Name:- Anmol Vipin Devansh Registration No.:- 21BCE10314 Assignment 4

```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.model selection import train test split
from sklearn.linear model import LinearRegression
from sklearn.metrics import mean squared error, r2 score
# Task 1: Load the dataset
print("Task 1: Load the dataset\n\n\n")
missing_values = ["", "NA", "N/A", "NaN"]
winequality = pd.read_csv('winequality-red.csv',
na values=missing values)
print(winequality)
# Find and handle missing values
missing values = winequality.isnull().sum()
print("\n\nMissing Values:")
print(missing values)
# Replace missing values with column means
winequality.fillna(winequality.mean(), inplace=True)
print("\nMissing Values After Handling:")
print(winequality.isnull().sum(), "\n\n")
# Find and handle outliers
def find and handle outliers(column):
    Q1 = winequality[column].quantile(0.25)
    Q3 = winequality[column].quantile(0.75)
    IQR = Q3 - Q1
    lower bound = Q1 - 1.5 * IQR
    upper bound = Q3 + 1.5 * IQR
    outliers = (winequality[column] < lower bound) |</pre>
(winequality[column] > upper_bound)
    if outliers.sum() > 0:
        print(f"Outliers in {column}:")
        print(winequality[outliers])
        print("\n")
    winequality.loc[outliers, column] = winequality[column].mean()
# Apply outlier handling to numeric columns
numeric columns =
```

```
winequality.select dtypes(include=[np.number]).columns
for column in numeric columns:
    find and handle outliers(column)
# Visualize outliers
plt.figure(figsize=(12, 8))
sns.boxplot(data=winequality[numeric_columns])
plt.title("Boxplot of Numeric Features (Outliers Handled)")
plt.xticks(rotation=45)
plt.show()
Task 1: Load the dataset
      fixed acidity volatile acidity citric acid residual sugar
chlorides
                7.4
                                 0.700
                                               0.00
                                                                 1.9
0.076 \
                7.8
                                 0.880
                                               0.00
                                                                 2.6
1
0.098
                7.8
                                 0.760
                                               0.04
                                                                 2.3
0.092
                                                                 1.9
3
               11.2
                                 0.280
                                               0.56
0.075
                7.4
                                 0.700
                                               0.00
                                                                 1.9
4
0.076
. . .
                                                                 . . .
. . .
                6.2
                                 0.600
                                               0.08
                                                                 2.0
1594
0.090
1595
                5.9
                                 0.550
                                               0.10
                                                                 2.2
0.062
                                                                 2.3
1596
                6.3
                                 0.510
                                               0.13
0.076
                5.9
                                 0.645
                                                                 2.0
1597
                                               0.12
0.075
                                                                 3.6
1598
                6.0
                                 0.310
                                               0.47
0.067
      free sulfur dioxide total sulfur dioxide density
sulphates
                     11.0
                                            34.0 0.99780 3.51
0
0.56 \
                     25.0
                                            67.0 0.99680 3.20
1
0.68
2
                     15.0
                                            54.0 0.99700 3.26
0.65
3
                     17.0
                                            60.0 0.99800 3.16
```

0.58					
4	11.0	3	34.0	0.99780	3.51
0.56					
• • •					
1594	32.0	,	44.0	0.99490	3.45
0.58	32.10		77.0	0.55450	3.43
1595	39.0	!	51.0	0.99512	3.52
0.76					
1596 0.75	29.0	4	40.0	0.99574	3.42
1597	32.0	4	44.0	0.99547	3.57
0.71	5_10				
1598	18.0	4	42.0	0.99549	3.39
0.66					
alcohol	quality				
0 9.4	5				
1 9.8	5 5				
1 9.8 2 9.8 3 9.8 4 9.4	6				
4 9.4	5				
	<u>.</u>				
1594 10.5 1595 11.2	5				
1595 11.2 1596 11.0	6 6				
1597 10.2	5				
1598 11.0	6				
[1599 rows x 12	columnel				
[1399 10W3 X 12	Cocumins				
Missing Values: fixed acidity	Θ				
volatile acidit					
citric acid	0				
residual sugar	0				
chlorides free sulfur dio	0 oxide 0				
total sulfur di					
density	0				
рН	0				
sulphates	0				
alcohol quality	0 0				
dtype: int64	U				
7 1					

Missing Values After Handling: fixed acidity 0 volatile acidity 0

citric acid	0
residual sugar	0
chlorides	0
free sulfur dioxide	0
total sulfur dioxide	0
density	0
pH	0
sulphates	0
alcohol	0
quality	0
1.	

dtype: int64

Outliers in fixed acidity:

		TINCU UC					
		acidity	volatile	acidity	citric acid	residual	sugar
chlori	des						
205	,	12.8		0.300	0.74		2.6
	\	10.0		0.000	0.74		2 6
206		12.8		0.300	0.74		2.6
0.095		15.0		0 210	0 44		2 2
243		15.0		0.210	0.44		2.2
0.075 244		15 0		0 210	0 44		2 2
0.075		15.0		0.210	0.44		2.2
264		12.5		0.560	0.49		2.4
0.064		12.5		0.500	0.49		2.4
294		13.3		0.340	0.52		3.2
0.094		13.3		0.540	0.52		3.2
328		13.4		0.270	0.62		2.6
0.082				0.27	0.02		
338		12.4		0.490	0.58		3.0
0.103							
339		12.5		0.280	0.54		2.3
0.082							
347		13.8		0.490	0.67		3.0
0.093							
353		13.5		0.530	0.79		4.8
0.120		12.6		0.200	0.66		2 6
359		12.6		0.380	0.66		2.6
0.088		12 5		0.460	0.62		2.0
363 0.071		12.5		0.460	0.63		2.0
364		12.8		0.615	0.66		5.8
0.083		12.0		0.013	0.00		5.0
366		12.8		0.615	0.66		5.8
0.083		12.0		0.013	0100		310
374		14.0		0.410	0.63		3.8
0.089							
381		13.7		0.415	0.68		2.9

0.085 391	13.7	0.415	0.68	2.9
0.085	13.7	0.413	0.00	2.9
394	12.7	0.600	0.65	2.3
0.063 409	12.5	0.460	0.49	4.5
0.070 429	12.8	0.840	0.63	2.4
0.088 440	12.6	0.310	0.72	2.2
0.072	-		-	
442 0.100	15.6	0.685	0.76	3.7
446	12.5	0.380	0.60	2.6
0.081 470	13.0	0.320	0.65	2.6
0.093 472	12.5	0.370	0.55	2.6
0.083 509	13.3	0.290	0.75	2.8
0.084	20.0	0.250	0175	2.0
510 0.073	12.4	0.420	0.49	4.6
516	12.5	0.600	0.49	4.3
0.100 538	12.9	0.350	0.49	5.8
0.066 544	14.3	0.310	0.74	1.8
0.075				
548 0.079	12.4	0.350	0.49	2.6
554	15.5	0.645	0.49	4.2
0.095 555	15.5	0.645	0.49	4.2
0.095 557	15.6	0.645	0.49	4.2
0.095	1310	01015	0115	2
559 0.085	13.0	0.470	0.49	4.3
560	12.7	0.600	0.49	2.8
0.075 564	13.0	0.470	0.49	4.3
0.085 565	12.7	0.600	0.49	2.8
0.075				
596 0.059	12.4	0.400	0.51	2.0
599 0.082	12.7	0.590	0.45	2.3
01002				

601		13.2	0.460	0.	52		2.2
0.071 603		13.2	0.460	0.	52		2.2
0.071							
611 0.081		13.2	0.380	0.	55		2.7
652		15.9	0.360	0.	65		7.5
0.096 680		13.3	0.430	0.	5.0		1.9
0.070		13.3	0.430	0.	50		1.9
811		12.9	0.500	0.	55		2.8
0.072 814		12.6	0.410	0.	54		2.8
0.103		10.6	0.200	0	40		2 5
1224 0.080		12.6	0.390	0.	49		2.5
	fron	sulfur dioxide	+o+ol culfur	diovido	density	ьЦ	
sulpha		Suttui uloxide	totat sutiui	uloxide	uensity	рН	
205		9.0		28.0	0.99940	3.20	
0.77 206	\	9.0		28.0	0.99940	3.20	
0.77							
243 0.84		10.0		24.0	1.00005	3.07	
244		10.0		24.0	1.00005	3.07	
0.84 264		5.0		27.0	0.99990	3.08	
0.87							
294 0.81		17.0		53.0	1.00140	3.05	
328		6.0		21.0	1.00020	3.16	
0.67 338		28.0		99.0	1.00080	3.16	
1.00							
339 1.36		12.0		29.0	0.99970	3.11	
347		6.0		15.0	0.99860	3.02	
0.93 353		23.0		77.0	1.00180	3.18	
0.77							
359 0.68		10.0		41.0	1.00100	3.17	
363		6.0		15.0	0.99880	2.99	
0.87 364		7.0		42.0	1.00220	3.07	
0.73		7.0		42.0	1.00220	3.07	
366		7.0		42.0	1.00220	3.07	
0.73							

374	6.0	47.0 1.00140 3.01
0.81 381	17.0	43.0 1.00140 3.06
0.80	17.0	45.0 1.00140 5.00
391	17.0	43.0 1.00140 3.06
0.80	6.0	25 0 0 00070 2 02
394 0.57	6.0	25.0 0.99970 3.03
409	26.0	49.0 0.99810 3.05
0.57		
429	13.0	35.0 0.99970 3.10
0.60 440	6.0	29.0 0.99870 2.88
0.82	0.0	29.0 0.99070 2.00
442	6.0	43.0 1.00320 2.95
0.68		
446	31.0	72.0 0.99960 3.10
0.73 470	15 0	47.0.0.000602.05
0.61	15.0	47.0 0.99960 3.05
472	25.0	68.0 0.99950 3.15
0.82		
509	23.0	43.0 0.99860 3.04
0.68	10.0	42.0.0.00700.2.02
510 0.61	19.0	43.0 0.99780 3.02
516	5.0	14.0 1.00100 3.25
0.74	5.0	2.10 2.00200 3.20
538	5.0	35.0 1.00140 3.20
0.66	6.0	15 0 1 00000 2 00
544 0.79	6.0	15.0 1.00080 2.86
548	27.0	69.0 0.99940 3.12
0.75	_, . •	00.00 0.000.00 0.122
554	10.0	23.0 1.00315 2.92
0.74	10.0	22 0 1 00215 2 02
555 0.74	10.0	23.0 1.00315 2.92
557	10.0	23.0 1.00315 2.92
0.74	20.0	
559	6.0	47.0 1.00210 3.30
0.68	5.0	10.0.0.00040.2.14
560 0.57	5.0	19.0 0.99940 3.14
564	6.0	47.0 1.00210 3.30
0.68	3.0	1,10 1100210 3100
565	5.0	19.0 0.99940 3.14
0.57		
596	6.0	24.0 0.99940 3.04

0.60 599	11.0		22.0	1.00000	3.00
0.70	11.0	2	22.0	1.00000	3.00
601	12.0	3	35.0	1.00060	3.10
0.56 603 0.56	12.0	3	35.0	1.00060	3.10
611 0.54	5.0]	16.0	1.00060	2.98
652 0.84	22.0	7	71.0	0.99760	2.98
680 0.49	15.0	2	40.0	1.00040	3.06
811 0.68	7.0	2	24.0	1.00012	3.09
814 0.76	19.0	2	41.0	0.99939	3.21
1224 0.82	8.0	2	20.0	0.99920	3.07
alcohol 205 10.8 206 10.8 243 9.2 244 9.2 264 10.9 294 9.5 328 9.7 338 11.5 339 9.8 347 12.0 353 13.0 359 9.8 363 10.2 364 10.0 366 10.0 374 10.8 381 10.0 391 10.0 391 10.0 394 9.9 409 9.6 429 10.4 440 9.8 442 11.2 446 10.5 470 10.6 472 10.4 509 11.4 510 9.5	quality 7 7 7 7 7 5 6 6 6 5 7 7 6 6 6 5 7 7 7 6 6 6 7				

