

```
In [1]: import numpy as np
```

```
In [2]: a=np.array([[1,2,3],[4,5,6],[7,8,9]])
```

```
In [3]: a.T
```

```
Out[3]: array([[1, 4, 7],
               [2, 5, 8],
               [3, 6, 9]])
```

```
In [4]: a[:,1]
```

```
Out[4]: array([2, 5, 8])
```

```
In [5]: b=a
```

```
In [6]: a+b
```

```
Out[6]: array([[ 2,  4,  6],
               [ 8, 10, 12],
               [14, 16, 18]])
```

```
In [7]: np.add(a,b)
```

```
Out[7]: array([[ 2,  4,  6],
               [ 8, 10, 12],
               [14, 16, 18]])
```

```
In [8]: a-b
```

```
Out[8]: array([[0, 0, 0],
               [0, 0, 0],
               [0, 0, 0]])
```

```
In [10]: np.subtract(a,b)
```

```
Out[10]: array([[0, 0, 0],
               [0, 0, 0],
               [0, 0, 0]])
```

```
In [11]: np.multiply(a,b)
```

```
Out[11]: array([[ 1,  4,  9],
               [16, 25, 36],
               [49, 64, 81]])
```

```
In [12]: a*b
```

```
Out[12]: array([[ 1,  4,  9],
               [16, 25, 36],
               [49, 64, 81]])
```

```
In [13]: a/b
```

```
Out[13]: array([[1., 1., 1.],
               [1., 1., 1.],
               [1., 1., 1.]])
```

```
In [14]: a//b
```

```
Out[14]: array([[1, 1, 1],
               [1, 1, 1],
               [1, 1, 1]], dtype=int32)
```

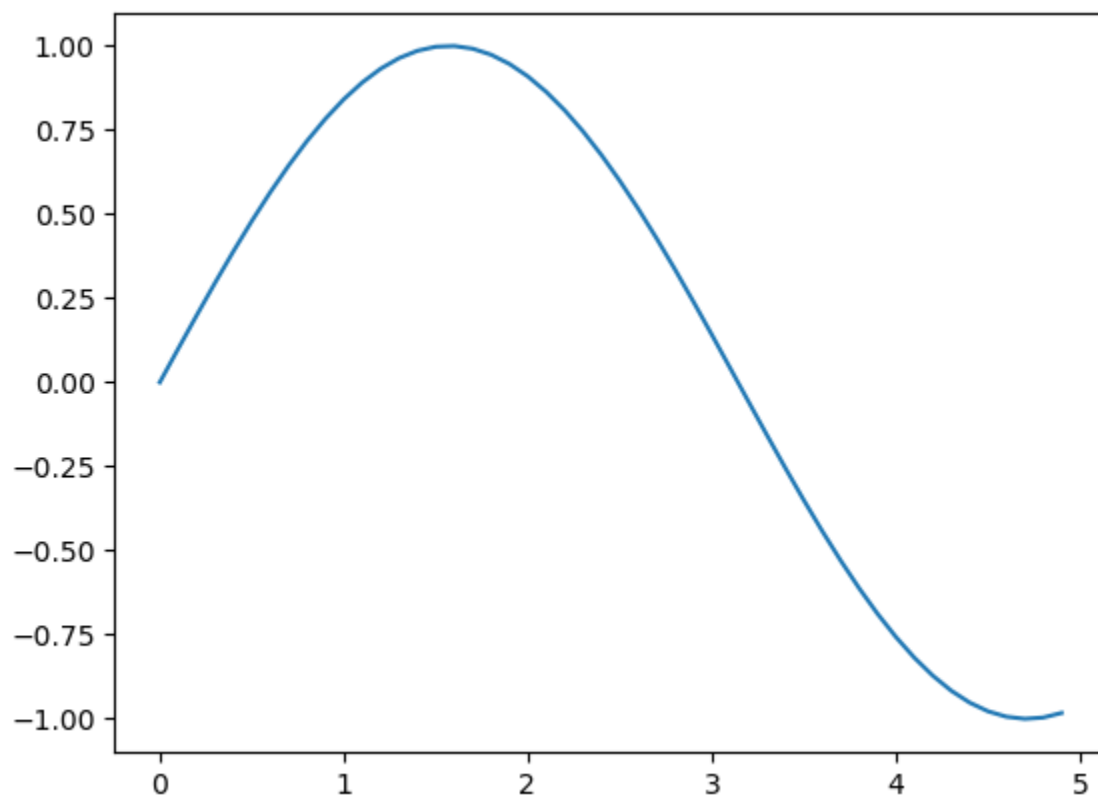
```
In [15]: np.sqrt(a)
```

```
Out[15]: array([[1.          , 1.41421356, 1.73205081],  
               [2.          , 2.23606798, 2.44948974],  
               [2.64575131, 2.82842712, 3.          ]])
```

