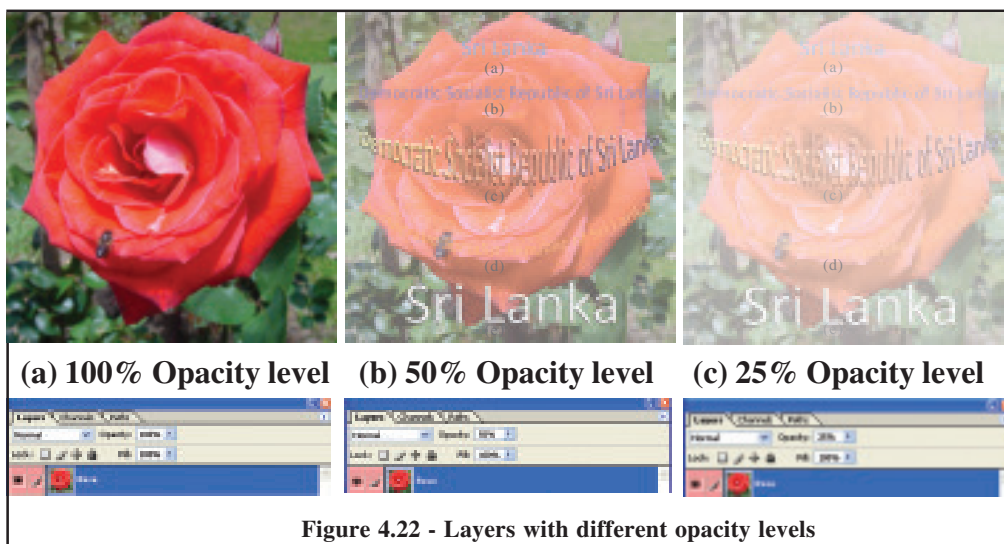


Figure 4.22 - Layers with different opacity levels

The icons below the Layer Dialog Box introduce several tools related to layers (see figure 4.23 and 4.24). Using these tools, operations such as deletion of layers, creation of new layers and addition of layer style can be performed.