599 9.3 6 601 9.0 6 603 9.0 6 611 9.4 5 652 14.9 5 680 9.0 5 811 10.9 6 814 11.3 6 1224 10.3 6	516 538 544 548 554 555 557 559 560 564 565 596	11.9 12.0 8.4 10.4 11.1 11.1 12.7 11.4 12.7 11.4 9.3	6 7 6 5 5 6 5 6 5 6
603 9.0 6 611 9.4 5 652 14.9 5 680 9.0 5 811 10.9 6 814 11.3 6			
611 9.4 5 652 14.9 5 680 9.0 5 811 10.9 6 814 11.3 6			
680 9.0 5 811 10.9 6 814 11.3 6			5
811 10.9 6 814 11.3 6	652	14.9	5
814 11.3 6			
1224 10.3 6			
	1224	10.3	6

Outliers in volatile acidity:

	fixed	acidity	volatile acidity	citric acid	residual sugar
chlori	des				
38		5.7	1.130	0.09	1.50
0.172	\				
94		5.0	1.020	0.04	1.40
0.045					
120		7.3	1.070	0.09	1.70
0.178					
126		8.2	1.330	0.00	1.70
0.081					
127		8.1	1.330	0.00	1.80
0.082					
134		7.9	1.040	0.05	2.20
0.084					
199		6.9	1.090	0.06	2.10
0.061					
553		5.0	1.040	0.24	1.60
0.050					
672		9.8	1.240	0.34	2.00
0.079					
690		7.4	1.185	0.00	4.25
0.097					
700		10.6	1.020	0.43	2.90
0.076					
705		8.4	1.035	0.15	6.00

0.073						
710		10.6	1.025	0.	43	2.80
0.080 724		7.5	1.115	0.	10	3.10
0.086		, 13	11113	0.		3.10
899		8.3	1.020	0.	02	3.40
0.084 1261		6.3	1.020	Θ	00	2.00
0.083		0.5	1.020	0.	00	2.00
1299		7.6	1.580	0.	00	2.10
0.137 1312		8.0	1.180	O	21	1.90
0.083		0.0	1.100	0.	Z I	1.50
1467		6.7	1.040	0.	08	2.30
0.067						
	free	sulfur dioxide	total sulfur	dioxide	density	рН
sulpha	ates	7.0		10.0	0.00400	2.50
38 0.48	\	7.0		19.0	0.99400	3.50
94	`	41.0		85.0	0.99380	3.75
0.48						2 22
120 0.57		10.0		89.0	0.99620	3.30
126		3.0		12.0	0.99640	3.53
0.49						
127 0.48		3.0		12.0	0.99640	3.54
134		13.0		29.0	0.99590	3.22
0.55						
199 0.43		12.0		31.0	0.99480	3.51
553		32.0		96.0	0.99340	3.74
0.62						
672 0.53		32.0		151.0	0.99800	3.15
690		5.0		14.0	0.99660	3.63
0.54						
700 0.57		26.0		88.0	0.99840	3.08
705		11.0		54.0	0.99900	3.37
0.49						
710 0.57		21.0		84.0	0.99850	3.06
724		5.0		12.0	0.99580	3.54
0.60						
899		6.0		11.0	0.99892	3.48
0.49 1261		17.0		24.0	0.99437	3.59
		1,10			3.33.37	2.33

```
0.55
                    5.0
1299
                                         9.0 0.99476 3.50
0.40
                   14.0
                                        41.0 0.99532 3.34
1312
0.47
                   19.0
1467
                                        32.0 0.99648 3.52
0.57
     alcohol quality
38
         9.8
        10.5
                   4
94
         9.0
                   5
120
                   5
126
        10.9
                   5
127
        10.9
                   6
        9.9
134
199
        11.4
                   4
                   5
553
        11.5
                   5
        9.5
672
                   3
690
        10.7
                   6
700
        10.1
                   5
        9.9
705
                   5
710
        10.1
                   4
        11.2
724
                   3
899
        11.0
                   4
        11.2
1261
                   3
1299
        10.9
                   5
1312
        10.5
1467
        11.0
                   4
Outliers in citric acid:
    fixed acidity volatile acidity citric acid residual sugar
chlorides
              9.2
                              0.52
                                           1.0
                                                          3.4
151
0.61 \
    free sulfur dioxide total sulfur dioxide density pH
sulphates
                  32.0
                                       69.0 0.9996 2.74
151
2.0 \
alcohol quality
151 9.4 4
Outliers in residual sugar:
     fixed acidity volatile acidity citric acid residual sugar
chlorides
                              0.500
               7.5
                                           0.36
                                                           6.1
0.071 \
```

11			7.5			0.500		0.3	36		6.1	
0.071 14			8.9			0.620		0.	18		3.8	
0.176 15			8.9			0.620		0.	19		3.9	
0.170 18			7.4			0.590		0.0			4.4	
0.086			7.4			0.390		0.0	36		4.4	
								•				
1552 0.103			6.3			0.680		0.0	91		3.7	
1558			6.9			0.630		0.3	33		6.7	
0.235 1574			5.6			0.310		0.	78		13.9	
0.074 1577			6.2			0.700		0.	15		5.1	
0.076 1589			6.6			0.725		0.2			7.8	
0.073			0.0			0.723		0.2	20		7.0	
		sul	fur dic	oxide	tota	l sulfur	dioxid	le	density	рŀ	ł	
sulph 9	ates			17.0			102.	0	0.99780	3.35	5	
0.80 11	\			17.0			102.		0.99780	3.35		
0.80												
14 0.88				52.0			145.	. 0	0.99860	3.16)	
15 0.93				51.0			148.	0	0.99860	3.17	1	
18 0.50				6.0			29.	0	0.99740	3.38	3	
 1552				32.0			54.	0	0.99586	3.51		
0.66 1558				66.0			115.	. 0	0.99787	3.22)	
0.56 1574				23.0			92.		0.99677	3.39		
0.48												
1577 0.60				13.0			27.	. 0	0.99622	3.54		
1589 0.54				29.0			79.	. 0	0.99770	3.29)	
0154	alcol	101	qualit	- \/								
9	10	9.5	quatri	5 5								
11 14		9.5 9.2		5								

15 18	9.2 9.0	5 4				
	9.0					
	11.3	6				
1558	9.5	5				
	10.5	6				
	11.9	6				
1589	9.2	5				
[155 rows	x 12 col	umns]				
Outliers :						
	ed acidit	y volat	ile acidity	citric ac	id resid	ual sugar
chlorides 14	8.	a	0.620000	Θ	18	2.538806
0.176 \	0.	9	0.020000	0.	10	2.550000
15	8.	9	0.620000	0.	19	2.538806
0.170						
17	8.	1	0.560000	0.	28	1.700000
0.368	7	Λ	0.220000	0	C 1	1 000000
19 0.341	7.	9	0.320000	0.	51	1.800000
38	5.	7	0.527821	0.	09	1.500000
0.172						
1.176	0	0	0 500000	0	F.0	2 520006
1476 0.205	9.	9	0.500000	Θ.	50	2.538806
1490	7.	1	0.220000	Θ.	49	1.800000
0.039	, .	_	0.122000	0.		1.00000
1558	6.	9	0.630000	Θ.	33	2.538806
0.235						
1570	6.	4	0.360000	Θ.	53	2.200000
0.230 1571	6.	1	0.380000	0	14	2.200000
0.038	0.	7	0.300000	0.	14	2.200000
fre	e sulfur	dioxide	total sulfu	r dioxide	density	рН
sulphates					,	,
14		52.0		145.0	0.99860	3.16
0.88 \		F1 0		140.0	0.00000	2 17
15		51.0		148.0	0.99860	3.1/

	free	sulfur	dioxide	total	sulfur	dioxide	density	рН
sulpha	ates						-	•
14			52.0			145.0	0.99860	3.16
0.88	\							
15			51.0			148.0	0.99860	3.17
0.93								
17			16.0			56.0	0.99680	3.11
1.28								
19			17.0			56.0	0.99690	3.04
1.08								
38			7.0			19.0	0.99400	3.50
0.48								

	48.0	82.0	1.00242	3.16
	8.0	18.0	0.99344	3.39
	66.0	115.0	0.99787	3.22
	19.0	35.0	0.99340	3.37
	15.0	25.0	0.99514	3.44
alcohol 9.2 9.2 9.3 9.2 9.8 8.8 12.4 9.5 12.4 11.1	quality 5 5 6 4 5 6 6 6			
č	9.2 9.3 9.2 9.8 8.8 12.4 9.5 12.4	48.0 8.0 66.0 19.0 15.0 alcohol quality 9.2 5.9.2 5.9.2 5.9.2 6.9.8 4 8.8 5.12.4 6.9.5 12.4	48.0 82.0 8.0 18.0 66.0 115.0 19.0 35.0 15.0 25.0 alcohol quality 9.2 5 9.2 5 9.3 5 9.2 6 9.8 4 8.8 5 12.4 6 9.5 5 12.4 6	48.0 82.0 1.00242 8.0 18.0 0.99344 66.0 115.0 0.99787 19.0 35.0 0.99340 15.0 25.0 0.99514 alcohol quality 9.2 5 9.2 5 9.3 5 9.2 6 9.8 4 8.8 5 12.4 6 9.5 5 12.4 6

[112 rows x 12 columns]

Outliers in free sulfur dioxide:

fixe	d acidity	volatile acidity	citric acid	residual sugar
chlorides	_	-		_
14	8.9	0.620	0.18	2.538806
0.087467	\			
15	8.9	0.620	0.19	2.538806
0.087467				
57	7.5	0.630	0.12	2.538806
0.111000				
396	6.6	0.735	0.02	2.538806
0.087467				
400	6.6	0.735	0.02	2.538806
0.087467				
497	7.2	0.340	0.32	2.500000
0.090000				
522	8.2	0.390	0.49	2.300000
0.099000				
584	11.8	0.330	0.49	3.400000
0.093000				
634	7.9	0.350	0.21	1.900000
0.073000				

678	8.3	0.780	0.10	2.600000
0.081000 925	8.6	0.220	0.36	1.900000
0.064000	0.10		0.30	
926	9.4	0.240	0.33	2.300000
0.061000 982	7.3	0.520	0.32	2.100000
0.070000	7.15	0.520	0132	2.100000
1075	9.1	0.250	0.34	2.000000
0.071000	г о	0 100	0.21	1 700000
1131 0.045000	5.9	0.190	0.21	1.700000
1154	6.6	0.580	0.00	2.200000
0.100000				
1156	8.5	0.180	0.51	1.750000
0.071000 1175	6.5	0.610	0.00	2.200000
0.095000	0.5	0.010	0.00	2.20000
1217	8.2	0.340	0.37	1.900000
0.057000				
1231 0.074000	7.8	0.815	0.01	2.600000
1244	5.9	0.290	0.25	2.538806
0.067000	3.3	0.250	0.25	2.00000
1256	7.5	0.590	0.22	1.800000
0.082000	6 6	0.620	0.00	2 520006
1295 0.093000	6.6	0.630	0.00	2.538806
1296	6.6	0.630	0.00	2.538806
0.093000				
1358	7.4	0.640	0.17	2.538806
0.087467 1434	10.2	0.540	0.37	2.538806
0.087467	1012	01510	0137	2.330000
1435	10.2	0.540	0.37	2.538806
0.087467	0.0	0 500	0 50	2 520000
1474 0.087467	9.9	0.500	0.50	2.538806
1476	9.9	0.500	0.50	2.538806
0.087467				
1558	6.9	0.630	0.33	2.538806
0.087467				
	sulfur dioxide	total sulfur d	ioxide density	рН
sulphates 14	52.0		145.0 0.99860	3.16
0.88 \	52.0		143.0 0.99000	3.10
15	51.0		148.0 0.99860	3.17
0.93				

