

In [30]:

```
import numpy as np
import pandas as pd
from numpy import cov
from scipy.stats import pearsonr
from scipy.stats import spearmanr
import matplotlib.pyplot as pp
```

In [4]:

```
a = pd.read_csv("cancer.csv")
a
```

Out[4]:

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean
0	842302	M	17.99	10.38	122.80	1001.0	0.11840
1	842517	M	20.57	17.77	132.90	1326.0	0.08474
2	84300903	M	19.69	21.25	130.00	1203.0	0.10960
3	84348301	M	11.42	20.38	77.58	386.1	0.14250
4	84358402	M	20.29	14.34	135.10	1297.0	0.10030
...
564	926424	M	21.56	22.39	142.00	1479.0	0.11100
565	926682	M	20.13	28.25	131.20	1261.0	0.09780
566	926954	M	16.60	28.08	108.30	858.1	0.0845!
567	927241	M	20.60	29.33	140.10	1265.0	0.11780
568	92751	B	7.76	24.54	47.92	181.0	0.0526:

569 rows × 32 columns

In [5]:

```
a.head()
```

Out[5]:

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean
0	842302	M	17.99	10.38	122.80	1001.0	0.11840
1	842517	M	20.57	17.77	132.90	1326.0	0.08474
2	84300903	M	19.69	21.25	130.00	1203.0	0.10960
3	84348301	M	11.42	20.38	77.58	386.1	0.14250
4	84358402	M	20.29	14.34	135.10	1297.0	0.10030

5 rows × 32 columns

In [6]: `a.head(10)`

Out[6]:

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean
0	842302	M	17.99	10.38	122.80	1001.0	0.11840
1	842517	M	20.57	17.77	132.90	1326.0	0.08474
2	84300903	M	19.69	21.25	130.00	1203.0	0.10960
3	84348301	M	11.42	20.38	77.58	386.1	0.14250
4	84358402	M	20.29	14.34	135.10	1297.0	0.10030
5	843786	M	12.45	15.70	82.57	477.1	0.12780
6	844359	M	18.25	19.98	119.60	1040.0	0.09463
7	84458202	M	13.71	20.83	90.20	577.9	0.11890
8	844981	M	13.00	21.82	87.50	519.8	0.12730
9	84501001	M	12.46	24.04	83.97	475.9	0.11860

10 rows × 32 columns

In [7]: `a.tail()`

Out[7]:

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean
564	926424	M	21.56	22.39	142.00	1479.0	0.11100
565	926682	M	20.13	28.25	131.20	1261.0	0.09780
566	926954	M	16.60	28.08	108.30	858.1	0.08455
567	927241	M	20.60	29.33	140.10	1265.0	0.11780
568	92751	B	7.76	24.54	47.92	181.0	0.05263

5 rows × 32 columns

In [8]: `a.tail(10)`

Out[8]:

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean
559	925291	B	11.51	23.93	74.52	403.5	0.09261
560	925292	B	14.05	27.15	91.38	600.4	0.09929
561	925311	B	11.20	29.37	70.67	386.0	0.07449
562	925622	M	15.22	30.62	103.40	716.9	0.10480

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean
563	926125	M	20.92	25.09	143.00	1347.0	0.10990
564	926424	M	21.56	22.39	142.00	1479.0	0.11100
565	926682	M	20.13	28.25	131.20	1261.0	0.09780
566	926954	M	16.60	28.08	108.30	858.1	0.08455
567	927241	M	20.60	29.33	140.10	1265.0	0.11780

In [11]:

a.columns

```
Out[11]: Index(['id', 'diagnosis', 'radius_mean', 'texture_mean', 'perimeter_mean',
       'area_mean', 'smoothness_mean', 'compactness_mean', 'concavity_mean',
       'concave points_mean', 'symmetry_mean', 'fractal_dimension_mean',
       'radius_se', 'texture_se', 'perimeter_se', 'area_se', 'smoothness_se',
       'compactness_se', 'concavity_se', 'concave points_se', 'symmetry_se',
       'fractal_dimension_se', 'radius_worst', 'texture_worst',
       'perimeter_worst', 'area_worst', 'smoothness_worst',
       'compactness_worst', 'concavity_worst', 'concave points_worst',
       'symmetry_worst', 'fractal_dimension_worst'],
      dtype='object')
```

