Q1-1: If the size of Input matrix I is NxN and kernel size is KxK, what is the size of the output matrix after performing Convolution? Assume N>K, no padding (VALID), and stride = 1.

1. (N - K + 1) x (N - K + 1)
2. (N - K) x (N - K)
3. (N - K - 1) x (N - K - 1)
4. None of the above

Q1-1: If the size of Input matrix I is NxN and kernel size is KxK, what is the size of the output matrix after performing Convolution? Assume N>K, no padding (VALID), and stride = 1.

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2. (N - K) x (N - K)
3. (N - K - 1) x (N - K - 1)
4. None of the above

- When sliding to the right, we have N-K+1 so many positions
- Similar when sliding downwards

Q1-2: Given the input I (left) and CNN kernel K (right) with stride=1 and no padding, compute the output matrix (O). Which of the following statements are true?

a	b	a
b	a	b
a	b	a

1	-1
-1	1

A. *The size of output matrix O = 2x2*

B. *Sum of all the values in output matrix is 0.*

C. *Output matrix O is a symmetric matrix.*

D. *Output matrix O is a positive definite matrix.*

1. A, B
2. A, B, C
3. A, C, D
4. A, B, C, D

Q1-2: Given the input I (left) and CNN kernel K (right) with stride=1 and no padding, compute the output matrix (O). Which of the following statements are true?

a	b	a
b	a	b
a	b	a

1	-1
-1	1

2a - 2b	2b - 2a
2b - 2a	2a - 2b

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B. *Sum of all the values in output matrix is 0.*

C. *Output matrix O is a symmetric matrix.*

D. *Output matrix O is a positive definite matrix.*

1. A, B
2. A, B, C
3. A, C, D
4. A, B, C, D

- A, B, C are trivial.
- D: Determinant of O = 0, hence it’s not positive definite.

Q2-1: Which of the following statements are TRUE?

A. *CNN successfully capture the Spatial dependencies.*
B. *Pooling helps in extracting dominant features.*
C. *In general, Average Pooling performs better denoising than Max Pooling.*

1. A
2. A, B
3. B, C
4. A, B, C

Q2-1: Which of the following statements are TRUE?

A. *CNN successfully capture the Spatial dependencies.*

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C. *In general, Average Pooling performs better denoising than Max Pooling.*

1. A
2. A, B
3. B, C
4. A, B, C

Max Pooling discards the noisy activations and performs denoising along with dimensionality reduction.
Average Pooling simply performs dimensionality reduction as a noise suppressing mechanism. In general, Max Pooling performs better than Average Pooling.

Q2-2: Given the input, perform Max Pooling and Average Pooling with 2x2 kernel. Assume no padding (VALID), and stride=1. Let the output matrix be M1 and M2. Select the correct option.

1	2	3
4	5	6
7	8	9

A. *M1 - M2 = 2*I where I is a 2x2 identity matrix.*
B. *det(M1) > det(M2) where det(.) refers to determinant of a matrix.*

1. Both the statements are TRUE.
2. Statement A is TRUE, but statement B is FALSE.
3. Statement A is FALSE, but statement B is TRUE.
4. Both the statements are FALSE.

Q2-2: Given the input, perform Max Pooling and Average Pooling with 2x2 kernel. Assume no padding (VALID), and stride=1. Let the output matrix be M1 and M2. Select the correct option.

1	2	3
4	5	6
7	8	9

M1

5	6
8	9

M2

3	4
6	7

A. *M1 - M2 = 2*I where I is a 2x2 identity matrix.*
B. *det(M1) > det(M2) where det(.) refers to determinant of a matrix.*