57	50.0	110.0 0.99830 3.26
0.77	60.0	124 0 0 00040 2 47
396 0.53	68.0	124.0 0.99940 3.47
400	68.0	124.0 0.99940 3.47
0.53	00.0	124:0 0:33340 3:47
497	43.0	113.0 0.99660 3.32
0.79		
522	47.0	133.0 0.99790 3.38
0.99		
584	54.0	80.0 1.00020 3.30
0.76		
634	46.0	102.0 0.99640 3.27
0.58	45.0	07.0.000000 2.40
678	45.0	87.0 0.99830 3.48
0.53 925	53.0	77.0 0.99604 3.47
0.87	33.0	77.0 0.99004 3.47
926	52.0	73.0 0.99786 3.47
0.90	32.0	75.0 0.55700 5.47
982	51.0	70.0 0.99418 3.34
0.82	5 = 1 5	
1075	45.0	67.0 0.99769 3.44
0.86		
1131	57.0	135.0 0.99341 3.32
0.44		
1154	50.0	63.0 0.99544 3.59
0.68		
1156	45.0	88.0 0.99524 3.33
0.76	40.0	50.0.0.00541.2.61
1175	48.0	59.0 0.99541 3.61
0.70 1217	43.0	74.0 0.99408 3.23
0.81	45.0	74.0 0.99400 3.23
1231	48.0	90.0 0.99621 3.38
0.62	1010	3010 0133021 3130
1244	72.0	160.0 0.99721 3.33
0.54		
1256	43.0	60.0 0.99499 3.10
0.42		
1295	51.0	77.5 0.99558 3.20
0.45		
1296	51.0	77.5 0.99558 3.20
0.45	F2 0	00 0 0 00726 2 20
1358 0.50	52.0	98.0 0.99736 3.28
1434	55.0	95.0 1.00369 3.18
0.77	33.0	55.0 1.00505 5.10
1435	55.0	95.0 1.00369 3.18
= . • •	22.0	22.0 2.0000 3.20

0.77 1474		48	3.0	82.0	1.00242	3.16
0.75		70	J. 0	02.0	1.00242	5.10
1476		48	3.0	82.0	1.00242	3.16
0.75 1558		66	5.0	115.0	0.99787	3.22
0.56		00	J. U	113.0	0.99707	3.22
14	alcohol 9.2	quality				
15	9.2	5				
57	9.4	5				
396	9.9	5 5 5 5 5 5 7				
400 497	9.9 11.1	5				
522	9.8	5				
584	10.7					
634	9.5	5				
678 925	10.0 11.0	5 5 7				
926	10.2	6				
982	12.9	6				
1075 1131	10.2 9.5	7				
1151	11.4	5 6				
1156	11.8	7				
1175	11.5	6				
1217 1231	12.0 10.8	6				
1244	10.3	5 6				
1256	9.2	5				
1295	9.5	5				
1296 1358	9.5 9.5	5 5 5 5				
1434		6				
1435	9.0					
1474 1476	8.8 8.8	6 5 5				
1558	9.5	5				
		_				
Ou+1 i	ers in to	ntal culfu	ır dioxide:			
outtr			platile acidity	citric ac	id residu	ual sugar
chlor						
14	467	8.9	0.620000	0.	18	2.538806
0.087 15	467 \	8.9	0.620000	0.1	19	2.538806
0.087	467	0.5	0.020000	0		21330000
86		8.6	0.490000	0.2	28	1.900000
0.110	000					

88	9.3	0.390000	0.44	2.100000	
0.107000 90	7.9	0.520000	0.26	1.900000	
0.079000 91	8.6	0.490000	0.28	1.900000	
0.110000	0.0	0.490000	0.20	1.90000	
92 0.110000	8.6	0.490000	0.29	2.000000	
109	8.1	0.785000	0.52	2.000000	
0.087467 130	8.0	0.745000	0.56	2.000000	
0.118000					
145 0.117000	8.1	0.670000	0.55	1.800000	
154	7.1	0.430000	0.42	2.538806	
0.070000 155	7.1	0.430000	0.42	2.538806	
0.071000	7.1	0.45000	0.42	2.550000	
156	7.1	0.430000	0.42	2.538806	
0.070000 157	7.1	0.430000	0.42	2.538806	
0.071000	7.0	0 500000	0.22	2 000000	
188 0.084000	7.9	0.500000	0.33	2.000000	
189	7.9	0.490000	0.32	1.900000	
0.082000 190	8.2	0.500000	0.35	2.900000	
0.077000					
192 0.099000	6.8	0.630000	0.12	2.538806	
201	8.8	0.370000	0.48	2.100000	
0.097000 219	7.8	0.530000	0.33	2.400000	
0.080000		0.330000			
313 0.076000	8.6	0.470000	0.30	3.000000	
354	6.1	0.210000	0.40	1.400000	
0.066000	C C	0.725000	0.00	2 520000	
396 0.087467	6.6	0.735000	0.02	2.538806	
400	6.6	0.735000	0.02	2.538806	
0.087467 415	8.6	0.725000	0.24	2.538806	
0.117000					
417 0.091000	7.0	0.580000	0.12	1.900000	
463	8.1	0.660000	0.70	2.200000	
0.098000 515	8.5	0.655000	0.49	2.538806	
313	0.0	שטטכנטיט	0.49	2.330000	

0.087467				
522 0.099000	8.2	0.390000	0.49	2.300000
523	9.3	0.400000	0.49	2.500000
0.085000				
591	6.6	0.390000	0.49	1.700000
0.070000 636	9.6	0.880000	0.28	2.400000
0.086000	9.0	0.000000	0.20	2.40000
637	9.5	0.885000	0.27	2.300000
0.084000				
649	6.7	0.420000	0.27	2.538806
0.068000 651	9.8	0.880000	0.25	2.500000
0.104000	9.0	0.000000	0.23	2.300000
672	9.8	0.527821	0.34	2.000000
0.079000				
684	9.8	0.980000	0.32	2.300000
0.078000 694	9.0	0.470000	0.31	2.700000
0.084000	9.0	0.470000	0.31	2.70000
723	7.1	0.310000	0.30	2.200000
0.053000				
741	9.2	0.530000	0.24	2.600000
0.078000 771	9.4	0.685000	0.26	2.400000
0.082000	9.4	0.003000	0.20	2.40000
772	9.5	0.570000	0.27	2.300000
0.082000				
791	8.8	0.640000	0.17	2.900000
0.084000 1079	7.9	0.300000	0.68	2.538806
0.050000	7.15	0.50000	0.00	21330000
1081	7.9	0.300000	0.68	2.538806
0.050000				
1131 0.045000	5.9	0.190000	0.21	1.700000
1244	5.9	0.290000	0.25	2.538806
0.067000	3.3	01230000	0123	21330000
1400	7.9	0.690000	0.21	2.100000
0.080000	7.0	0.00000	0.01	2 100000
1401 0.080000	7.9	0.690000	0.21	2.100000
1419	7.7	0.640000	0.21	2.200000
0.077000	, . ,	0.0.000	0.21	2.20000
1493	7.7	0.540000	0.26	1.900000
0.089000	7 7	0 540000	0.00	1 000000
1496 0.089000	7.7	0.540000	0.26	1.900000
0.009000				

1559	7.8	0.600000	0.26	2.000000
0.080000 1560	7.8	0.600000	0.26	2.000000
0.080000	7.0	0.00000	0.20	2.000000
1561	7.8	0.600000	0.26	2.000000
0.080000				
	sulfur dioxide	total sulfur di	oxide density	рН
sulphates 14	15.874922		145.0 0.99860	3.16
0.88 \	13.074922		145.0 0.99000	3.10
15	15.874922		148.0 0.99860	3.17
0.93 86	20.000000		136.0 0.99720	2.93
1.95	20.00000		130.0 0.99720	2.93
88	34.000000		125.0 0.99780	3.14
1.22 90	42.000000		140.0 0.99640	3.23
0.54	42.000000		140.0 0.99040	3.23
91	20.000000		136.0 0.99720	2.93
1.95 92	19.000000		133.0 0.99720	2.93
1.98	19.000000		133.0 0.99720	2.95
109	37.000000		153.0 0.99690	3.21
0.69 130	30.000000		134.0 0.99680	3.24
0.66	30.000000		154.0 0.55000	3.24
145	32.000000		141.0 0.99680	3.17
0.62 154	29.000000		129.0 0.99730	3.42
0.72	23.000000		12310 0133730	3112
155	28.000000		128.0 0.99730	3.42
0.71 156	29.000000		129.0 0.99730	3.42
0.72	23100000			31.12
157	28.000000		128.0 0.99730	3.42
0.71 188	15.000000		143.0 0.99680	3.20
0.55	23.000000		1.5.0 0.55000	3.20
189	17.000000		144.0 0.99680	3.20
0.55 190	21.000000		127.0 0.99760	3.23
0.62	21100000		12710 0133700	3123
192	16.000000		126.0 0.99690	3.28
0.61 201	39.000000		145.0 0.99750	3.04
1.03	33.00000		11310 0133730	J107
219	24.000000		144.0 0.99655	3.30
0.60				

313	30.000000	135.0	0.99760	3.30
0.53	40 500000	165 0	0 00120	2 25
354 0.59	40.500000	165.0	0.99120	3.25
396	15.874922	124.0	0.99940	3.47
0.53				
400	15.874922	124.0	0.99940	3.47
0.53				
415	31.000000	134.0	1.00140	3.32
1.07	24 00000	104.0	0.00560	2 44
417 0.48	34.000000	124.0	0.99560	3.44
463	25.000000	129.0	0.99720	3.08
0.53	23.000000	129.0	0.99720	3.00
515	34.000000	151.0	1.00100	3.31
1.14				
522	15.874922	133.0	0.99790	3.38
0.99				
523	38.000000	142.0	0.99780	3.22
0.55	22 000000	140 0	0 00220	2 12
591 0.50	23.000000	149.0	0.99220	3.12
636	30.000000	147.0	0.99790	3.24
0.53	30.000000	11710	0.33730	3121
637	31.000000	145.0	0.99780	3.24
0.53				
649	24.000000	148.0	0.99480	3.16
0.57	25 000000	155 0	1 00100	2 41
651 0.67	35.000000	155.0	1.00100	3.41
672	32.000000	151.0	0.99800	3.15
0.53	32.00000	131.0	0.33000	5.15
684	35.000000	152.0	0.99800	3.25
0.48				
694	24.000000	125.0	0.99840	3.31
0.61	25 22222	107.0	0.00550	2.04
723	36.000000	127.0	0.99650	2.94
1.62 741	28.000000	139.0	0.99788	3.21
0.57	28.00000	139.0	0.99700	3.21
771	23.000000	143.0	0.99780	3.28
0.55				
772	23.000000	144.0	0.99782	3.27
0.55				
791	25.000000	130.0	0.99818	3.23
0.54	37 500000	270 0	0 00216	3.01
1079 0.51	37.500000	278.0	0.99316	3.01
1081	37.500000	289.0	0.99316	3.01
1001	37.1300000	20310	3133310	3101