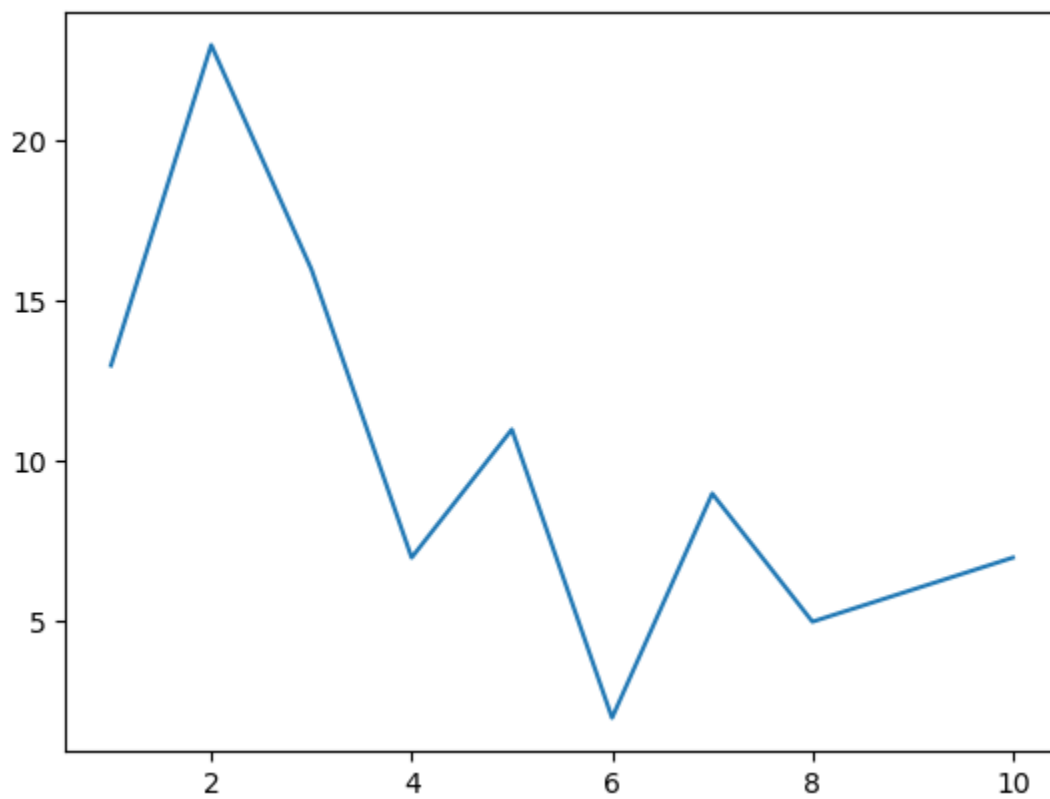
```
In [16]: import matplotlib.pyplot as plt
```

Matplotlib is building the font cache; this may take a moment.

