

Q1.

- 1) 1.75, 2.25, 2.25, 3.25, 3.25, 3.25, 2.5, 2.75, 2.75, 2.75, 1.5, 1.0, 1.25, 1.25, 1.75, 2.25, 2.25, 2.25, 2.0, 2.25, 1.25, 0.25, -1.25, -1.25, -1.75, -1.0, -2.25, -1.5, -1.5, -0.75, 0.0, 1.0

- 2) We will need 5 bits ($2^5 = 32$) to transmit

Q2.

4:2:0 YUV conversion : $(12\text{bits} \times 4 + 12\text{bits} + 12\text{bits}) / 4 = 18\text{bits/pixel}$

- 1) Assuming Disk runs at 12Mbytes/sec = 96000000bits/sec
 $18\text{bits/pixel} \times (1920 \times 1080) \text{pixel} \times 24\text{Hz} = 895795200\text{bits/sec}$
 $(895795200\text{bits/sec}) / (96000000\text{bits/sec}) = 9.3312$
about 9.3312:1

- 2) $18\text{bits/pixel} \times (352 \times 288) \text{pixel} \times 24\text{Hz} = 43794432\text{bits/sec}$
 $(43794432\text{bits/sec}) / 96000000\text{bits/sec} = 0.456$
No compression needed

- 3) $4:3 = 16:12 = 12:9$
The pixels with stretch with a width:height ratio of 3:4

Q3.

- 1) $(36000 \text{ m/h}) / (0.4244\pi \text{ m/rotation}) = 27000 \text{ rotation/h} = 7.5 \text{ rotation/sec} = 7.5\text{hz}$
 $7.5\text{hz} \times 2 = 15\text{hz}$
24 > 15 thus:
7.5 rotation/sec

- 2) Since $15 > 8$, there will be an aliasing effect.
 $(7.5 \text{ rotation/sec}) / (8 \text{ frame/sec}) = 0.9375 \text{ rotation/frame}$
The wheel is going backwards for 0.0625 rotation/frame
 $0.0625 \text{ rotation/frame} \times 8 \text{ frame/sec} = 0.5 \text{ rotation/sec (backward)}$

- 3) $24\text{hz} / 2 = 12\text{hz}$
 $12 \text{ rotation/sec} = 43200 \text{ rotation/hour}$
 $(180000 \text{ m/hour}) / (43200 \text{ rotation/hour}) = 4.166 \text{ m/rotation}$
 $4.166 \text{ m} / \pi = 1.326 \text{ m}$