0 51				
0.51				
1131	15.874922	135	.0 0.99341	3.32
0.44 1244	15.874922	160	.0 0.99721	3.33
0.54	13.074922	100	.0 0.99721	3.33
1400	33.000000	141	.0 0.99620	3.25
0.51				
1401	33.000000	141	.0 0.99620	3.25
0.51	22 000000	122	0 0 00560	2 27
1419 0.45	32.000000	133	.0 0.99560	3.27
1493	23.000000	147	.0 0.99636	3.26
0.59	23.00000	2.,		3.20
1496	23.000000	147	.0 0.99636	3.26
0.59	21 22222	101		2 21
1559	31.000000	131	.0 0.99622	3.21
0.52 1560	31.000000	131	.0 0.99622	3.21
0.52	31100000	131	.0 0.59022	J. Z.I
1561	31.000000	131	.0 0.99622	3.21
0.52				
alcohol 14 9.2 15 9.2 86 9.9 88 9.5 90 9.5 91 9.9 92 9.8 109 9.3 130 9.4 145 9.4 154 10.5 155 10.5 156 10.5 157 10.5 158 9.5 188 9.5 189 9.5 190 9.4 192 9.5 201 9.3 219 9.5 313 9.4 354 11.9 396 9.9 400 9.9	quality 5 5 6 5 5 6 5 5 5 5 5 5 5 5 5 5 5 5 5			

463 515 522 523 591 636 637 649 651 672 684 694 723 741 771 772 791 1079 1081 1131 1244 1400 1401 1419 1493 1496 1559 1560 1561	9.0 9.3 9.8 9.4 11.5 9.4 9.4 9.5 9.4 9.5 9.4 9.5 9.5 9.4 9.5 9.5 9.7 9.9 9.9 9.9 9.9 9.9 9.9	555565555555555555555555555555555555555				
fix		volatile	acidity	citric	acid	residual sugar
chlorides						
142 0.050000	5.200000		0.340		0.00	1.800000
144	5.200000		0.340		0.00	1.800000
0.050000 294	8.319637		0.340		0.52	3.200000
0.094000			_		_	
324	10.000000		0.490		0.20	2.538806

0.490

0.530

0.210

0.615

0.20

0.79

0.40

0.66

2.538806

2.538806

1.400000

2.538806

0.071000

0.071000

0.087467

0.066000

0.083000

325

353

354

364

10.000000

8.319637

6.100000

8.319637

366 0.083000	8.319637	0.615	0.66	2.538806
374	8.319637	0.410	0.63	2.538806
0.089000 381	8.319637	0.415	0.68	2.900000
0.085000 391	8.319637	0.415	0.68	2.900000
0.085000 415	8.600000	0.725	0.24	2.538806
0.117000 442	8.319637	0.685	0.76	2.538806
0.100000 480	10.600000	0.280	0.39	2.538806
0.069000 538	8.319637	0.350	0.49	2.538806
0.066000 554	8.319637	0.645	0.49	2.538806
0.095000				
555 0.095000	8.319637	0.645	0.49	2.538806
557 0.095000	8.319637	0.645	0.49	2.538806
559 0.085000	8.319637	0.470	0.49	2.538806
564 0.085000	8.319637	0.470	0.49	2.538806
588	5.000000	0.420	0.24	2.000000
0.060000 591	6.600000	0.390	0.49	1.700000
0.070000 608	10.100000	0.650	0.37	2.538806
0.110000 695	5.100000	0.470	0.02	1.300000
0.087467 821	4.900000	0.420	0.00	2.100000
0.048000 836	6.700000	0.280	0.28	2.400000
0.087467 837	6.700000	0.280	0.28	2.400000
0.087467 889	10.700000	0.900	0.34	2.538806
0.112000				
999 0.055000	6.400000	0.690	0.00	1.650000
1017 0.049000	8.000000	0.180	0.37	0.900000
1018 0.049000	8.000000	0.180	0.37	0.900000
1114	5.000000	0.400	0.50	2.538806

0.046000				
1122 0.055000	6.300000	0.470	0.00	1.400000
1126	5.800000	0.290	0.26	1.700000
0.063000	F 100000	0. 420	0.00	1 000000
1228 0.044000	5.100000	0.420	0.00	1.800000
1269	5.500000	0.490	0.03	1.800000
0.044000	E 000000	0.200	0.01	1 600000
1270 0.048000	5.000000	0.380	0.01	1.600000
1298	5.700000	0.600	0.00	1.400000
0.063000	10.00000	0.540	0.07	2 520006
1434 0.087467	10.200000	0.540	0.37	2.538806
1435	10.200000	0.540	0.37	2.538806
0.087467		0.0.0	0.07	
1474	9.900000	0.500	0.50	2.538806
0.087467	E 20000	0.470	0 11	2 200000
1475 0.048000	5.300000	0.470	0.11	2.200000
1476	9.900000	0.500	0.50	2.538806
0.087467				
1477	5.300000	0.470	0.11	2.200000
0.048000				
	e sulfur dioxide	total sulfur diox:	ide density	рН
sulphates	27 000000	62,000	000 0 00160	2 60
142 0.79 \	27.000000	63.0000	000 0.99160	3.68
144	27.000000	63.000	000 0.99160	3.68
0.79				
294	17.000000	53.0000	000 1.00140	3.05
0.81 324	13.000000	50.000	000 1.00150	3.16
0.69	13.00000	301000	1100130	3.10
325	13.000000	50.0000	000 1.00150	3.16
0.69				
0.69 353	13.000000 23.000000	50.0000 77.0000		3.16
0.69			000 1.00180	
0.69 353 0.77 354 0.59	23.000000 40.500000	77.0000 46.4677	000 1.00180 792 0.99120	3.18 3.25
0.69 353 0.77 354 0.59 364	23.000000	77.0000	000 1.00180 792 0.99120	3.18
0.69 353 0.77 354 0.59 364 0.73	23.000000 40.500000 7.000000	77.0000 46.4677 42.0000	1.00180 792 0.99120 900 1.00220	3.18 3.25 3.07
0.69 353 0.77 354 0.59 364 0.73 366 0.73	23.000000 40.500000 7.000000 7.000000	77.0000 46.4677	1.00180 792 0.99120 900 1.00220 900 1.00220	3.18 3.25
0.69 353 0.77 354 0.59 364 0.73 366 0.73 374	23.000000 40.500000 7.000000	77.0000 46.4677 42.0000	1.00180 792 0.99120 900 1.00220 900 1.00220	3.18 3.25 3.07
0.69 353 0.77 354 0.59 364 0.73 366 0.73	23.000000 40.500000 7.000000 7.000000	77.0000 46.4677 42.0000 42.0000	1.00180 792 0.99120 900 1.00220 900 1.00220 900 1.00140	3.18 3.25 3.07 3.07

0.80				
391	17.000000	43.000000	1.00140	3.06
0.80	21 000000	46 467700	1 00140	2 22
415 1.07	31.000000	46.467792	1.00140	3.32
442	6.000000	43.000000	1.00320	2.95
0.68	0.000000	45.000000	1.00320	2.93
480	6.000000	23.000000	1.00260	3.12
0.66	0.00000			0.1
538	5.000000	35.000000	1.00140	3.20
0.66				
554	10.000000	23.000000	1.00315	2.92
0.74				
555	10.000000	23.000000	1.00315	2.92
0.74	10 000000	22 000000	1 00015	2 02
557 0.74	10.000000	23.000000	1.00315	2.92
559	6.000000	47.000000	1.00210	3.30
0.68	0.00000	47.000000	1.00210	3.30
564	6.000000	47.000000	1.00210	3.30
0.68	0.00000	1,100000	1100210	3.30
588	19.000000	50.000000	0.99170	3.72
0.74				
591	23.000000	46.467792	0.99220	3.12
0.50				
608	11.000000	65.000000	1.00260	3.32
0.64	10 000000	44 00000	0 00210	2 00
695 0.62	18.000000	44.000000	0.99210	3.90
821	16.000000	42.000000	0.99154	3.71
0.74	10.000000	12100000	0.33131	3171
836	36.000000	100.000000	0.99064	3.26
0.39				
837	36.000000	100.000000	0.99064	3.26
0.39				_
889	23.000000	99.000000	1.00289	3.22
0.68	7 000000	12 00000	0.00163	2 47
999 0.53	7.000000	12.000000	0.99162	3.47
1017	36.000000	109.000000	0.99007	2.89
0.44	30.000000	103.000000	0.55007	2.03
1018	36.000000	109.000000	0.99007	2.89
0.44				
1114	29.000000	80.000000	0.99020	3.49
0.66				
1122	27.000000	33.000000	0.99220	3.45
0.48	2 000000	11 00000	0.00750	2 22
1126	3.000000	11.000000	0.99150	3.39
0.54				

1228		18.000000	88.000000	0.99157	3.68
0.73 1269		28.000000	87.000000	0.99080	3.50
0.82 1270		26.000000	60.000000	0.99084	3.70
0.75					
1298 0.56		11.000000	18.000000	0.99191	3.45
1434		15.874922	95.000000	1.00369	3.18
0.77 1435		15.874922	95.000000	1.00369	3.18
0.77					
1474 0.75		15.874922	82.000000	1.00242	3.16
1475		16.000000	89.000000	0.99182	3.54
0.88 1476		15.874922	82.000000	1.00242	3.16
0.75		16 000000	00 000000		
1477 0.88		16.000000	89.000000	0.99182	3.54
	alcohol	quality			
142	14.000000	6			
144 294	14.000000 9.500000	6 6			
324	9.200000	6			
325	9.200000	6			
353	13.000000	5			
354	11.900000	6 7			
364 366	10.000000	7			
374	10.800000	6			
381	10.000000	6			
391	10.000000	6			
415	9.300000	5			
442 480	11.200000 9.200000	7 5			
538	12.000000	7			
554	11.100000	5			
555	11.100000	5			
557	11.100000	5			
559 564	12.700000 12.700000	6 6			
588	14.000000	8			
591	11.500000	6			
608	10.400000	6			
695	12.800000	6			
821 836	14.000000 11.700000	7 7			
0.50	11.700000	,			