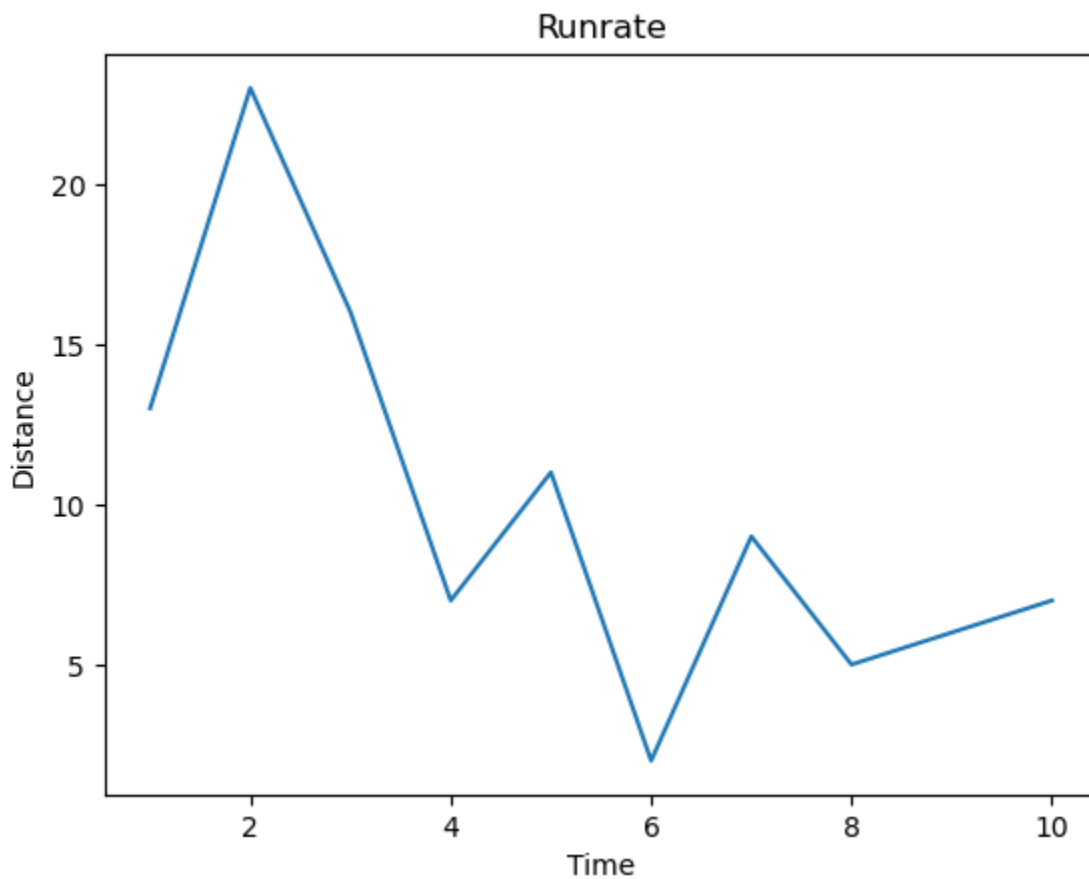
```
In [19]: x=np.arange(0,5,0.1)  
y=np.sin(x)  
plt.plot(x,y)  
plt.show()
```



```
In [27]: c=[1,2,3,4,5,6,7,8,9,10]  
d=[13,23,16,7,11,2,9,5,6,7]  
plt.plot(c,d)  
plt.show()
```