In [12]:

a.index

```
Out[12]: RangeIndex(start=0, stop=569, step=1)
```

In [13]:

a.describe()

Out[13]:

	id	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean	cc
count	5.690000e+02	569.000000	569.000000	569.000000	569.000000	569.000000	
mean	3.037183e+07	14.127292	19.289649	91.969033	654.889104	0.096360	
std	1.250206e+08	3.524049	4.301036	24.298981	351.914129	0.014064	
min	8.670000e+03	6.981000	9.710000	43.790000	143.500000	0.052630	
25%	8.692180e+05	11.700000	16.170000	75.170000	420.300000	0.086370	
50%	9.060240e+05	13.370000	18.840000	86.240000	551.100000	0.095870	
75%	8.813129e+06	15.780000	21.800000	104.100000	782.700000	0.105300	
max	9.113205e+08	28.110000	39.280000	188.500000	2501.000000	0.163400	

8 rows × 31 columns

In [14]:

a[0:2]

Out[14]:

id diagnosis radius_mean texture_mean perimeter_mean area_mean smoothness_mean cc

0	842302	M	17.99	10.38	122.8	1001.0	0.11840
1	842517	M	20.57	17.77	132.9	1326.0	0.08474

2 rows × 32 columns

In [16]: `a["id"]`

Out[16]:

```
0      842302
1      842517
2      84300903
3      84348301
4      84358402
       ...
564    926424
565    926682
566    926954
567    927241
568    92751
Name: id, Length: 569, dtype: int64
```

In [17]: `a.iloc[0:5]`

Out[17]:

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean
0	842302	M	17.99	10.38	122.80	1001.0	0.11840
1	842517	M	20.57	17.77	132.90	1326.0	0.08474
2	84300903	M	19.69	21.25	130.00	1203.0	0.10960
3	84348301	M	11.42	20.38	77.58	386.1	0.14250
4	84358402	M	20.29	14.34	135.10	1297.0	0.10030

5 rows × 32 columns

In [18]: `a.loc["id": "radius_mean"]`

Out[18]:

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean	compactness_mean
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0 rows × 32 columns

In [19]: `pd.isna(a)`

Out[19]:

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean	compactness_mean	symmetry_mean	fractal_dimension_mean	radius_se	texture_se	perimeter_se	area_se	smoothness_se	compactness_se	symmetry_se	fractal_dimension_se	radius_worst	texture_worst	perimeter_worst	area_worst	smoothness_worst	compactness_worst	symmetry_worst	fractal_dimension_worst		
0	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean	compactness_mean	concavity_mean	concave points_mean	symmetry_mean	fractal_dimension_mean
1	False	False	False	False	False	False	False	False	False	False	False	False
2	False	False	False	False	False	False	False	False	False	False	False	False
3	False	False	False	False	False	False	False	False	False	False	False	False
4	False	False	False	False	False	False	False	False	False	False	False	False
...
564	False	False	False	False	False	False	False	False	False	False	False	False
565	False	False	False	False	False	False	False	False	False	False	False	False
566	False	False	False	False	False	False	False	False	False	False	False	False
567	False	False	False	False	False	False	False	False	False	False	False	False
568	False	False	False	False	False	False	False	False	False	False	False	False

In [21]:

`a.fillna(5)`

Out[21]:

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean	compactness_mean	concavity_mean	concave points_mean	symmetry_mean	fractal_dimension_mean
0	842302	M	17.99	10.38	122.80	1001.0	0.11840	0.12000	0.00000	0.00000	0.00000	0.00000
1	842517	M	20.57	17.77	132.90	1326.0	0.08474	0.12000	0.00000	0.00000	0.00000	0.00000
2	84300903	M	19.69	21.25	130.00	1203.0	0.10960	0.12000	0.00000	0.00000	0.00000	0.00000
3	84348301	M	11.42	20.38	77.58	386.1	0.14250	0.12000	0.00000	0.00000	0.00000	0.00000
4	84358402	M	20.29	14.34	135.10	1297.0	0.10030	0.12000	0.00000	0.00000	0.00000	0.00000
...
564	926424	M	21.56	22.39	142.00	1479.0	0.11100	0.12000	0.00000	0.00000	0.00000	0.00000
565	926682	M	20.13	28.25	131.20	1261.0	0.09780	0.12000	0.00000	0.00000	0.00000	0.00000
566	926954	M	16.60	28.08	108.30	858.1	0.0845!	0.12000	0.00000	0.00000	0.00000	0.00000
567	927241	M	20.60	29.33	140.10	1265.0	0.11780	0.12000	0.00000	0.00000	0.00000	0.00000
568	92751	B	7.76	24.54	47.92	181.0	0.0526:	0.12000	0.00000	0.00000	0.00000	0.00000