837	889 9.300000 5	
889	889 9.300000 5	
999 12.990000 6 1017 12.700000 6 1018 12.700000 6 1114 13.600000 6 1126 13.500000 6 1127 13.500000 6 128 13.500000 6 128 13.500000 7 128 13.600000 8 1270 14.000000 8 1270 14.000000 6 1298 12.200000 6 1433 9.000000 6 1474 8.800000 5 1477 13.566667 7 1476 8.800000 5 1477 13.600000 7 Outliers in pH: fixed acidity volatile acidity citric acid residual sugar chlorides 45 4.600000 7 Outliers in 5.000000 0.527821 0.040000 1.400000 0.054000		
1018 12.700000 6 1114 13.600000 6 1122 12.300000 6 1126 13.500000 7 1269 14.000000 8 1270 14.000000 6 1298 12.200000 6 1433 9.000000 6 1434 9.000000 6 1474 8.800000 5 1477 13.66667 7 1476 8.800000 7 Outliers in pH:	999 IZ.900000 0	
1018 12.700000 6 1114 13.600000 6 1122 12.300000 6 1126 13.500000 7 1269 14.000000 8 1270 14.000000 6 1298 12.200000 6 1433 9.000000 6 1434 9.000000 6 1474 8.800000 5 1477 13.66667 7 1476 8.800000 7 Outliers in pH:		
1114 13.600000 6 1122 12.300000 6 1126 13.500000 7 1269 14.000000 8 1270 14.000000 6 1298 12.200000 6 1434 9.000000 6 1434 9.000000 6 1434 9.000000 6 1474 8.800000 5 1475 13.566667 7 1476 8.800000 7 Outliers in pH:		
1126 13.500000 6 1228 13.600000 7 1269 14.000000 8 1270 14.000000 6 1298 12.200000 6 1434 9.000000 6 1435 9.000000 6 1474 8.800000 5 1475 13.566667 7 1476 8.800000 7 Outliers in pH: fixed acidity volatile acidity citric acid residual sugar chlorides 45 4.600000 0.520000 0.150000 2.100000 0.054000 0 94 5.000000 0.527821 0.040000 1.400000 0.045000 0 95 4.700000 0.600000 0.170000 2.300000 0.058000 151 9.200000 0.520000 0.270976 3.400000 0.087407 268 6.900000 0.520000 0.270976 3.400000 0.807407 268 6.900000 0.540000 0.040000 3.000000 0.077000 276 6.900000 0.540000 0.040000 3.000000 0.077000 276 6.900000 0.540000 0.720000 3.000000 0.077000 276 8.319637 0.310000 0.720000 2.200000 0.077000 553 5.000000 0.527821 0.240000 1.800000 0.075000 554 8.319637 0.310000 0.740000 1.800000 0.055000 555 8.319637 0.645000 0.490000 2.538806 0.095000 557 8.319637 0.645000 0.490000 2.538806		
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1434 9.000000 6 1435 9.000000 6 1475 13.566667 7 1476 8.800000 5 1477 13.600000 7 Outliers in pH: fixed acidity volatile acidity citric acid residual sugar chlorides 45 4.600000 0.520000 0.150000 2.100000 0.054000 \ 94 5.000000 0.527821 0.040000 1.400000 0.045000 95 4.700000 0.600000 0.170000 2.300000 0.058000 151 9.200000 0.520000 0.170000 2.300000 0.087467 268 6.900000 0.540000 0.270976 3.400000 0.077000 0.077000 440 8.319637 0.310000 0.720000 2.200000 0.077000 440 8.319637 0.310000 0.720000 2.200000 0.075000 553 5.000000 0.527821 0.240000 1.800000 0.075000 554 8.319637 0.310000 0.740000 1.800000 0.075000 555 8.319637 0.645000 0.490000 2.538806 0.095000 557 8.319637 0.645000 0.490000 2.538806 0.095000	1270 14.000000 6	
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1476 8.800000 5 1477 13.600000 7 Outliers in pH: fixed acidity volatile acidity citric acid residual sugar chlorides 45		
Outliers in pH: fixed acidity volatile acidity citric acid residual sugar chlorides 45		
Outliers in pH: fixed acidity volatile acidity citric acid residual sugar chlorides 45		
fixed acidity volatile acidity citric acid residual sugar chlorides 45	1477 13.600000 7	
fixed acidity volatile acidity citric acid residual sugar chlorides 45		
fixed acidity volatile acidity citric acid residual sugar chlorides 45	Outliers in pH.	
chlorides 45		dual cugar
45 4.600000 0.520000 0.150000 2.100000 94 5.000000 0.527821 0.040000 1.400000 0.045000 4.700000 0.600000 0.170000 2.300000 0.058000 151 9.200000 0.520000 0.270976 3.400000 0.087467 268 6.900000 0.540000 0.040000 3.000000 276 6.900000 0.540000 0.040000 3.000000 0.077000 440 8.319637 0.310000 0.720000 2.200000 544 8.319637 0.310000 0.740000 1.600000 554 8.319637 0.645000 0.490000 2.538806 0.095000 555 8.319637 0.645000 0.490000 2.538806 557 8.319637 0.645000 0.490000 2.538806 0.095000 557 8.319637 0.645000 0.490000 2.538806	•	uuat Sugar
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		2 100000
94 5.000000 0.527821 0.040000 1.400000 95 4.700000 0.600000 0.170000 2.300000 0.058000 151 9.200000 0.520000 0.270976 3.400000 0.087467 268 6.900000 0.540000 0.040000 3.000000 0.077000 276 6.900000 0.540000 0.040000 3.000000 0.077000 440 8.319637 0.310000 0.720000 2.200000 544 8.319637 0.310000 0.740000 1.800000 553 5.000000 0.527821 0.240000 1.600000 554 8.319637 0.645000 0.490000 2.538806 0.095000 557 8.319637 0.645000 0.490000 2.538806 557 8.319637 0.645000 0.490000 2.538806		2.100000
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614	9.200000	0.755000	0.180000	2.200000
0.087467 650	10.700000	0.430000	0.390000	2.200000
0.106000 656	10.700000	0.430000	0.390000	2.200000
0.106000	10.700000			2.200000
657 0.073000	12.000000	0.500000	0.590000	1.400000
695	5.100000	0.470000	0.020000	1.300000
0.087467 821	4.900000	0.420000	0.000000	2.100000
0.048000				
930 0.080000	6.600000	0.610000	0.010000	1.900000
934	6.600000	0.610000	0.010000	1.900000
0.080000 996	5.600000	0.660000	0.000000	2.200000
0.087000				
997 0.087000	5.600000	0.660000	0.000000	2.200000
1017	8.000000	0.180000	0.370000	0.900000
0.049000 1018	8.000000	0.180000	0.370000	0.900000
0.049000	F 400000	0 420000	0. 270000	2 000000
1111 0.092000	5.400000	0.420000	0.270000	2.000000
1270 0.048000	5.000000	0.380000	0.010000	1.600000
1300	5.200000	0.645000	0.000000	2.150000
0.080000 1316	5.400000	0.740000	0.000000	1.200000
0.041000				
1319 0.087467	9.100000	0.760000	0.680000	1.700000
1321	5.000000	0.740000	0.000000	1.200000
0.041000 1377	5.200000	0.490000	0.260000	2.300000
0.090000				
1470 0.084000	10.000000	0.690000	0.110000	1.400000
1488	5.600000	0.540000	0.040000	1.700000
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	e sulfur dioxide	total sulfur	dioxide density	у рН
sulphates 45	8.0		65.0 0.993400	3.90
0.56 \	0.0		05.0 0.995400	J . 90