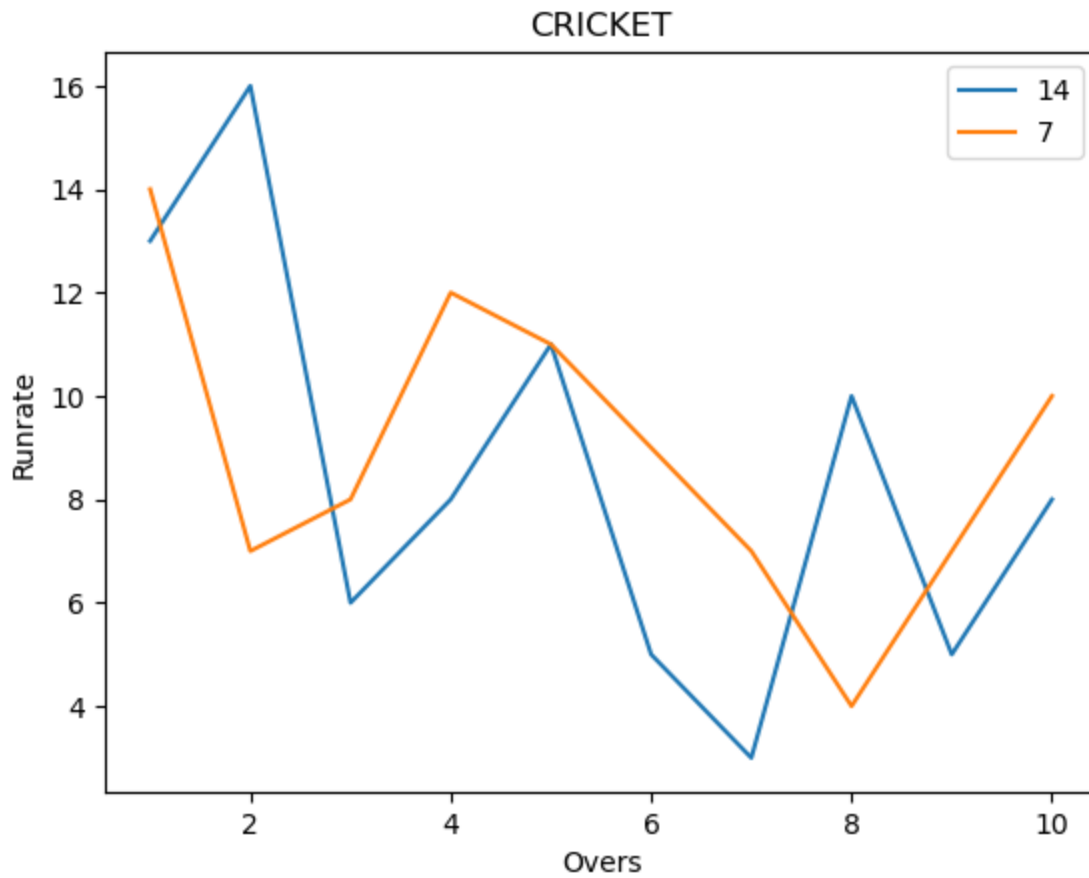


```
In [28]: plt.title("Runrate")
plt.xlabel("Time")
plt.ylabel("Distance")
plt.plot(c,d)
plt.show()
```



```
In [36]: x=[1,2,3,4,5,6,7,8,9,10]
india=[13,16,6,8,11,5,3,10,5,8]
        -2,11,9,7,4,7,10]
```

```
plt.title("CRICKET")
plt.xlabel("Overs")
plt.ylabel("Runrate")
plt.plot(x, india)
plt.plot(x, aus)
plt.legend(aus)
plt.show()
```



```
In [37]: import pandas as pd
```

```
In [43]: ds=pd.read_csv("D:\president_heights.csv")
```

```
In [44]: ds.info
```

```

Out[44]: <bound method DataFrame.info of
0      1      George Washington      189
1      2      John Adams      170
2      3      Thomas Jefferson      189
3      4      James Madison      163
4      5      James Monroe      183
5      6      John Quincy Adams      171
6      7      Andrew Jackson      185
7      8      Martin Van Buren      168
8      9      William Henry Harrison      173
9     10      John Tyler      183
10    11      James K. Polk      173
11    12      Zachary Taylor      173
12    13      Millard Fillmore      175
13    14      Franklin Pierce      178
14    15      James Buchanan      183
15    16      Abraham Lincoln      193
16    17      Andrew Johnson      178
17    18      Ulysses S. Grant      173
18    19      Rutherford B. Hayes      174
19    20      James A. Garfield      183
20    21      Chester A. Arthur      183
21    23      Benjamin Harrison      168
22    25      William McKinley      170
23    26      Theodore Roosevelt      178
24    27      William Howard Taft      182
25    28      Woodrow Wilson      180
26    29      Warren G. Harding      183
27    30      Calvin Coolidge      178
28    31      Herbert Hoover      182
29    32      Franklin D. Roosevelt      188
30    33      Harry S. Truman      175
31    34      Dwight D. Eisenhower      179
32    35      John F. Kennedy      183
33    36      Lyndon B. Johnson      193
34    37      Richard Nixon      182
35    38      Gerald Ford      183
36    39      Jimmy Carter      177
37    40      Ronald Reagan      185
38    41      George H. W. Bush      188
39    42      Bill Clinton      188
40    43      George W. Bush      182
41    44      Barack Obama      185>