569 rows × 32 columns

In [23]:

`a.dropna()`

Out[23]:

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean	compactness_mean	concavity_mean	concave points_mean	symmetry_mean	fractal_dimension_mean
0	842302	M	17.99	10.38	122.80	1001.0	0.11840	0.12000	0.00000	0.00000	0.00000	0.00000
1	842517	M	20.57	17.77	132.90	1326.0	0.08474	0.12000	0.00000	0.00000	0.00000	0.00000
2	84300903	M	19.69	21.25	130.00	1203.0	0.10960	0.12000	0.00000	0.00000	0.00000	0.00000

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean
3	84348301	M	11.42	20.38	77.58	386.1	0.14250
4	84358402	M	20.29	14.34	135.10	1297.0	0.10030
...
564	926424	M	21.56	22.39	142.00	1479.0	0.11100
565	926682	M	20.13	28.25	131.20	1261.0	0.09780
566	926954	M	16.60	28.08	108.30	858.1	0.0845!
567	927241	M	20.60	29.33	140.10	1265.0	0.11780
568	92751	B	7.76	24.54	47.92	181.0	0.0526:

In [24]:

`a.drop(1)`

Out[24]:

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean
0	842302	M	17.99	10.38	122.80	1001.0	0.11840
2	84300903	M	19.69	21.25	130.00	1203.0	0.10960
3	84348301	M	11.42	20.38	77.58	386.1	0.14250
4	84358402	M	20.29	14.34	135.10	1297.0	0.10030
5	843786	M	12.45	15.70	82.57	477.1	0.12780
...
564	926424	M	21.56	22.39	142.00	1479.0	0.11100
565	926682	M	20.13	28.25	131.20	1261.0	0.09780
566	926954	M	16.60	28.08	108.30	858.1	0.0845!
567	927241	M	20.60	29.33	140.10	1265.0	0.11780
568	92751	B	7.76	24.54	47.92	181.0	0.0526:

568 rows × 32 columns

In [26]:

`a.shape`

Out[26]: (569, 32)

In [27]:

