1. **What is the optimal value of alpha for ridge and lasso regression? What will be the changes in the model if you choose double the value of alpha for both ridge and lasso? What will be the most important predictor variables after the change is implemented?**

   The optimal value of alpha for Lasso is 0.0005 and that of Ridge is 10.0. When we chose to double the learning rate alpha, the coefficients are penalized further and mostly they got decreased. We also find the R2 Score decreasing both in the case of test and train and the MSE got increased. Since the models now get trained with a different learning rates, the most significant features list and their order also changes:

   So now below are the features corresponding to the alpha values before and after doubling

	Features	Coefficient	Coeff_Abs
0	OverallQual_9	0.1894	0.1894
1	OverallCond_3	-0.1860	0.1860
2	TotRmsAbvGrd_11	-0.1637	0.1637
3	OverallQual_2	-0.1453	0.1453
4	Fireplaces_3	-0.1340	0.1340

	Features	Coefficient	Coeff_Abs
0	OverallCond_3	-0.1747	0.1747
1	OverallQual_9	0.1619	0.1619
2	GrLivArea	0.1231	0.1231
3	OverallQual_8	0.1080	0.1080
4	Fireplaces_2	0.1011	0.1011

   The r2_score before doubling for train and test is 0.92 and 0.87 whereas after doubling is 0.90 and 0.86 for lasso and same is being followed by ridge

2. **You have determined the optimal value of lambda for ridge and lasso regression during the assignment. Now, which one will you choose to apply and why?**

   Given a choice, we should go with the Lasso model owing to the following reasons:

   - Lasso renders a lesser MSE on the test data, as compared to the Ridge model
   - Unlike Ridge, since Lasso tends to do feature elimination as well, the Lasso model would be less complex as compared with Ridge

3. **After building the model, you realised that the five most important predictor variables in the lasso model are not available in the incoming data. You will now have to create another model excluding the five most important predictor variables. Which are the five most important predictor variables now?**

   On removing the 5 most significant features from the data since they were not available, we rebuilt the model with Lasso regularization once again. This time the optimum values of alpha came out to be 0.0003 and 5 most significant features (in order) were:

	Features	Coefficient	Coeff_Abs
0	MSZoning_RL	0.2150	0.2150
1	MSZoning_FV	0.2136	0.2136
2	MSZoning_RH	0.1925	0.1925
3	MSZoning_RM	0.1743	0.1743
4	Neighborhood_StoneBr	0.1432	0.1432

4. **How can you make sure that a model is robust and generalisable? What are the implications of the same for the accuracy of the model and why?**

   For the model to be more robust and generalised we need to keep the model simple but still we need to take care about the bias considering the simplicity and also, we must have some balance between the bias and the Variance and must take care of the overfitting as well using lasso or ridge or any other regularisation mechanisms. The hyper parameter tuning must also be done with care