```

```
In [46]: ds
```

Out[46]:

	order	name	height(cm)
0	1	George Washington	189
1	2	John Adams	170
2	3	Thomas Jefferson	189
3	4	James Madison	163
4	5	James Monroe	183
5	6	John Quincy Adams	171
6	7	Andrew Jackson	185
7	8	Martin Van Buren	168
8	9	William Henry Harrison	173
9	10	John Tyler	183
10	11	James K. Polk	173
11	12	Zachary Taylor	173
12	13	Millard Fillmore	175
13	14	Franklin Pierce	178
14	15	James Buchanan	183
15	16	Abraham Lincoln	193
16	17	Andrew Johnson	178
17	18	Ulysses S. Grant	173
18	19	Rutherford B. Hayes	174
19	20	James A. Garfield	183
20	21	Chester A. Arthur	183
21	23	Benjamin Harrison	168
22	25	William McKinley	170
23	26	Theodore Roosevelt	178
24	27	William Howard Taft	182
25	28	Woodrow Wilson	180
26	29	Warren G. Harding	183
27	30	Calvin Coolidge	178
28	31	Herbert Hoover	182
29	32	Franklin D. Roosevelt	188
30	33	Harry S. Truman	175
31	34	Dwight D. Eisenhower	179
32	35	John F. Kennedy	183
33	36	Lyndon B. Johnson	193
34	37	Richard Nixon	182
35	38	Gerald Ford	183
36	39	Jimmy Carter	177
37	40	Ronald Reagan	185
38	41	George H. W. Bush	188

	order	name	height(cm)
39	42	Bill Clinton	188
40	43	George W. Bush	182
41	44	Barack Obama	185

In [47]: `ds.dtypes`

Out[47]:

order	int64
name	object
height(cm)	int64
dtype:	object

In [48]: `ds1=ds`

In [49]: `ds1.head()`

Out[49]:

	order	name	height(cm)
0	1	George Washington	189
1	2	John Adams	170
2	3	Thomas Jefferson	189
3	4	James Madison	163
4	5	James Monroe	183

In [50]: `ds1.tail()`

Out[50]:

	order	name	height(cm)
37	40	Ronald Reagan	185
38	41	George H. W. Bush	188
39	42	Bill Clinton	188
40	43	George W. Bush	182
41	44	Barack Obama	185

In [51]: `ds1.iloc[35]`

Out[51]:

order	38
name	Gerald Ford
height(cm)	183
Name:	35, dtype: object

In [52]: `ds1.iloc[35:39]`

Out[52]:

	order	name	height(cm)
35	38	Gerald Ford	183
36	39	Jimmy Carter	177
37	40	Ronald Reagan	185
38	41	George H. W. Bush	188

In [53]: `ds1.describe()`

Out [53]:

	order	height(cm)
count	42.000000	42.000000
mean	22.476190	179.738095
std	13.152461	7.015869
min	1.000000	163.000000
25%	11.250000	174.250000
50%	22.000000	182.000000
75%	33.750000	183.000000
max	44.000000	193.000000

In [55]: `ds1['order'].describe()`

Out[55]:

count	42.000000
mean	22.476190
std	13.152461
min	1.000000
25%	11.250000
50%	22.000000
75%	33.750000
max	44.000000