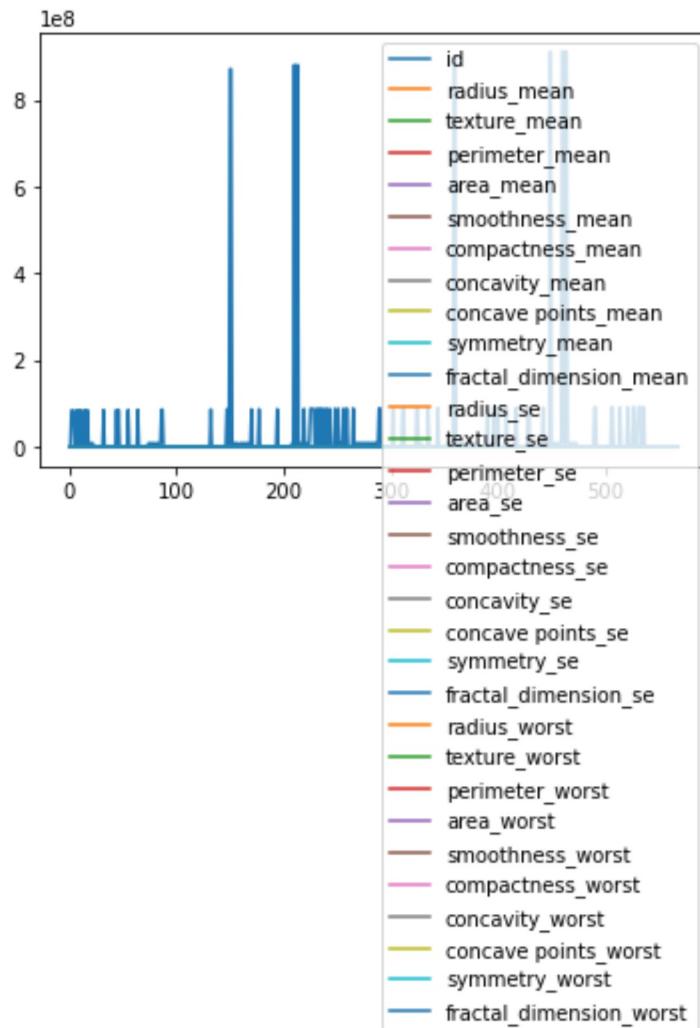
`a.size`

Out[27]: 18208

In [28]:

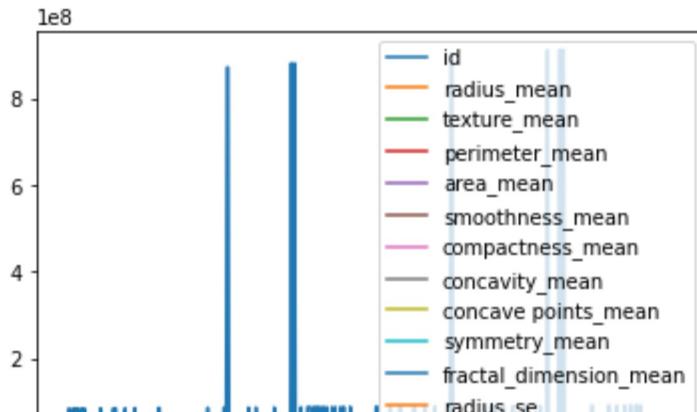
`a.plot()`

Out[28]: <AxesSubplot:>



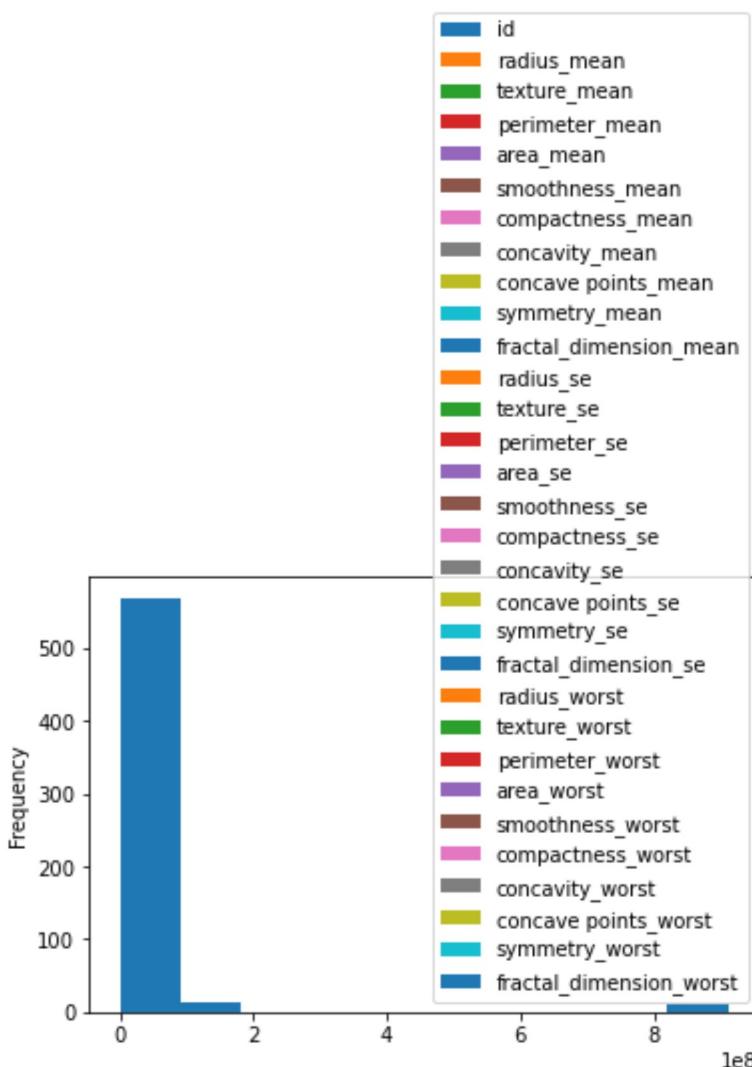
In [46]: `a.plot.line()`

Out[46]: <AxesSubplot:>



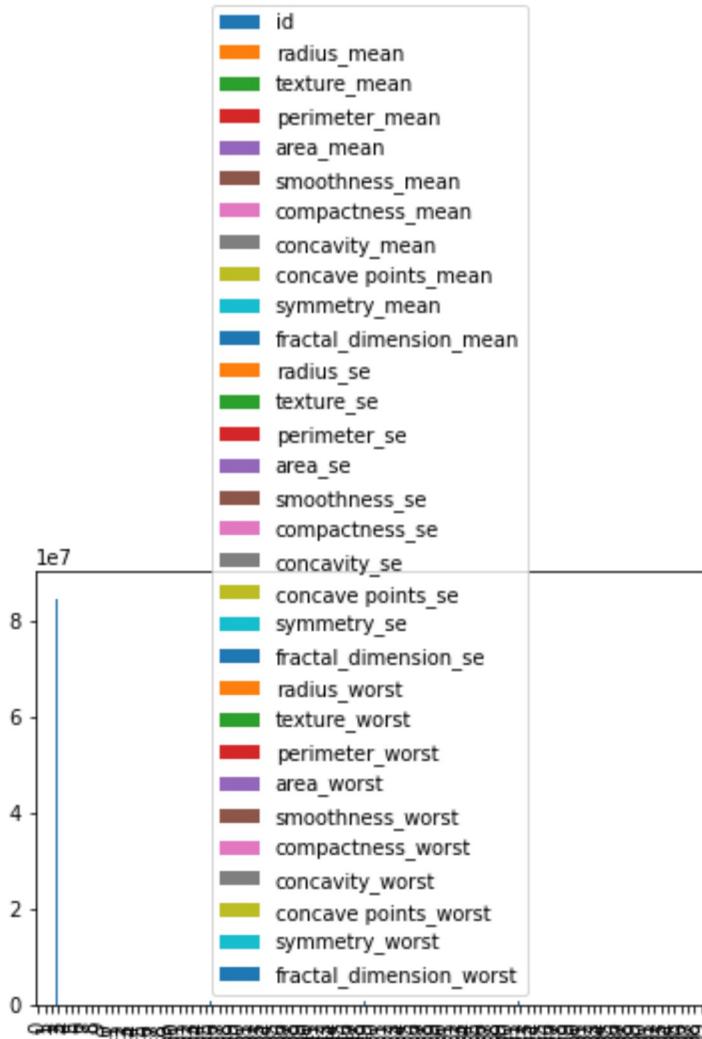
In [47]:
a.plot.hist()

Out[47]: <AxesSubplot:ylabel='Frequency'>



In [53]:
b = a.head(100)
b.plot.bar()

Out[53]: <AxesSubplot:>



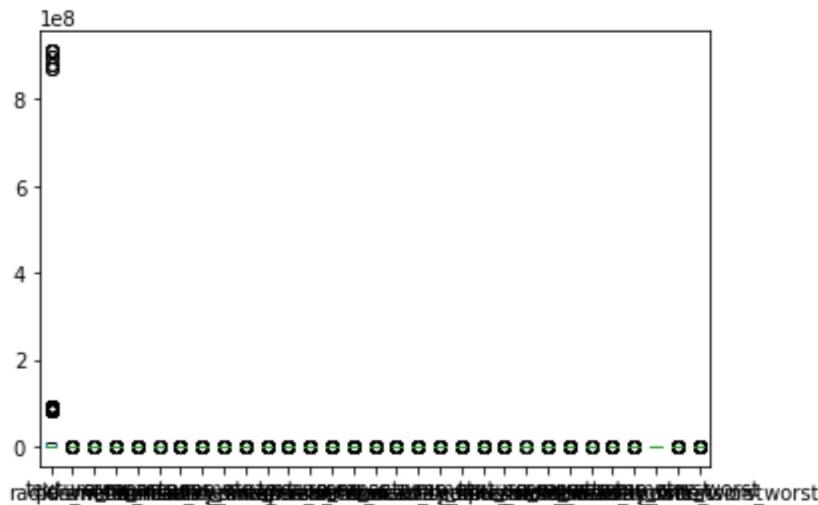
In [54]:
a.plot.area()

