1. What exactly is a feature?

Ans: A **feature** is an individual measurable property or characteristic of a phenomenon

Features are usually numeric, but structural features such as [strings](https://en.wikipedia.org/wiki/String_(computer_science)) and [graphs](https://en.wikipedia.org/wiki/Graph_(discrete_mathematics)) are used in [syntactic pattern recognition](https://en.wikipedia.org/wiki/Syntactic_pattern_recognition). The concept of "feature" is related to that of [explanatory variable](https://en.wikipedia.org/wiki/Explanatory_variable) used in [statistical](https://en.wikipedia.org/wiki/Statistics) techniques such as [linear regression](https://en.wikipedia.org/wiki/Linear_regression).

2. For a top edge detector, write out the convolutional kernel matrix.

Highlighting Horizontal edges:

Ans:

[[ 1 2 1]

[ 0 0 0]

[-1 -2 -1]]

3. Describe the mathematical operation that a 3x3 kernel performs on a single pixel in an image.

Ans:

Image =(6,6); image pixel = p1,p2,…p36

Kernel = (3,3) kernel elements = f1,f2….f9

New image = (**p-f + 2\*padding) /stride + 1**

P =pixel length/width of image

F = length/width of filter

Z1 = **∑9i=1 fi \* pi**

Consider padding =0

New image length = 6-3/1+1 = 4

New image width = 6-3/1 +1 = 4

New image = (4,4)

New\_image = Z1, Z2 …..Z16

4. What is the significance of a convolutional kernel added to a 3x3 matrix of zeroes?

Ans:If all border values of a kernel are set to zero, then system will consider it as a 3x3 matrix.

5. What exactly is padding?

Ans:In general, pixels in the middle are used more often than pixels on corners and edges. Consequently, the information on the borders of images is not preserved as well as the information in the middle.

Padding is simply **a process of adding layers of zeros to our input images** so as to avoid the problems mentioned above. This prevents shrinking as, if p = number of layers of zeros added to the border of the image, then our (n x n) image becomes (n + 2p) x (n + 2p) image after padding.

6. What is the concept of stride?

Ans:Stride is **a component of convolutional neural networks, or neural networks tuned for the compression of images and video data**. Stride is a parameter of the neural network's filter that modifies the amount of movement over the image or video

7. What are the shapes of PyTorch&#39;s 2D convolution&#39;s input and weight parameters?

Ans: in pytorch the shapes of 2D convolution (Batch size, Channel, height,width)

8. What exactly is a channel?

Ans: Color digital images are made of pixels, and pixels are made of combinations of primary colors represented by a series of code. A channel in this context is the grayscale image of the same size as a color image, made of just one of these primary colors.

A channel is the grayscale image of a coloured image, which is made up of only one of the primary colours that form the coloured image.

9. Explain relationship between matrix multiplication and a convolution?

Ans: in Matrix multiplication we transpose a matrix to multiply with another.

In convolution we move the one matrix over other step by step and multiply each value in the matrix with the value in other matrix