Name: order, dtype: float64

In [56]: `subset=ds1[['order', 'name']]`

In [57]: `subset`

Out[57]:

	order	name
0	1	George Washington
1	2	John Adams
2	3	Thomas Jefferson
3	4	James Madison
4	5	James Monroe
5	6	John Quincy Adams
6	7	Andrew Jackson
7	8	Martin Van Buren
8	9	William Henry Harrison
9	10	John Tyler
10	11	James K. Polk
11	12	Zachary Taylor
12	13	Millard Fillmore
13	14	Franklin Pierce
14	15	James Buchanan
15	16	Abraham Lincoln
16	17	Andrew Johnson
17	18	Ulysses S. Grant
18	19	Rutherford B. Hayes
19	20	James A. Garfield
20	21	Chester A. Arthur
21	23	Benjamin Harrison
22	25	William McKinley
23	26	Theodore Roosevelt
24	27	William Howard Taft
25	28	Woodrow Wilson
26	29	Warren G. Harding
27	30	Calvin Coolidge
28	31	Herbert Hoover
29	32	Franklin D. Roosevelt
30	33	Harry S. Truman
31	34	Dwight D. Eisenhower
32	35	John F. Kennedy
33	36	Lyndon B. Johnson
34	37	Richard Nixon
35	38	Gerald Ford
36	39	Jimmy Carter
37	40	Ronald Reagan
38	41	George H. W. Bush

order		name
39	42	Bill Clinton
40	43	George W. Bush
41	44	Barack Obama

In [58]: `del subset['order']`

In [59]: `subset`

Out [59] :

	name
0	George Washington
1	John Adams
2	Thomas Jefferson
3	James Madison
4	James Monroe
5	John Quincy Adams
6	Andrew Jackson
7	Martin Van Buren
8	William Henry Harrison
9	John Tyler
10	James K. Polk
11	Zachary Taylor
12	Millard Fillmore
13	Franklin Pierce
14	James Buchanan
15	Abraham Lincoln
16	Andrew Johnson
17	Ulysses S. Grant
18	Rutherford B. Hayes
19	James A. Garfield
20	Chester A. Arthur
21	Benjamin Harrison
22	William McKinley
23	Theodore Roosevelt
24	William Howard Taft
25	Woodrow Wilson
26	Warren G. Harding
27	Calvin Coolidge
28	Herbert Hoover
29	Franklin D. Roosevelt
30	Harry S. Truman
31	Dwight D. Eisenhower
32	John F. Kennedy
33	Lyndon B. Johnson
34	Richard Nixon
35	Gerald Ford
36	Jimmy Carter
37	Ronald Reagan
38	George H. W. Bush

	name
39	Bill Clinton
40	George W. Bush
41	Barack Obama

In [60]: ds1

Out[60]:

	order	name	height(cm)
0	1	George Washington	189
1	2	John Adams	170
2	3	Thomas Jefferson	189
3	4	James Madison	163
4	5	James Monroe	183
5	6	John Quincy Adams	171
6	7	Andrew Jackson	185
7	8	Martin Van Buren	168
8	9	William Henry Harrison	173
9	10	John Tyler	183
10	11	James K. Polk	173
11	12	Zachary Taylor	173
12	13	Millard Fillmore	175
13	14	Franklin Pierce	178
14	15	James Buchanan	183
15	16	Abraham Lincoln	193
16	17	Andrew Johnson	178
17	18	Ulysses S. Grant	173
18	19	Rutherford B. Hayes	174
19	20	James A. Garfield	183
20	21	Chester A. Arthur	183
21	23	Benjamin Harrison	168
22	25	William McKinley	170
23	26	Theodore Roosevelt	178
24	27	William Howard Taft	182
25	28	Woodrow Wilson	180
26	29	Warren G. Harding	183
27	30	Calvin Coolidge	178
28	31	Herbert Hoover	182
29	32	Franklin D. Roosevelt	188
30	33	Harry S. Truman	175
31	34	Dwight D. Eisenhower	179
32	35	John F. Kennedy	183
33	36	Lyndon B. Johnson	193
34	37	Richard Nixon	182
35	38	Gerald Ford	183
36	39	Jimmy Carter	177
37	40	Ronald Reagan	185
38	41	George H. W. Bush	188

order		name	height(cm)
39	42	Bill Clinton	188
40	43	George W. Bush	182
41	44	Barack Obama	185

```
In [62]: ds1.rename(columns={'order':'new column'})
```