Out[54]: <AxesSubplot:>



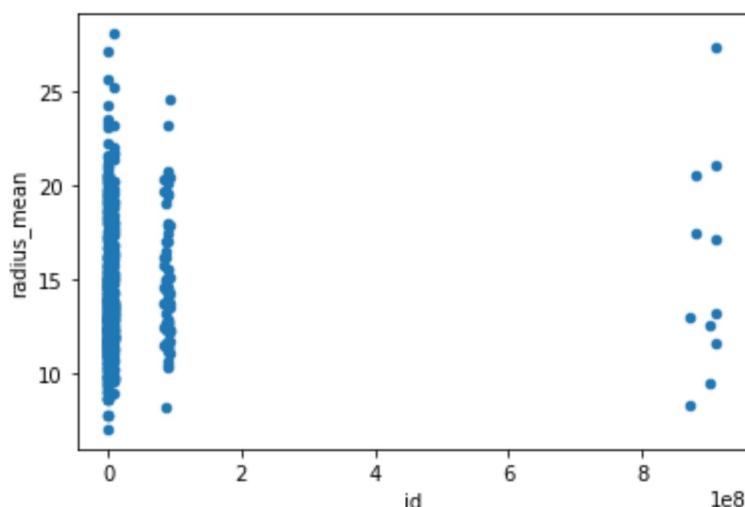
In [55]: `a.plot.box()`

Out[55]: <AxesSubplot:>



In [58]: `a.plot.scatter(x = "id", y = "radius_mean")`

Out[58]: <AxesSubplot:xlabel='id', ylabel='radius_mean'>



In [60]: `a.plot.pie(y = "radius_mean")`

```
Out[60]: <AxesSubplot:ylabel='radius_mean'>
```



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In [61]:

a.cov()

Out[61]:

	id	radius_mean	texture_mean	perimeter_mean	area_mean
id	1.563015e+16	3.287883e+07	5.364807e+07	2.222490e+08	4.262946e+09
radius_mean	3.287883e+07	1.241892e+01	4.907582e+00	8.544714e+01	1.224483e+03
texture_mean	5.364807e+07	4.907582e+00	1.849891e+01	3.443976e+01	4.859938e+02
perimeter_mean	2.222490e+08	8.544714e+01	3.443976e+01	5.904405e+02	8.435772e+03
area_mean	4.262946e+09	1.224483e+03	4.859938e+02	8.435772e+03	1.238436e+05
smoothness_mean	-2.280205e+04	8.454460e-03	-1.414779e-03	7.083607e-02	8.761781e-01
compactness_mean	6.318839e+02	9.419706e-02	5.376681e-02	7.147141e-01	9.264931e+00
concavity_mean	4.991277e+05	1.901276e-01	1.036923e-01	1.387234e+00	1.924492e+01
concave points_mean	2.142177e+05	1.124751e-01	4.897693e-02	8.023604e-01	1.124196e+01
symmetry_mean	-7.579262e+04	1.427317e-02	8.418876e-03	1.219216e-01	1.459596e+00
fractal_dimension_mean	-4.635137e+04	-7.753706e-03	-2.321158e-03	-4.485888e-02	-7.034264e-01
radius_se	4.959431e+06	6.636503e-01	3.290374e-01	4.661401e+00	7.149094e+01
texture_se	-5.190618e+05	-1.891886e-01	9.166951e-01	-1.162988e+00	-1.286717e+01
perimeter_se	3.471365e+07	4.803550e+00	2.449449e+00	3.405303e+01	5.170100e+02
area_se	1.010874e+09	1.179682e+02	5.084087e+01	8.234928e+02	1.280852e+04
smoothness_se	3.632916e+04	-2.355336e-03	8.540990e-05	-1.478818e-02	-1.762210e-01
compactness_se	7.603492e+04	1.300051e-02	1.478660e-02	1.091112e-01	1.339725e+00
concavity_se	2.084665e+05	2.065883e-02	1.860393e-02	1.672962e-01	2.205952e+00
concave points_se	6.076269e+04	8.179563e-03	4.348380e-03	6.105470e-02	8.084602e-01
symmetry_se	-1.788548e+04	-3.038982e-03	3.245070e-04	-1.639643e-02	-2.108964e-01
fractal_dimension_se	8.510281e+03	-3.976249e-04	6.197726e-04	-3.551365e-04	-1.851854e-02
radius_worst	4.979381e+07	1.651375e+01	7.329267e+00	1.138581e+02	1.637521e+03
texture_worst	4.973106e+07	6.433100e+00	2.411015e+01	4.525811e+01	6.218249e+02
perimeter_worst	3.360214e+08	1.142886e+02	5.174593e+01	7.923282e+02	1.134179e+04
area_worst	7.629681e+09	1.888227e+03	8.412838e+02	1.302615e+04	1.921926e+05
smoothness_worst	2.951016e+04	9.624625e-03	7.611070e-03	8.352553e-02	9.925135e-01
compactness_worst	-5.838341e+04	2.292492e-01	1.880100e-01	1.742478e+00	2.161660e+01
concavity_worst	6.051816e+05	3.873864e-01	2.701101e-01	2.858506e+00	3.763442e+01
concave points_worst	2.890528e+05	1.723927e-01	8.349085e-02	1.231848e+00	1.670179e+01
symmetry_worst	-3.420616e+05	3.574576e-02	2.794199e-02	2.842997e-01	3.125809e+00

