1. Supervised learning is when all data are labeled. For continuous output, supervised learning often involves regression, which can be linear regression, neural networks and so on. For discrete (categorical) output supervised learning can involve more types of classification, such as classifying a type of flower based on its attributes.

2. Label encoding is when we assign each unique number to each distinct value whereas one-hot encoding is when we create a new binary feature for each distinct value. For example:

	Gender
Sam	M

label enc →

	Gender
Sam	1

one-hot →

Sam	Male	Female
	1	0

3. Overfitting is when your model learns the noise rather than generalities. You avoid it with early stopping when you start getting more errors on your test set.

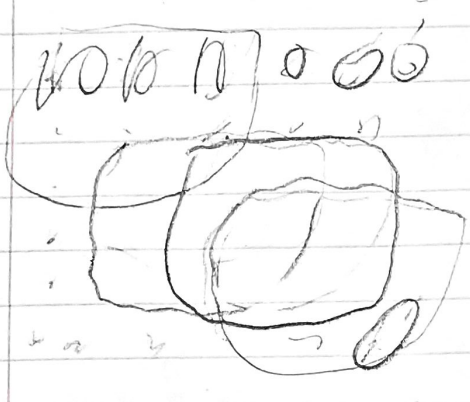
5. a) 13 * 13 = 169 ~~filters~~ = 16
16 * 3 = 48
4 * 4 * 3 = 48
~~4 outputs~~
3 filters
4 * 4 filter
stride 1

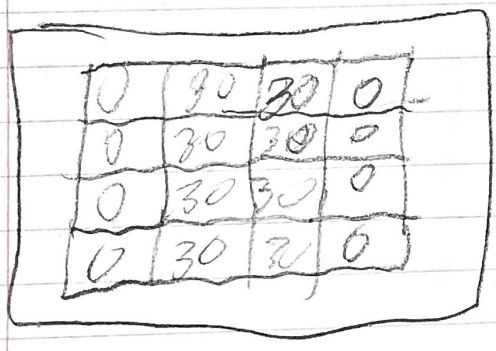
48

b) 13 * 13 = 169
3 * 5 * 5 → 4 (?) **300**
25 = 75 * 4 = 300

c) model = Sequential()
input_shape = (img_rows, img_cols, 1)
model.add(Conv2D, kernel_size = (3, 3), strides
→ = (1, 1), padding = 'valid', activation = 'relu'
, input_shape = input_shape))
model.add(MaxPooling2D(pool_size = (2, 2), strides = 2))
model.add(Dense(15, activation = 'relu'))
model.add(Dense(4), activation = 'softmax'))

d) model.compile(loss = 'categorical_crossentropy'
, optimizer = 'adam')
monitor = EarlyStopping(monitor = 'val_loss'
, min_delta = 1e-3, patience = 5, verbose = 2, mode = 'auto')




0 30 30 0
0 30 30 0
0 30 30 0
0 30 2 0