Out[62]:

new column		name	height(cm)
0	1	George Washington	189
1	2	John Adams	170
2	3	Thomas Jefferson	189
3	4	James Madison	163
4	5	James Monroe	183
5	6	John Quincy Adams	171
6	7	Andrew Jackson	185
7	8	Martin Van Buren	168
8	9	William Henry Harrison	173
9	10	John Tyler	183
10	11	James K. Polk	173
11	12	Zachary Taylor	173
12	13	Millard Fillmore	175
13	14	Franklin Pierce	178
14	15	James Buchanan	183
15	16	Abraham Lincoln	193
16	17	Andrew Johnson	178
17	18	Ulysses S. Grant	173
18	19	Rutherford B. Hayes	174
19	20	James A. Garfield	183
20	21	Chester A. Arthur	183
21	23	Benjamin Harrison	168
22	25	William McKinley	170
23	26	Theodore Roosevelt	178
24	27	William Howard Taft	182
25	28	Woodrow Wilson	180
26	29	Warren G. Harding	183
27	30	Calvin Coolidge	178
28	31	Herbert Hoover	182
29	32	Franklin D. Roosevelt	188
30	33	Harry S. Truman	175
31	34	Dwight D. Eisenhower	179
32	35	John F. Kennedy	183
33	36	Lyndon B. Johnson	193
34	37	Richard Nixon	182
35	38	Gerald Ford	183
36	39	Jimmy Carter	177
37	40	Ronald Reagan	185
38	41	George H. W. Bush	188

	new column	name	height(cm)
39	42	Bill Clinton	188
40	43	George W. Bush	182
41	44	Barack Obama	185

```
In [63]: ds1.columns
```

```
Out[63]: Index(['order', 'name', 'height(cm)'], dtype='object')
```

```
In [64]: ds1
```


Out[64]:

	order	name	height(cm)
0	1	George Washington	189
1	2	John Adams	170
2	3	Thomas Jefferson	189
3	4	James Madison	163
4	5	James Monroe	183
5	6	John Quincy Adams	171
6	7	Andrew Jackson	185
7	8	Martin Van Buren	168
8	9	William Henry Harrison	173
9	10	John Tyler	183
10	11	James K. Polk	173
11	12	Zachary Taylor	173
12	13	Millard Fillmore	175
13	14	Franklin Pierce	178
14	15	James Buchanan	183
15	16	Abraham Lincoln	193
16	17	Andrew Johnson	178
17	18	Ulysses S. Grant	173
18	19	Rutherford B. Hayes	174
19	20	James A. Garfield	183
20	21	Chester A. Arthur	183
21	23	Benjamin Harrison	168
22	25	William McKinley	170
23	26	Theodore Roosevelt	178
24	27	William Howard Taft	182
25	28	Woodrow Wilson	180
26	29	Warren G. Harding	183
27	30	Calvin Coolidge	178
28	31	Herbert Hoover	182
29	32	Franklin D. Roosevelt	188
30	33	Harry S. Truman	175
31	34	Dwight D. Eisenhower	179
32	35	John F. Kennedy	183
33	36	Lyndon B. Johnson	193
34	37	Richard Nixon	182
35	38	Gerald Ford	183
36	39	Jimmy Carter	177
37	40	Ronald Reagan	185
38	41	George H. W. Bush	188

order		name	height(cm)
39	42	Bill Clinton	188
40	43	George W. Bush	182
41	44	Barack Obama	185

```
In [ ]: ds1.insert(7,8,"Dr. Karev")
```