id **radius_mean** **texture_mean** **perimeter_mean** **area_mean**

In [62]: a.sum()

```
Out[62]: id                                     17281572085
diagnosis                               MBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB
radius_mean                                8038.429
texture_mean                                10975.81
perimeter_mean                             52330.38
area_mean                                    372631.9
smoothness_mean                            54.829
compactness_mean                           59.37002
concavity_mean                             50.526811
concave points_mean                      27.834994
symmetry_mean                             103.0811
fractal_dimension_mean                   35.73184
radius_se                                    230.5429
texture_se                                    692.3896
perimeter_se                                 1630.7877
area_se                                       22951.798
smoothness_se                                4.006317
compactness_se                                14.497061
concavity_se                                    18.147525
concave points_se                           6.712002
symmetry_se                                    11.688568
fractal_dimension_se                         2.1593
radius_worst                                  9257.169
texture_worst                                 14610.34
perimeter_worst                              61031.63
area_worst                                    501051.8
smoothness_worst                            75.31773
compactness_worst                            144.67681
concavity_worst                               154.875247
concave points_worst                        65.210941
symmetry_worst                                165.053
fractal_dimension_worst                     47.76517
dtype: object
```

In [63]: a.mean()

```
Out[63]: id          3.037183e+07  
radius_mean    1.412729e+01  
texture_mean   1.928965e+01  
perimeter_mean 9.196903e+01  
area_mean      6.548891e+02  
smoothness_mean 9.636028e-02  
compactness_mean 1.043410e-01  
concavity_mean 8.879932e-02  
concave_points_mean 4.891915e-02  
symmetry_mean 1.811619e-01  
fractal_dimension_mean 6.279761e-02  
radius_se       4.051721e-01  
texture_se      1.216853e+00  
perimeter_se   2.866059e+00  
area_se         4.033708e+01  
smoothness_se  7.040979e-03  
compactness_se 2.547814e-02
```

```
concavity_se           3.189372e-02
concave_points_se     1.179614e-02
symmetry_se            2.054230e-02
fractal_dimension_se   3.794904e-03
radius_worst           1.626919e+01
texture_worst          2.567722e+01
perimeter_worst        1.072612e+02
area_worst              8.805831e+02
smoothness_worst       1.323686e-01
compactness_worst      2.542650e-01
concavity_worst        2.721885e-01
concave_points_worst   1.146062e-01
symmetry_worst         2.900756e-01
fractal_dimension_worst 8.394582e-02
```