94					
95	94	41.0	85.0	0.993800	3.75
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2.00 268 7.0 27.0 0.998700 3.69 0.91 27.0 0.998700 3.69 0.91 27.0 0.998700 3.69 0.91 440 6.0 29.0 0.998700 2.88 0.82 544 6.0 15.0 1.000800 2.86 0.79 553 32.0 96.0 0.993400 3.74 0.62 10.0 23.0 0.996747 2.92 0.74 23.0 0.996747 2.92 0.74 555 10.0 23.0 0.996747 2.92 0.74 557 10.0 23.0 0.996747 2.92 0.74 558 19.0 23.0 0.996747 2.92 0.74 557 10.0 23.0 0.996747 2.92 0.74 558 10.0 23.0 0.996747 2.92 0.74 559 8.0 32.0 0.99600 2.87 1.36 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 <td></td> <td>=7.10</td> <td></td> <td>0.00000</td> <td></td>		=7.10		0.00000	
268 7.0 27.0 0.998700 3.69 0.91 27.0 0.998700 3.69 0.91 440 6.0 29.0 0.998700 2.88 0.82 544 6.0 15.0 1.000800 2.86 0.79 553 32.0 96.0 0.993400 3.74 0.62 554 10.0 23.0 0.996747 2.92 0.74 555 10.0 23.0 0.996747 2.92 0.74 557 10.0 23.0 0.996747 2.92 0.74 588 19.0 50.0 0.996747 3.72 0.74 588 19.0 103.0 0.996900 2.87 1.36 650 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.92 0.62 821 10.0 42.0 0.996747 3.71 0.73 <td></td> <td>32.0</td> <td>69.0</td> <td>0.999600</td> <td>2.74</td>		32.0	69.0	0.999600	2.74
0.91 276 7.0 27.0 0.998700 3.69 0.91 440 6.0 29.0 0.998700 2.88 0.82 544 6.0 15.0 1.000800 2.86 0.79 32.0 96.0 0.993400 3.74 0.62 23.0 0.996747 2.92 0.74 23.0 0.996747 2.92 0.74 23.0 0.996747 2.92 0.74 23.0 0.996747 2.92 0.74 557 10.0 23.0 0.996747 2.92 0.74 588 19.0 50.0 0.996747 3.72 0.74 614 10.0 103.0 0.996900 2.87 1.36 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 656 8.0 32.0 0.998600 2.89 0.50 657 23.0 42.0 0.998700 2.92		7.0	27.0	0.000700	2.60
276 7.0 27.0 0.998700 3.69 0.91 440 6.0 29.0 0.998700 2.88 0.82 544 6.0 15.0 1.000800 2.86 0.79 96.0 0.993400 3.74 0.62 32.0 0.996747 2.92 0.74 23.0 0.996747 2.92 0.74 23.0 0.996747 2.92 0.74 3.72 0.74 3.72 588 19.0 50.0 0.996747 3.72 0.74 3.30 0.996900 2.87 1.36 32.0 0.996900 2.87 1.36 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 656 8.0 32.0 0.998000 2.92 0.68 9.6 8.0 32.0 0.998000 2.92 0.62 23.0 42.0 0.998747 3.71 0.74 33 3.0 44.0 0.996747 3.71 0.7		7.0	27.0	0.998700	3.69
0.91 440 6.0 29.0 0.998700 2.88 544 6.0 15.0 1.000800 2.86 0.79 32.0 96.0 0.993400 3.74 0.62 10.0 23.0 0.996747 2.92 0.74 23.0 0.996747 2.92 0.74 23.0 0.996747 2.92 0.74 3.72 3.72 557 10.0 23.0 0.996747 2.92 0.74 588 19.0 50.0 0.996747 3.72 0.74 3.0 32.0 0.99600 2.87 1.36 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998000 2.92 0.68 8.0 32.0 0.998000 2.92 0.68 95 18.0 44.0 0.996747 3.71 0.74 930 8.0 25.0 0.997460 3.6		7.0	27.0	0.998700	3.69
0.82 544 6.0 15.0 1.000800 2.86 0.79 32.0 96.0 0.993400 3.74 0.62 32.0 96.0 0.996747 2.92 554 10.0 23.0 0.996747 2.92 0.74 555 10.0 23.0 0.996747 2.92 0.74 557 10.0 23.0 0.996747 2.92 0.74 588 19.0 50.0 0.996747 3.72 0.74 588 19.0 103.0 0.996900 2.87 1.36 650 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.68 8.0 32.0 0.998600 2.92 0.68 95 18.0 44.0 0.996747 3.71 0.74 93 8.0 <td></td> <td>, . •</td> <td></td> <td></td> <td></td>		, . •			
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0.79 553 32.0 96.0 0.993400 3.74 0.62 10.0 23.0 0.996747 2.92 0.74 23.0 0.996747 2.92 0.74 23.0 0.996747 2.92 0.74 23.0 0.996747 2.92 0.74 3.72 0.996747 3.72 0.74 10.0 103.0 0.996900 2.87 1.36 650 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.63 18.0 44.0 0.996747 3.90 0.62 8.1 10.0 0.996747 3.71 0.73 93 8.0 25.0 0.997460 3.69 0.73 93 3.0 11.0 0					
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0.62 554 10.0 23.0 0.996747 2.92 0.74 555 10.0 23.0 0.996747 2.92 0.74 557 10.0 23.0 0.996747 2.92 0.74 588 19.0 50.0 0.996747 3.72 0.74 614 10.0 103.0 0.996900 2.87 1.36 650 8.0 32.0 0.998600 2.89 0.50 656 8.0 32.0 0.998600 2.89 0.50 657 23.0 42.0 0.998000 2.92 0.68 695 18.0 44.0 0.996747 3.90 0.62 821 16.0 42.0 0.996747 3.71 0.74 930 8.0 25.0 0.997460 3.69 0.73 996 3.0 11.0 0.993780 3.71 0.63 1007 3.0 11.0 0.993780 3.71 0.63 1007 0.996747 2.89 0.44 1008 36.0 109.0 <td></td> <td>32 0</td> <td>06.0</td> <td>0 003400</td> <td>3 7/</td>		32 0	06.0	0 003400	3 7/
554 10.0 23.0 0.996747 2.92 0.74 23.0 0.996747 2.92 0.74 23.0 0.996747 2.92 0.74 23.0 0.996747 2.92 0.74 588 19.0 50.0 0.996747 3.72 0.74 614 10.0 103.0 0.996900 2.87 1.36 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.63 8.0 42.0 0.998000 2.92 0.62 8.0 44.0 0.996747 3.71 930 8.0 25.0 0.997460 3.69 0.73 934 8.0 25.0 0.997460 3.69 0.73 996 3.0 11.		32.0	90.0	0.995400	3.74
0.74 555 10.0 23.0 0.996747 2.92 0.74 557 10.0 23.0 0.996747 2.92 0.74 588 19.0 50.0 0.996747 3.72 0.74 614 10.0 103.0 0.996900 2.87 1.36 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.63 18.0 44.0 0.996747 3.90 0.63 3.0 44.0 0.996747 3.71 0.63 3.0 11.0 0.993780 3.71 0.63 3.0 11.0 0.993780 3.71 0.63 3.0 10.0 0.996747 2.89		10.0	23.0	0.996747	2.92
0.74 557 10.0 23.0 0.996747 2.92 0.74 19.0 50.0 0.996747 3.72 0.74 103.0 0.996900 2.87 1.36 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 23.0 42.0 0.998000 2.92 0.68 8.0 44.0 0.996747 3.90 0.62 821 16.0 42.0 0.996747 3.71 0.74 930 8.0 25.0 0.997460 3.69 0.73 996 3.0 11.0 0.993780 3.71 0.63 3.0 11.0 0.993780 3.71 0.63 1017 36.0 109.0 0.996747 2.89 0.44 1018 36.0 109.0 0.996747 2.89 0.44 1018 36.0 109.0 0.996747 2.89					
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0.74 588 19.0 50.0 0.996747 3.72 0.74 103.0 0.996900 2.87 1.36 32.0 0.998600 2.89 0.50 32.0 0.998600 2.89 0.50 32.0 0.998600 2.89 0.50 32.0 0.998000 2.92 0.68 32.0 0.998000 2.92 0.68 369 3.00 42.0 0.996747 3.71 0.62 32.1 16.0 42.0 0.996747 3.71 930 8.0 25.0 0.997460 3.69 0.73 394 8.0 25.0 0.997460 3.69 0.73 394 8.0 25.0 0.997460 3.69 0.73 394 8.0 25.0 0.997460 3.69 0.63 397 3.0 11.0 0.993780 3.71 0.63 30 109.0 0.996747 2.89 0.44 36.0 109.0 0.996747 2.89 0.44 <td< td=""><td></td><td></td><td>22.0</td><td></td><td>2 22</td></td<>			22.0		2 22
588 19.0 50.0 0.996747 3.72 0.74 10.0 103.0 0.996900 2.87 1.36 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 656 8.0 32.0 0.998000 2.89 0.50 657 23.0 42.0 0.998000 2.92 0.68 8.0 44.0 0.996747 3.90 0.62 821 16.0 42.0 0.996747 3.71 0.74 930 8.0 25.0 0.997460 3.69 0.73 934 8.0 25.0 0.997460 3.69 0.73 996 3.0 11.0 0.993780 3.71 0.63 997 3.0 11.0 0.993780 3.71 0.63 109.0 0.996747 2.89 0.44 36.0 109.0 0.996747 2.89 0.44 36.0 109.0 0.996747 2.89		10.0	23.0	0.996/4/	2.92
0.74 614 10.0 103.0 0.996900 2.87 1.36 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 657 23.0 42.0 0.998000 2.92 0.68 695 18.0 44.0 0.996747 3.90 0.62 821 16.0 42.0 0.996747 3.71 0.74 930 8.0 25.0 0.997460 3.69 0.73 934 8.0 25.0 0.997460 3.69 0.73 996 3.0 11.0 0.993780 3.71 0.63 997 3.0 11.0 0.993780 3.71 0.63 1017 36.0 109.0 0.996747 2.89 0.44 1018 36.0 109.0 0.996747 2.89 0.444		10 0	50 0	0 006747	3 72
614		19.0	30.0	0.990747	5.72
650 8.0 32.0 0.998600 2.89 0.50 8.0 32.0 0.998600 2.89 0.50 23.0 42.0 0.998000 2.92 0.68 32.0 0.998000 2.92 0.68 42.0 0.996747 3.90 0.62 3.0 42.0 0.996747 3.71 0.74 30 42.0 0.997460 3.69 0.73 33 25.0 0.997460 3.69 0.73 396 3.0 11.0 0.993780 3.71 0.63 397 3.0 11.0 0.993780 3.71 0.63 36.0 109.0 0.996747 2.89 0.44 1018 36.0 109.0 0.996747 2.89 0.44 1018 36.0 109.0 0.996747 2.89		10.0	103.0	0.996900	2.87
0.50 656 8.0 32.0 0.998600 2.89 0.50 42.0 0.998000 2.92 0.68 44.0 0.996747 3.90 0.62 32.1 16.0 42.0 0.996747 3.71 0.74 330 8.0 25.0 0.997460 3.69 0.73 334 8.0 25.0 0.997460 3.69 0.73 396 3.0 11.0 0.993780 3.71 0.63 397 3.0 11.0 0.993780 3.71 0.63 1017 36.0 109.0 0.996747 2.89 0.44 1018 36.0 109.0 0.996747 2.89 0.44 1018 36.0 109.0 0.996747 2.89	1.36				
656 8.0 32.0 0.998600 2.89 0.50 23.0 42.0 0.998000 2.92 0.68 30.0 44.0 0.996747 3.90 0.62 32.1 16.0 42.0 0.996747 3.71 0.74 330 8.0 25.0 0.997460 3.69 0.73 334 8.0 25.0 0.997460 3.69 0.73 396 3.0 11.0 0.993780 3.71 0.63 397 3.0 11.0 0.993780 3.71 0.63 101 0.993780 3.71 0.63 1017 36.0 109.0 0.996747 2.89 0.44 1018 36.0 109.0 0.996747 2.89 0.44 1018 36.0 109.0 0.996747 2.89		8.0	32.0	0.998600	2.89
0.50 657 23.0 42.0 0.998000 2.92 0.68 695 18.0 44.0 0.996747 3.90 0.62 3.1 42.0 0.996747 3.71 0.74 3.0 25.0 0.997460 3.69 0.73 3.0 25.0 0.997460 3.69 0.73 3.0 11.0 0.993780 3.71 0.63 3.0 11.0 0.993780 3.71 0.63 109.0 0.996747 2.89 0.44 36.0 109.0 0.996747 2.89 0.44 36.0 109.0 0.996747 2.89		0.0	22.0	0.00000	2.00
657		8.0	32.0	0.998600	2.89
0.68 695 18.0 44.0 0.996747 3.90 0.62 3.0 42.0 0.996747 3.71 0.74 30 8.0 25.0 0.997460 3.69 0.73 334 8.0 25.0 0.997460 3.69 0.73 396 3.0 11.0 0.993780 3.71 0.63 397 3.0 11.0 0.993780 3.71 0.63 1017 36.0 109.0 0.996747 2.89 0.44 1018 36.0 109.0 0.996747 2.89 0.44 1018 36.0 109.0 0.996747 2.89		23.0	42.0	0.998000	2.92
0.62 821 16.0 42.0 0.996747 3.71 0.74 30 8.0 25.0 0.997460 3.69 0.73 34 8.0 25.0 0.997460 3.69 0.73 396 3.0 11.0 0.993780 3.71 0.63 397 3.0 11.0 0.993780 3.71 0.63 1017 36.0 109.0 0.996747 2.89 0.44 1018 36.0 109.0 0.996747 2.89 0.44 1018 36.0 109.0 0.996747 2.89		23.0	1210	0.00000	2132
821 16.0 42.0 0.996747 3.71 930 8.0 25.0 0.997460 3.69 0.73 34 8.0 25.0 0.997460 3.69 0.73 396 3.0 11.0 0.993780 3.71 0.63 397 3.0 11.0 0.993780 3.71 0.63 36.0 109.0 0.996747 2.89 0.44 36.0 109.0 0.996747 2.89 0.44 36.0 109.0 0.996747 2.89	695	18.0	44.0	0.996747	3.90
0.74 930 8.0 25.0 0.997460 3.69 0.73 34 8.0 25.0 0.997460 3.69 0.73 396 3.0 11.0 0.993780 3.71 0.63 3.0 11.0 0.993780 3.71 0.63 109.0 0.996747 2.89 0.44 36.0 109.0 0.996747 2.89 0.44 36.0 109.0 0.996747 2.89 0.44 36.0 109.0 0.996747 2.89					
930 8.0 25.0 0.997460 3.69 0.73 934 8.0 25.0 0.997460 3.69 0.73 996 3.0 11.0 0.993780 3.71 0.63 997 3.0 11.0 0.993780 3.71 0.63 1017 36.0 109.0 0.996747 2.89 0.44 1018 36.0 109.0 0.996747 2.89 0.44		16.0	42.0	0.996747	3.71
0.73 934 8.0 25.0 0.997460 3.69 0.73 3.0 11.0 0.993780 3.71 0.63 3.0 11.0 0.993780 3.71 0.63 36.0 109.0 0.996747 2.89 0.44 36.0 109.0 0.996747 2.89 0.44 36.0 109.0 0.996747 2.89 0.44 36.0 109.0 0.996747 2.89	~	8 0	25.0	0 007/60	3 60
934 8.0 25.0 0.997460 3.69 0.73 3.0 11.0 0.993780 3.71 9.63 3.0 11.0 0.993780 3.71 0.63 109.0 0.996747 2.89 0.44 36.0 109.0 0.996747 2.89 0.44 36.0 109.0 0.996747 2.89 0.44 36.0 109.0 0.996747 2.89		0.0	23.0	0.997400	5.09
0.73 996 3.0 11.0 0.993780 3.71 0.63 11.0 0.993780 3.71 0.63 109.0 0.996747 2.89 0.44 1018 36.0 109.0 0.996747 2.89 0.44 109.0 0.996747 2.89		8.0	25.0	0.997460	3.69
0.63 997 3.0 11.0 0.993780 3.71 0.63 36.0 109.0 0.996747 2.89 0.44 36.0 109.0 0.996747 2.89 0.44 36.0 109.0 0.996747 2.89 0.44	0.73				
997 3.0 11.0 0.993780 3.71 0.63 1017 36.0 109.0 0.996747 2.89 0.44 1018 36.0 109.0 0.996747 2.89 0.44		3.0	11.0	0.993780	3.71
0.63 1017 36.0 109.0 0.996747 2.89 0.44 1018 36.0 109.0 0.996747 2.89 0.44		2.0	11.0	0.000700	2 71
1017 36.0 109.0 0.996747 2.89 0.44 1018 36.0 109.0 0.996747 2.89 0.44		3.⊎	11.0	0.993/80	3./1
0.44 1018 36.0 109.0 0.996747 2.89 0.44		36 ብ	1ค9 ค	0.996747	2.89
1018 36.0 109.0 0.996747 2.89 0.44		30.10	103.0	01330747	2103
		36.0	109.0	0.996747	2.89
1111 23.0 55.0 0.994710 3.78					
	1111	23.0	55.0	0.994710	3.78

0.64 1270	26.0	60.0	0.996747	3.70
0.75			0.994440	
1300 0.61	15.0	28.0		3.78
1316 0.59	16.0	46.0	0.992580	4.01
1319 1.33	18.0	64.0	0.996520	2.90
1321	16.0	46.0	0.992580	4.01
0.59 1377	23.0	74.0	0.995300	3.71
0.62 1470	8.0	24.0	0.995780	2.88
0.47 1488	5.0	13.0	0.994200	3.72
0.58 1491	5.0	13.0	0.994200	3.72
0.58	310	1310	01331200	3172
45 13 94 10 95 12 151 9 268 9 276 9 440 9 544 8 553 11 554 11 555 11 557 11 588 14 614 10 650 9	.5 4 .9 6 .4 .4 6 .8 8 .4 .5 .5 .1 .5 .1 .5 .1 .1 .5 .2 .6 .5 .5 .6 .5 .5 .8 .0 .5 .5 .5 .5 .5 .5 .7 .8 .7 .7 .7 .7 .7 .7 .7 .7 .7 .7 .7 .7 .7			

