Consider three different raster systems with resolutions of 640 x 480, 1280 x 1024, and 2560 x 2048. a) What size is frame buffer (in bytes) for each of these systems to store 12 bits per pixel?

Ans. Because eight bits constitute a byte, frame-buffer sizes of the systems are as follows: 640 x 480 x 12 bits / 8 = 450KB; 1280 x 1024 x 12 bits / 8 = 1920KB; 2560 x 2048 x 12 bits / 8 = 7680KB

b) How much storage (in bytes) is required for each system if 24 bits per pixel are to be stored?

Similarly, each of the above results is just doubled for 24 (12×2) bits of storage per pixel (number of bits / pixel or pixel depth)
If we increase the resolution and also the pixel depth that will increase the memory requirements of the frame buffer.

Consider two raster systems with the resolutions of 640 x 480 and 1280 x 1024. a) How many pixels could be accessed per second in each of these systems by a display controller that refreshes the screen at a rate of 60 frames per second?

one frame = (640x480) pixels = resolution
Access rate = f (resolution (total number of pixels , refresh rate (number of frames / second))
Access rate = number of pixels/ second

- Since 60 frames are refreshed per second and each frame consists of 640 x 480 pixels, the access rate of such a system is (640 x 480) * 60 = 1.8432 x 10^7 pixels/second. Likewise, for the 1280 x 1024 system, the access rate is (1280 x 1024) * 60 = 7.86432 x 10^7 pixels/second.

7.86432 x 10^7 pixel in 1 second

1 pixel access time = 1/ (7.86432 x 10^7) = 1/ Access rate

- If we increase the access rate of raster system then per pixel access time decreases.
- According to the definition of access rate, we know that the access time per pixel should be 1/(access rate).
- Therefore, the access time is around 54 nanoseconds/pixel for the 640 x 480 system, and the access time is around 12.7 nanoseconds/pixel for the 1280×1024 system.

Suppose RGB raster system is to be designed using on 8 inch X 10 inch screen with a resolution of 100 pixels per inch in each direction. If we want to store 6 bits per pixel in the frame buffer, how much storage (in bytes) do we need for frame buffer?

- Here, resolution = 8 inch X 10 inch First, we convert it in pixel then Now resolution = 8 X 100 by 10 X 100 pixel = 800 X 1000 pixel 1 pixel can store 6 bits So, frame buffer size required = 800 X 1000 X 6 bits = (800 X 1000 X 6)/8 Bytes = 6 x 10^5 bytes.
- c= 800 r=600 = W/H = Width / Height

- Aspect ratio = 800/600 = 4:3 = c/r = W/H

How much time is spent scanning across each row of pixels during screen refresh on a raster system with resolution of 1280 X 1024 and a refresh rate of 60 frames per second?

(m x n) resolution then the number of scan lines = n
Single frame consists of n number of scan lines

Refresh rate = 60 frames/ second.
1 frame access time = 1/60 sec
1 frame contains 1024 scanlines
1024 scanlines take 1/60 seconds
1 scan line will take = 1/(60x1024)
1 Scanline take = 1/(60x1024) seconds = 0.0000162 seconds

How Many k bytes does a frame buffer need in a 600 x 400 pixel ?

- Resolution is 600 x 400 Suppose 1 pixel can store n bits Then, the size of frame buffer = Resolution X bits per pixel = (600 X 400) X n bits = 240000 n bits = 240000 n bits
- We know 1KB = 1024 bytes= 1024 X 8 bits
- 240000 n bits = (240000)/1024*8= 29.296876 = 29.30 n k bytes

Find out the aspect ratio of the raster system having resolution (640x480)

- We know that, Aspect ratio = Width/ Height = 640/480 Aspect ratio = 4 : 3