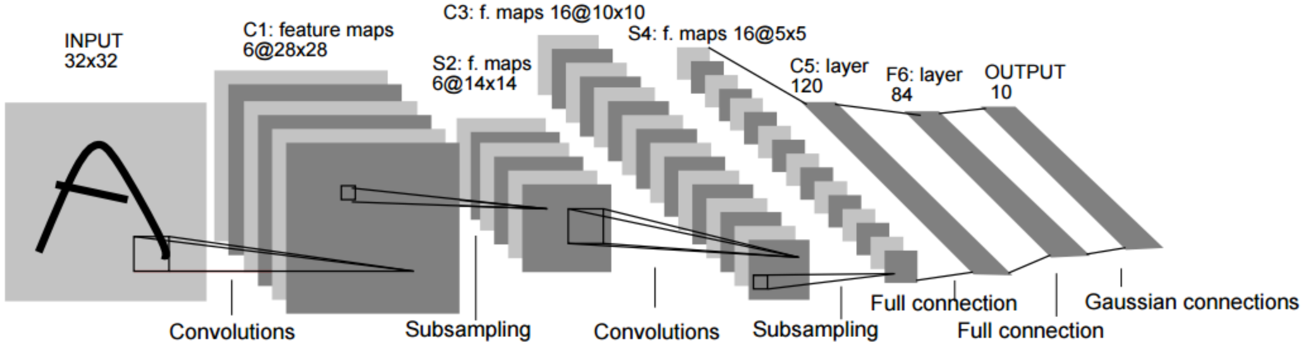
1. Both the statements are TRUE.
2. Statement A is TRUE, but statement B is FALSE.
3. Statement A is FALSE, but statement B is TRUE.
4. Both the statements are FALSE.

- det(M1) = 45 - 48 = -3
- det(M2) = 21 - 24 = -3

Q3-1: Select the correct option about LeNet-5.

A. *LeNet-5 architecture has subsampling layers which essentially does pooling operation.*

B. *Fully Connected Network is used in the end to obtain softmax scores.*



1. Both statements are true.
2. Both statements are false.
3. Statement A is true, Statement B is false.
4. Statement B is true, Statement A is false.

Q3-1: Select the correct option about LeNet-5.

A. *LeNet-5 architecture has subsampling layers which essentially does pooling operation.*

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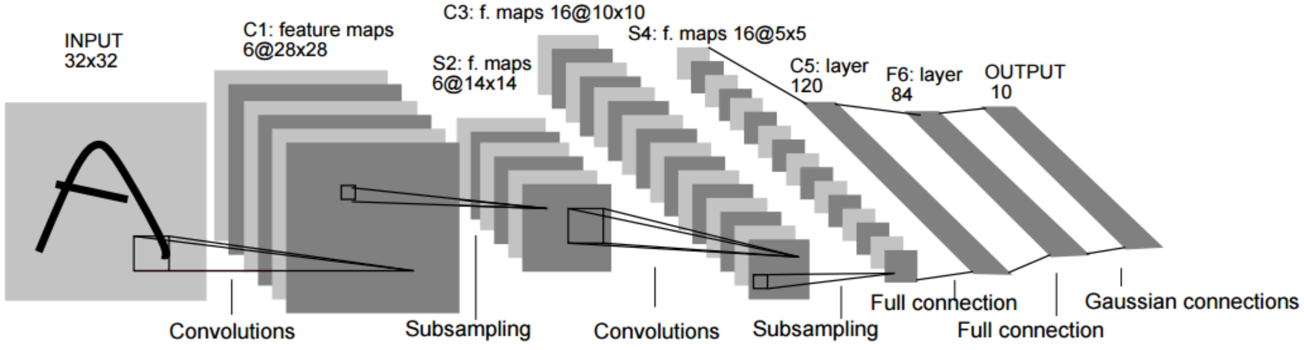

1. Both statements are true.
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3. Statement A is true, Statement B is false.
4. Statement B is true, Statement A is false.

Q3-2: If the size of Input matrix I is NxN and kernel size is KxK, what is the size of the output matrix after performing Convolution? Assume no padding, and stride = S. For simplicity, also assume N, K, and S are such that the division involved gives integer outputs.

1. **(N - K + 1)/S** x **(N - K + 1)/S**
2. **[(N - K)/S + 1] x [(N - K)/S + 1]**
3. **(N - K - 1)/S** x **(N - K - 1)/S**
4. **[(N - K)/S – 1]** x **[(N - K)/S – 1]**

Q3-2: If the size of Input matrix I is NxN and kernel size is KxK, what is the size of the output matrix after performing Convolution? Assume no padding, and stride = S. For simplicity, also assume N, K, and S are such that the division involved gives integer outputs.

1. $(N - K + 1)/S \times (N - K + 1)/S$
2. $[(N - K)/S + 1] \times [(N - K)/S + 1]$
3. $(N - K - 1)/S \times (N - K - 1)/S$
4. $[(N - K)/S - 1] \times [(N - K)/S - 1]$