1316 1319 1321 1377 1470 1488	12.5 9.1 12.5 12.2 9.7 11.4	6 6 6 5 5		
1491	11.4	5		
	in sulphate			
		volatile acidity	citric acid	residual sugar
chloride: 13	7.800000	0.610	0.290000	1.600000
0.114000	\	01010	01230000	1100000
17	8.100000	0.560	0.280000	1.700000
0.087467	7 000000	0 220	0 510000	1 000000
19 0.087467	7.900000	0.320	0.510000	1.800000
43	8.100000	0.660	0.220000	2.200000
0.069000				
79	8.300000	0.625	0.200000	1.500000
0.080000 81	7.800000	0.430	0.700000	1.900000
0.087467	7.800000	0.430	0.700000	1.90000
83	7.300000	0.670	0.260000	1.800000
0.087467				
86	8.600000	0.490	0.280000	1.900000
0.110000 88	9.300000	0.390	0.440000	2.100000
0.107000	3130000	01330	01110000	2110000
91	8.600000	0.490	0.280000	1.900000
0.110000	0 600000	0 400	0 200000	2 000000
92 0.110000	8.600000	0.490	0.290000	2.000000
106	7.800000	0.410	0.680000	1.700000
0.087467				
151	9.200000	0.520	0.270976	3.400000
0.087467 161	7.600000	0.680	0.020000	1.300000
0.072000	7.000000	0.000	0.020000	1.500000
169	7.500000	0.705	0.240000	1.800000
0.087467	0.00000	0.610	0 400000	2 000000
181 0.087467	8.900000	0.610	0.490000	2.000000
201	8.800000	0.370	0.480000	2.100000
0.097000				
226	8.900000	0.590	0.500000	2.000000
0.087467 240	8.900000	0.635	0.370000	1.700000
240	0.90000	0.033	0.370000	1.70000

0.087467	7 70000	0.410	0.760000	1 000000
258 0.087467	7.700000	0.410	0.760000	1.800000
281	7.700000	0.270	0.680000	3.500000
0.087467 338 0.103000	8.319637	0.490	0.580000	3.000000
339	8.319637	0.280	0.540000	2.300000
0.082000 340	12.200000	0.340	0.500000	2.400000
0.066000 369 0.074000	9.400000	0.270	0.530000	2.400000
372	9.100000	0.280	0.480000	1.800000
0.067000 376 0.078000	11.500000	0.450	0.500000	3.000000
377	9.400000	0.270	0.530000	2.400000
0.074000 415 0.117000	8.600000	0.725	0.240000	2.538806
451 0.087467	8.400000	0.370	0.530000	1.800000
477 0.075000	10.400000	0.240	0.490000	1.800000
482 0.087467	10.600000	0.360	0.590000	2.200000
483 0.087467	10.600000	0.360	0.600000	2.200000
503	10.500000	0.260	0.470000	1.900000
0.078000 504	10.500000	0.240	0.420000	1.800000
0.077000 506	10.400000	0.240	0.460000	1.800000
0.075000 515 0.087467	8.500000	0.655	0.490000	2.538806
586 0.094000	11.100000	0.310	0.490000	2.700000
614 0.087467	9.200000	0.755	0.180000	2.200000
639 0.067000	8.900000	0.290	0.350000	1.900000
689 0.087467	8.100000	0.380	0.480000	1.800000
692 0.087467	8.600000	0.490	0.510000	2.000000
723 0.053000	7.100000	0.310	0.300000	2.200000

754 0.087467	7.800000	0.480	0.680000	1.700000
795	10.800000	0.890	0.300000	2.600000
0.087467 852	8.000000	0.420	0.320000	2.500000
0.080000 1051	8.500000	0.460	0.590000	1.400000
0.087467 1158	6.700000	0.410	0.430000	2.800000
0.076000 1165	8.500000	0.440	0.500000	1.900000
0.087467 1260	8.600000	0.635	0.680000	1.800000
0.087467 1288	7.000000	0.600	0.300000	2.538806
0.068000 1289	7.000000	0.600	0.300000	2.538806
0.068000				
1319 0.087467	9.100000	0.760	0.680000	1.700000
1367 0.088000	6.900000	0.540	0.300000	2.200000
1370 0.087467	8.700000	0.780	0.510000	1.700000
1371 0.087467	7.500000	0.580	0.560000	3.100000
1372 0.087467	8.700000	0.780	0.510000	1.700000
1403 0.061000	7.200000	0.330	0.330000	1.700000
1408	8.100000	0.290	0.360000	2.200000
0.048000				
13 17 19 43 79 81 83 86 88 91 92 106 151 161 169 181	sulfur dioxide 9.0 16.0 17.0 9.0 27.0 22.0 16.0 20.0 34.0 20.0 19.0 18.0 32.0 9.0 15.0 23.0	29.6 56.6 56.6 23.1 119.6 67.6 46.4 46.4 46.4 69.6 69.6	ioxide densi 000000 0.9974 000000 0.9968 000000 0.9968 000000 0.9974 000000 0.9974 000000 0.9974 467792 0.9978 467792 0.9978 467792 0.9978 467792 0.9978 467792 0.9978 000000 0.9968 000000 0.9968 000000 0.9968 000000 0.9968	3.260000 \ 3.00 3.110000 \ 300 3.040000 \ 300 3.160000 \ 200 3.160000 \ 200 3.160000 \ 200 2.930000 \ 200 2.930000 \ 200 2.930000 \ 200 2.930000 \ 200 3.160000 \ 200 3.170000 \ 3.000000
101	25.0	110.	0.5312	200 31120000

201 226 240 258 281 338		39.0 27.0 5.0 8.0 5.0 28.0		46.467792 81.000000 62.000000 45.000000 10.000000 99.000000	0.997500 0.996400 0.997100 0.996800 0.997200 1.000800	3.040000 3.040000 3.000000 3.060000 3.250000 3.160000	
339 340 369 372 376		12.0 10.0 6.0 26.0 19.0		29.000000 21.000000 18.000000 46.000000 47.000000	0.999700 1.000000 0.996200 0.996700 1.000300	3.110000 3.120000 3.200000 3.320000 3.260000	
377 415 451 477		6.0 31.0 9.0 6.0		18.000000 46.467792 26.000000 20.000000	0.996200 0.996747 0.997900 0.997700	3.200000 3.320000 3.060000 3.180000	
482 483 503 504 506		6.0 7.0 6.0 6.0 6.0		18.000000 18.000000 24.000000 22.000000 21.000000	0.998600 0.998600 0.997600 0.997600 0.997600	3.040000 3.040000 3.180000 3.210000 3.250000	
515 586 614 639		34.0 16.0 10.0 25.0		46.467792 47.000000 103.000000 57.000000	1.001000 0.998600 0.996900 0.997000	3.310000 3.120000 3.311113 3.180000	
689 692 723 754 795		5.0 16.0 36.0 14.0 7.0		17.000000 62.000000 46.467792 32.000000 60.000000	0.997600 0.997900 0.996500 0.996560 0.997860	3.300000 3.030000 2.940000 3.090000 2.990000	
852 1051 1158 1165		26.0 16.0 22.0 15.0		122.000000 45.000000 54.000000 38.000000	0.998010 0.997020 0.995720 0.996340	3.220000 3.030000 3.420000 3.010000	
1260 1288 1289 1319 1367 1370		19.0 20.0 20.0 18.0 9.0 12.0		56.000000 110.000000 110.000000 64.000000 105.000000 66.000000	0.996320 0.999140 0.999140 0.996520 0.997250 0.996230	3.020000 3.300000 3.300000 3.311113 3.250000 3.000000	
1371 1372 1403 1408		5.0 12.0 3.0 35.0		14.000000 66.000000 13.000000 53.000000	0.994760 0.996230 0.996000 0.995000	3.210000 3.000000 3.230000 3.270000	
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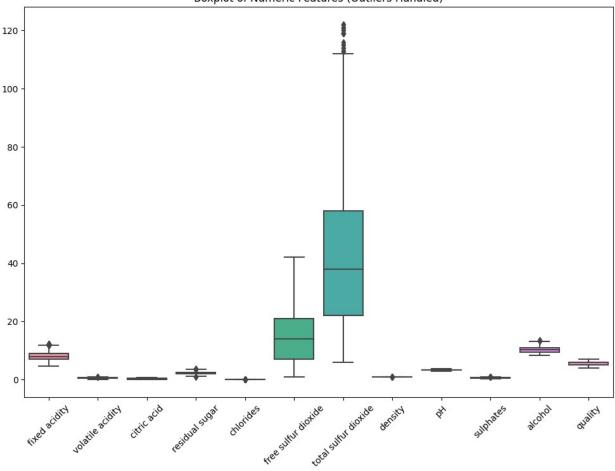
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723 1.62 9.5 5 754 1.06 9.1 6 795 1.18 10.2 5 852 1.07 9.7 5 1051 1.34 9.2 5 1158 1.16 10.6 6 1165 1.10 9.4 5 1260 1.15 9.3 5 1288 1.17 10.2 5				5	
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754 1.06 9.1 6 795 1.18 10.2 5 852 1.07 9.7 5 1051 1.34 9.2 5 1158 1.16 10.6 6 1165 1.10 9.4 5 1260 1.15 9.3 5 1288 1.17 10.2 5					
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1165 1.10 9.4 5 1260 1.15 9.3 5 1288 1.17 10.2 5				5	
1165 1.10 9.4 5 1260 1.15 9.3 5 1288 1.17 10.2 5				6	
1260 1.15 9.3 5 1288 1.17 10.2 5				5	
1260 1.15 9.3 5 1288 1.17 10.2 5 1289 1.17 10.2 5 1319 1.33 9.1 6				5	
1288 1.17 10.2 5 1289 1.17 10.2 5 1319 1.33 9.1 6				5	
1289 1.17 10.2 5 1319 1.33 9.1 6	1288	3 1.17	10.2	5	
1319 1.33 9.1 6				5	
1313 1133 311				6	
	1013	1133	J. 1	J	

1367 1370 1371 1372 1403 1408	1.18 1.17 1.03 1.17 1.10	10.5 9.2 11.6 9.2 10.0 12.4	: (:	5 5 5 5 7					
chlorides 142 0.050 \ 144 0.050 467 0.065 588 0.060 652 0.096 821 0.048 1114 0.046 1132 0.075 1228 0.044 1269 0.044 1270 0.048 1475	n alcohol d acidity 5.200000 5.200000 8.800000 5.000000 5.000000 7.400000 5.100000 5.500000 5.000000 5.300000		le aci	idity 0.34 0.34 0.46 0.42 0.36 0.42 0.40 0.36 0.42 0.49 0.38 0.47	citric	acid 0.00 0.00 0.45 0.24 0.65 0.00 0.34 0.00 0.03	resido	1.800000 1.800000 2.600000 2.000000 2.538806 2.100000 2.538806 1.800000 1.800000 1.600000 2.200000	
142	5.300000 sulfur d	27.0	total	0.47 sulfur	63.	0 0	density 996747	2.200000 pH 3.680000	\
144 467 588 652 821 1114 1132 1228 1269 1270		27.0 7.0 19.0 22.0 16.0 29.0 18.0 28.0 26.0			63. 18. 50. 71. 42. 80. 38. 88. 87.	0 0 0 0 0 0 0 0 0 0	. 996747 . 994700 . 996747 . 996747 . 996747 . 993300 . 996747 . 996747	3.680000 3.320000 3.311113 2.980000 3.311113 3.490000 3.380000 3.680000 3.5000000 3.311113	

