

# Task 5

a)

Both JPEG and JPEG2000 do lossy compression, but JPEG2000 is also capable of lossless compression. JPEG2000 also offers scalability, the wavelet transform is done several times and gives several low-resolution approximations of the picture. This way lower-resolution versions can be displayed before the entire bitstream has been received. JPEG uses DCT on 8x8 blocks, while JPEG2000 uses wavelets on the entire image. JPEG's partitioning of the image is in blocks and macro-blocks of sections of the image, but JPEG2000 divides the image into sub-bands of high and low frequency.

JPEG2000 uses EBCOT and a binary arithmetic coder (MQ-coder) for entropy coding and encodes each sub-band separately in order to achieve good error resilience. JPEG supports both Huffman and arithmetic coding for entropy coding, although Huffman is most commonly used.

c)

In general JPEG2000 looks better than JPEG at lower bitrates, but the type of distortion is different between the two. JPEG has a lot of contouring because it codes the image on a block by block basis. JPEG2000 has no contouring artefacts, but does have some ringing along sharp edges because JPEG2000 compresses in the frequency domain. As a result of this, images of similar quality look better on smooth even surfaces with JPEG2000, but the very detailed areas with sharp edges look better with JPEG.

d)

## Café

Rates [quality]	Bits per pixel	PSNR for JPEG [dB]	PSNR for JPEG2000 [dB]
5	0,296	21,69	23,98
20	0,729	26,50	29,35
40	1,097	29,21	32,84
60	1,419	31,20	35,30
80	2,073	34,67	39,53

## Bike

Rates [quality]	Bits per pixel	PSNR for JPEG [dB]	PSNR for JPEG2000 [dB]
5	0,198	24,67	28,45
20	0,454	29,64	32,97
40	0,707	32,18	35,62
60	0,942	33,95	37,71
80	1,436	36,93	40,95

## Woman

Rates [quality]	Bits per pixel	PSNR for JPEG [dB]	PSNR for JPEG2000 [dB]
5	0,167	24,91	28,34
20	0,412	29,63	32,48
40	0,651	32,09	35,26
60	0,891	33,90	37,64
80	1,401	37,01	41,07