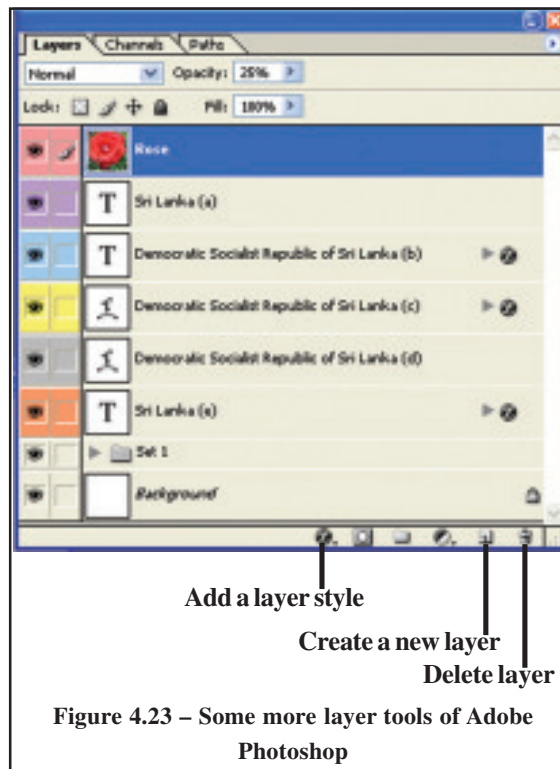


Figure 4.23 – Some more layer tools of Adobe Photoshop

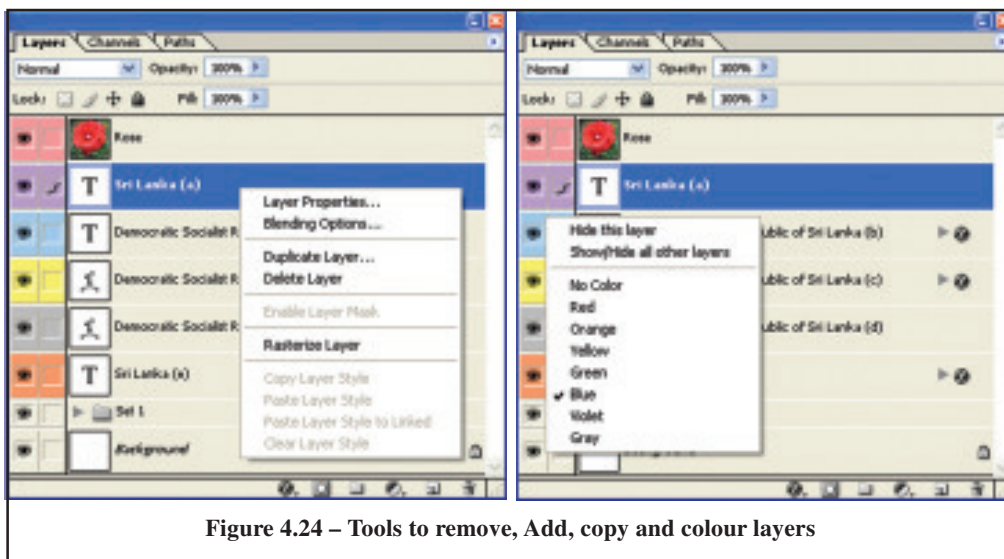


Figure 4.24 – Tools to remove, Add, copy and colour layers



If you are planning to use an image edited using an image processing package such as Adobe Photoshop in a website or for printing purposes the image should be stored in a suitable file format. There are several image file formats which use different algorithms to represent an image (see figure 4.25).

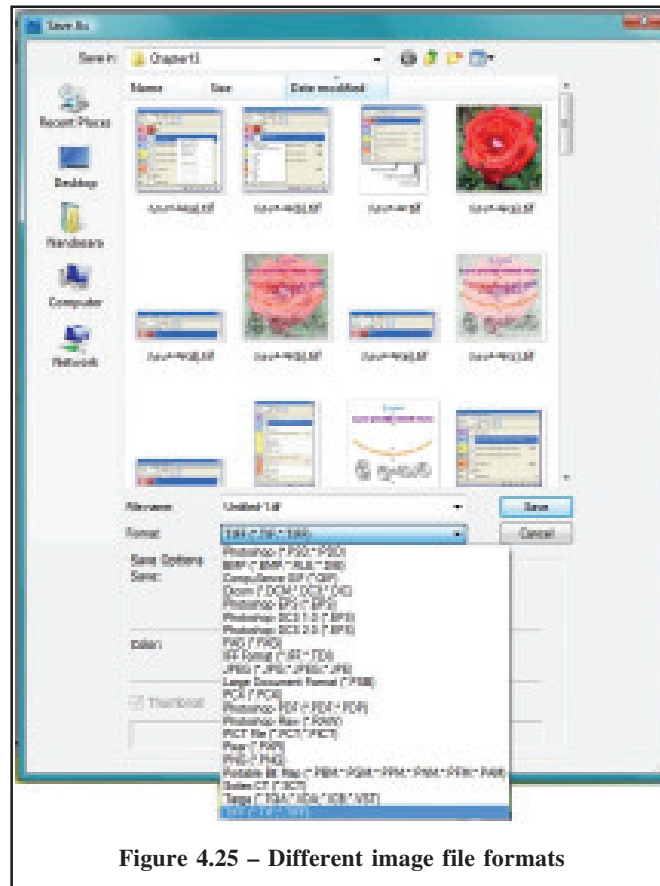


Figure 4.25 – Different image file formats

When you select a file format for your image, you must select a file format which will not degrade your creation. The number of colours is a vital factor which should be considered at this stage. If you need to use a large number of colours (eg. 16,777,216) then you can use file formats such as BMP(Bitmap), TIFF (Tagged Image File Format) or TGA (Taga). Another factor which you should consider is the size of the image file. The height and width of the image, number of pixels and number of bits per pixel are the factors which determine the size of an image file. We have discussed how the number of bits per pixel determines the number of colours. You

may use 2, 4, 8, 16 or 24 bits per pixel to decide on the colour depth of the image. The size of an image can be calculated as height (number of pixels) x width (number of pixels) x (bits per pexel/8). For example, an image with 480 pixel height, 320 pixel width and colour depth with 24 bits per pixel has size  $480 \times 320 \times (24/8) = \text{Bytes } 460,800$ . If you are using BMP, TIFE or TGA type image, then you need a large space on your disk. These file formats have high details hence are suitable for printing applications. However, if you are using an image for an Internet application you need a file format such as JPG (Joint Photographers Expert Group), GIF or PNG since they are compressed files of a smaller size. This is because communication is easier with smaller files.

The GIF files use a smaller number of colours (256 colours) which is a very common file format used in the Internet.