In [64]: `a.median()`

```
Out[64]: id                906024.000000
radius_mean           13.370000
texture_mean           18.840000
perimeter_mean         86.240000
area_mean               551.100000
smoothness_mean        0.095870
compactness_mean       0.092630
concavity_mean          0.061540
concave_points_mean    0.033500
symmetry_mean           0.179200
fractal_dimension_mean 0.061540
radius_se                0.324200
texture_se                1.108000
perimeter_se              2.287000
area_se                  24.530000
smoothness_se             0.006380
compactness_se            0.020450
concavity_se              0.025890
concave_points_se        0.010930
symmetry_se                0.018730
fractal_dimension_se     0.003187
radius_worst              14.970000
texture_worst              25.410000
perimeter_worst            97.660000
area_worst                 686.500000
smoothness_worst           0.131300
compactness_worst          0.211900
concavity_worst             0.226700
concave_points_worst       0.099930
symmetry_worst              0.282200
fractal_dimension_worst    0.080040
dtype: float64
```

In [66]: `a.min()`

```
Out[66]: id                8670
diagnosis                  B
radius_mean            6.981
texture_mean            9.71
perimeter_mean          43.79
area_mean                 143.5
smoothness_mean          0.05263
compactness_mean         0.01938
```

```
concavity_mean          0.0
concave points_mean     0.0
symmetry_mean           0.106
fractal_dimension_mean  0.04996
radius_se                0.1115
texture_se                0.3602
perimeter_se              0.757
area_se                  6.802
smoothness_se            0.001713
compactness_se           0.002252
concavity_se              0.0
concave points_se         0.0
symmetry_se               0.007882
fractal_dimension_se     0.000895
radius_worst              7.93
texture_worst              12.02
perimeter_worst            50.41
area_worst                 185.2
smoothness_worst          0.07117
compactness_worst          0.02729
concavity_worst             0.0
concave points_worst        0.0
symmetry_worst              0.1565
fractal_dimension_worst    0.05504
dtype: object
```

In [67]:

```
a.max()
```

```
Out[67]: id                      911320502
diagnosis                   M
radius_mean                 28.11
texture_mean                 39.28
perimeter_mean               188.5
area_mean                     2501.0
smoothness_mean              0.1634
compactness_mean              0.3454
concavity_mean                0.4268
concave points_mean           0.2012
symmetry_mean                 0.304
fractal_dimension_mean        0.09744
radius_se                      2.873
texture_se                      4.885
perimeter_se                    21.98
area_se                        542.2
smoothness_se                  0.03113
compactness_se                  0.1354
concavity_se                    0.396
concave points_se                0.05279
symmetry_se                      0.07895
fractal_dimension_se            0.02984
radius_worst                     36.04
texture_worst                     49.54
perimeter_worst                   251.2
area_worst                       4254.0
smoothness_worst                  0.2226
compactness_worst                  1.058
concavity_worst                     1.252
concave points_worst                 0.291
symmetry_worst                      0.6638
fractal_dimension_worst            0.2075
dtype: object
```

```
In [68]: a.count()
```

```
Out[68]: id          569  
diagnosis      569  
radius_mean    569  
texture_mean   569  
perimeter_mean 569  
area_mean      569  
smoothness_mean 569  
compactness_mean 569  
concavity_mean 569  
concave_points_mean 569  
symmetry_mean 569  
fractal_dimension_mean 569  
radius_se       569  
texture_se      569  
perimeter_se   569  
area_se         569  
smoothness_se 569  
compactness_se 569  
concavity_se   569  
concave_points_se 569  
symmetry_se   569  
fractal_dimension_se 569  
radius_worst   569  
texture_worst 569  
perimeter_worst 569  
area_worst     569  
smoothness_worst 569  
compactness_worst 569  
concavity_worst 569  
concave_points_worst 569  
symmetry_worst 569  
fractal_dimension_worst 569  
dtype: int64
```

```
In [71]: print(pearsonr(a['id'],a['perimeter_se']))
```

```
(0.13733106601320996, 0.0010226272558843572)
```

```
In [72]: print(spearmanr(a['id'],a['perimeter_se']))
```

```
SpearmanrResult(correlation=0.0026563664652948355, pvalue=0.9495873422501462)
```