1475 1477	16 16			6747 3.540000 6747 3.540000
sul 142 144 467 588 652 821 1114 1132 1228 1269 1270 1475 1477	negates alcolumn (1.000) 0.79 14.000) 0.79 14.000) 0.74 14.000) 0.84 14.900) 0.66 13.600) 0.88 13.600) 0.82 14.000) 0.82 14.000) 0.82 14.000) 0.88 13.5660 0.88 13.5660	900 6 900 6 900 8 900 5 900 7 900 6 900 7 900 7 900 7		
		latile acidity	citric acid r	esidual sugar
267	7.900000	0.350000	0.46	3.600000
0.078000 278	10.300000	0.320000	0.45	2.538806
0.073000				
390 0.045000	5.600000	0.850000	0.05	1.400000
440	8.319637	0.310000	0.72	2.200000
0.072000 455	11.300000	0.620000	0.67	2.538806
0.086000 459	11.600000	0.580000	0.66	2.200000
0.074000	11.000000	0.380000	0.00	2.20000
481 0.080000	9.400000	0.300000	0.56	2.800000
495	10.700000	0.350000	0.53	2.600000
0.070000 498	10.700000	0.350000	0.53	2.600000
0.070000				
517 0.087467	10.400000	0.610000	0.49	2.100000
588	5.000000	0.420000	0.24	2.000000
0.060000 690	7.400000	0.527821	0.00	2.538806
0.097000	7 800000	0.570000	0.00	
828 0.065000	7.800000	0.570000	0.09	2.300000
832 0.087467	10.400000	0.440000	0.42	1.500000

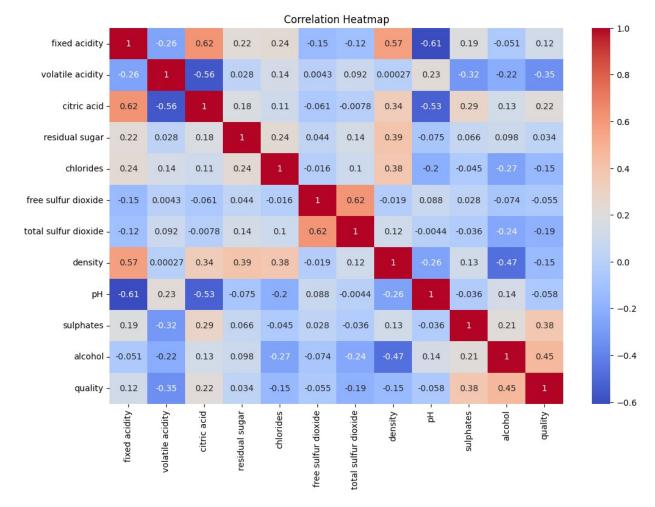
899 0.084000	8.300000	0.527821	0.02	3.400000
1061	9.100000	0.400000	0.50	1.800000
0.071000 1090	10.000000	0.260000	0.54	1.900000
0.083000 1120	7.900000	0.540000	0.34	2.500000
0.076000 1202	8.600000	0.420000	0.39	1.800000
0.068000 1269	5.500000	0.490000	0.03	1.800000
0.044000 1299	7.600000	0.527821	0.00	2.100000
0.087467 1374	6.800000	0.815000	0.00	1.200000
0.087467 1403	7.200000	0.330000	0.33	1.700000
0.061000 1449	7.200000	0.380000	0.31	2.000000
0.056000 1469	7.300000	0.980000	0.05	2.100000
0.061000 1478	7.100000	0.875000	0.05	2.538806
0.082000 1505 0.078000	6.700000	0.760000	0.02	1.800000
1549 0.074000	7.400000	0.360000	0.30	1.800000
free 267 278 390 440 455 459 481 495 498 517 588 690 828 832 899 1061 1090 1120 1202	sulfur dioxide 15.0 5.0 12.0 6.0 6.0 10.0 6.0 5.0 5.0 19.0 5.0 34.0 34.0 6.0 7.0 42.0 8.0 6.0	total sulfur	dioxide density 37.0 0.997300 13.0 0.997600 88.0 0.992400 29.0 0.998800 47.0 1.000800 17.0 0.996400 16.0 0.997200 16.0 0.997200 16.0 0.999400 50.0 0.996747 14.0 0.996600 45.0 0.994170 48.0 0.998320 11.0 0.998320 11.0 0.998510 17.0 0.992350 12.0 0.995160	3.350000 \ 3.230000 \ 3.560000 \ 3.560000 \ 3.311113 \ 3.220000 \ 3.150000 \ 3.150000 \ 3.160000 \ 3.31113 \ 3.630000 \ 3.460000 \ 3.380000 \ 3.480000 \ 3.210000

```
1269
                        28.0
                                                 87.0
                                                        0.996747
                                                                   3.500000
1299
                        5.0
                                                  9.0
                                                        0.994760
                                                                   3.500000
1374
                        16.0
                                                 29.0
                                                        0.994710
                                                                   3.320000
1403
                         3.0
                                                 13.0
                                                        0.996000
                                                                   3,230000
                                                 29.0
1449
                        15.0
                                                        0.994720
                                                                   3.230000
1469
                        20.0
                                                 49.0
                                                        0.997050
                                                                   3.310000
1478
                         3.0
                                                 14.0
                                                        0.998080
                                                                   3.400000
1505
                         6.0
                                                 12.0
                                                        0.996000
                                                                   3.550000
1549
                        17.0
                                                 24.0
                                                                   3.240000
                                                        0.994190
      sulphates
                     alcohol
                                quality
267
        0.860000
                                      8
                   12.800000
278
        0.820000
                   12.600000
                                      8
                                      8
390
        0.820000
                   12,900000
                                      8
440
        0.820000
                    9.800000
455
        0.690000
                   13.400000
                                      8
                                      3
459
        0.570000
                    9.000000
                                      8
481
        0.920000
                   11.700000
                                      8
495
        0.650000
                   11.000000
                                      8
498
        0.650000
                   11.000000
                                      3
517
        0.630000
                    8.400000
                                      8
588
        0.740000
                   10.422983
                                      3
8
3
3
690
        0.540000
                   10.700000
828
        0.740000
                   12.700000
832
        0.860000
                    9.900000
899
        0.490000
                   11.000000
                                      8
1061
        0.690000
                   12.500000
                                      8
1090
        0.630000
                   11.800000
                                      8
1120
        0.720000
                   13.100000
                                      8
1202
        0.690000
                   11.700000
                                      8
1269
                   10.422983
        0.820000
1299
                                      3
        0.400000
                   10.900000
                                      3
1374
        0.510000
                    9.800000
                                      8
1403
        0.658149
                   10.000000
                                      8
        0.760000
1449
                   11.300000
                                      3
1469
        0.550000
                    9.700000
                                      3
1478
        0.520000
                   10.200000
1505
        0.630000
                    9.950000
                                      3
                                      8
                   11.400000
1549
        0.700000
```



```
# Task 2: Data preprocessing including visualization
print("Task 2: Data preprocessing including visualization\n\n\n")
# Summary statistics
print(winequality.describe())
# Correlation heatmap
correlation matrix = winequality.corr()
plt.figure(figsize=(12, 8))
sns.heatmap(correlation_matrix, annot=True, cmap="coolwarm")
plt.title("Correlation Heatmap")
plt.show()
Task 2: Data preprocessing including visualization
                                                     residual sugar
       fixed acidity
                      volatile acidity citric acid
         1599.000000
                            1599.00000
                                                        1599,000000
count
                                        1599.000000
            8.167394
                               0.52064
                                           0.270520
                                                            2.214643
mean
```

std min 25% 50% 75% max	1.49044 4.60000 7.10000 7.90000 9.00000	0 0 0 0 0 0 0 0	.16559 .12000 .39000 .52000 .63000	0.193945 0.000000 0.090000 0.260000 0.420000 0.790000	0.439827 0.900000 1.900000 2.200000 2.538806 3.650000
density count 15 1599.0000 mean 0.996735 std 0.001643 min 0.992350 25% 0.995680 50% 0.996747 75% 0.997800 max 1.001000	chlorides 399.000000 000 \ 0.079366 0.014506 0.041000 0.070000 0.080000 0.087467 0.119000	1599 15 9 1 7 14 21	dioxide	43. 26. 6. 22. 38.	lioxide 000000 116778 749839 000000 000000 000000 000000
	pH 599.000000 3.308824 0.138952 2.930000 3.210000 3.310000 3.400000 3.680000	sulphates 1599.000000 0.637217 0.118780 0.330000 0.550000 0.620000 0.710000 0.990000	alcol 1599.0000 10.3940 1.0172 8.4000 9.5000 10.2000 11.0000	300 1599.0006 510 5.6258 252 0.7386 300 4.0006 300 5.0006 300 6.0006 300 6.0006 300 6.0006	000 397 371 000 000 000



```
# Task 3: Machine Learning Model building
print("Task 3: Machine Learning Model building\n")
print("simple linear regression model\n\n")
# Split the data into features (X) and target (y)
X = winequality.drop(columns=["quality"])
y = winequality["quality"]
# Split the data into training and testing sets
X train, X test, y train, y test = train test split(X, y,
test size=0.2, random state=42)
# Create and train the model
model = LinearRegression()
model.fit(X train, y train)
print("Coefficients:\n", model.coef_)
print("\nIntercept:", model.intercept_)
# Predict wine quality on the test set
y pred = model.predict(X test)
```

```
Task 3: Machine Learning Model building
simple linear regression model
Coefficients:
 [ 2.76473387e-02 -7.79557572e-01 -1.97372126e-01 3.08511810e-02
 -8.45068967e-01 2.83769828e-03 -2.62366581e-03 -1.69720757e+01
 -3.05377648e-01 1.53115721e+00 2.47871989e-01]
Intercept: 20.298968156503374
# Predict wine quality on the test set
y pred = model.predict(X test)
# Task 4: Evaluate the model
print("Task 4: Evaluate the model\n\n")
mse = mean_squared_error(y_test, y_pred)
r2 = r2_score(y_test, y_pred)
print("Mean Squared Error:", mse)
print("R-squared:", r2)
Task 4: Evaluate the model
Mean Squared Error: 0.3471079906969369
R-squared: 0.36476504751762473
# Task 5: Test with random observation
print("Task 5: Test with random observation\n\n")
observations = [
    {
        'fixed acidity': 7.0,
        'volatile acidity': 0.6,
        'citric acid': 0.1,
        'residual sugar': 2.1,
        'chlorides': 0.07,
        'free sulfur dioxide': 25.0,
        'total sulfur dioxide': 60.0,
        'density': 0.995,
        'pH': 3.0,
        'sulphates': 0.5,
        'alcohol': 10.0
    },
        'fixed acidity': 7.2,
        'volatile acidity': 0.42,
        'citric acid': 0.24,
```

```
'residual sugar': 2.5,
        'chlorides': 0.076,
        'free sulfur dioxide': 15.0,
        'total sulfur dioxide': 37.0,
        'density': 0.995,
        'pH': 3.2,
        'sulphates': 0.58,
        'alcohol': 9.0
   },
1
# Create a DataFrame from the list of observations
test data = pd.DataFrame(observations)
print("Test data:\n", test data)
# Predict the quality for each observation
predicted qualities = model.predict(test data)
print("\n\n\n\nPredicted Qualities:", predicted qualities)
Task 5: Test with random observation
Test data:
   fixed acidity volatile acidity citric acid residual sugar
chlorides
            7.0
                              0.60
                                           0.10
                                                            2.1
0.070 \
             7.2
                              0.42
                                           0.24
                                                            2.5
0.076
   free sulfur dioxide total sulfur dioxide density pH sulphates
alcohol
                  25.0
                                        60.0
                                                0.995 3.0
                                                                 0.50
10.0
1
                  15.0
                                        37.0
                                                0.995 3.2
                                                                 0.58
9.0
Predicted Qualities: [5.3651332 5.33613338]
```