✔ Congratulations! You passed!

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1. What do you think applying this filter to a grayscale image will do?   **0 / 1 point**

$$\begin{bmatrix} 0 & 1 & 1 & 0 \\ 1 & 3 & 3 & 1 \\ -1 & -3 & -3 & -1 \\ 0 & -1 & -1 & 0 \end{bmatrix}$$

↙↗ **Expand**

⊗ **Incorrect**
   Incorrect. Notice that there is a different direction in which we can notice a
   high delta in the values.

2. Suppose your input is a 128 by 128 color (RGB) image, and you are not using a
convolutional network. If the first hidden layer has 64 neurons, each one fully
connected to the input, how many parameters does this hidden layer have (including
the bias parameters)?

1 / 1 point

⤢ **Expand**

✓ **Correct**

Correct, the number of inputs for each unit is $128 \times 128 \times 3$ since the input
image is RGB, so we need $128 \times 128 \times 3 \times 64$ parameters for the weights
and 64 parameters for the bias parameters, thus
$128 \times 128 \times 3 \times 64 + 64 = 3145792.$

3. Suppose your input is a 300 by 300 color (RGB) image, and you use a convolutional layer with 100 filters that are each 5x5. How many parameters does this hidden layer have (including the bias parameters)?

1 / 1 point

↙↗ **Expand**

⊘ **Correct**

Correct, you have $25 \times 3 = 75$ weights and 1 bias per filter. Given that you have 100 filters, you get 7,600 parameters for this layer.

4. You have an input volume that is 63x63x16, and convolve it with 32 filters that are each 7x7, using a stride of 2 and no padding. What is the output volume?

1 / 1 point

↗️ **Expand**

✓ **Correct**
Yes, $\frac{63-7+0\times2}{2} + 1 = 29$ and the number of channels should match the number of filters.

5. You have an input volume that is 15x15x8, and pad it using "pad=2". What is the dimension of the resulting volume (after padding)?   **1 / 1 point**

↗️ **Expand**

✓ **Correct**
Correct, padding is applied over the height and the width of the input image. If the padding is two, you add 4 to the height dimension and 4 to the width dimension.

6. You have a volume that is $64 \times 64 \times 32$, and convolve it with 40 filters of 9×9, and   **1 / 1 point**
stride 1. You want to use a "same" convolution. What is the padding?

↙↗ **Expand**

⊘ **Correct**
    Yes, when using a padding of 4 the output volume has $n_H = \frac{64-9+2\times4}{1} + 1.$

7. You have an input volume that is 32x32x16, and apply max pooling with a stride of 2   **1 / 1 point**
and a filter size of 2. What is the output volume?

↙↗ **Expand**

✓ **Correct**

Correct, using the following formula: $n_H^{[l]} = \frac{n_H^{[l-1]} + 2 \times p - f}{s} + 1$

8. Which of the following are hyperparameters of the pooling layers? (Choose all that apply)

1 / 1 point

↗ **Expand**

✓ **Correct**

Great, you got all the right answers.

9. Which of the following are the benefits of using convolutional layers? (Check all that apply)

1 / 1 point

↗ **Expand**
↙

⊘ **Correct**

Great, you got all the right answers.

10. The sparsity of connections and weight sharing are mechanisms that allow us to use fewer parameters in a convolutional layer making it possible to train a network with smaller training sets. True/False?

1 / 1 point

↗ **Expand**

✓ **Correct**

Yes, weight sharing reduces significantly the number of parameters in a neural network, and sparsity of connections allows us to use a smaller number of inputs thus reducing even further the number of parameters.