```python
import math
import random
import numpy as np
import matplotlib.pyplot as plt
```

```python
#initialization:
N = 100
len = 100    #lenth of box
T = 298
dt  = 1
pos = []
for i in range(N):
  x = random.randrange(N)
  pos.append(x)
  pos_1 = np.array(pos)    #initial position that randomly generated for N particles

  v = (pos_1 - 0.5)
  sum_v = np.sum(v)
  sum_v2 = np.sum(v**2)

  sum_v = sum_v/ N          #velocity CM
  sum_v2 = sum_v2/ N        #Mean Squred velocity
  fs = np.sqrt(3 * T / sum_v2)    #Scale Factor


  v = (v  - sum_v) * fs     #velocity center of mass to zero
  xm = pos_1 - v * dt            #position previous time step
```

```python
print(pos_1)
```

```
    [73 57 22 92 32  1  2 76 28 62 21  2 87 78 25 92 57 73 46 37 13 48 20  2
     40 65 40 86 65 74 80 29 77 53 27 82 61 29 81 45 70 75 60 57 76 22 68 27
     93 82  1 44 82 13 75 37 71 41 27 94 75  4 73 55 22  9 32 39 17 27 35 53
     98 84 45 75  2 30 19 93 20 31 56 86 61 96 66  7 69 33 55 25 28 86 50 96
     11 65 30 11]
```

```python
print(v)
```

```
    [ 12.34523721    3.88959528 -14.60712142   22.38631199   -9.32234522
     -25.70515145 -25.17667383  13.93067007 -11.4362557     6.53198339
     -15.13559904 -25.17667383  19.74392389  14.98762531 -13.02168856
      22.38631199    3.88959528  12.34523721   -1.92365854   -6.67995712
     -19.36342001   -0.8667033  -15.66407666 -25.17667383   -5.09452426
       8.11741625   -5.09452426  19.21544627    8.11741625  12.87371483
      16.04458055 -10.90777808  14.45914769    1.7756848  -11.96473332
      17.10153579    6.00350577 -10.90777808  16.57305817   -2.45213616
      10.75980435  13.40219245    5.47502815    3.88959528  13.93067007
     -14.60712142    9.70284911 -11.96473332  22.91478961  17.10153579
     -25.70515145   -2.98061378  17.10153579 -19.36342001  13.40219245
      -6.67995712  11.28828197   -4.56604664 -11.96473332  23.44326723
      13.40219245 -24.11971859  12.34523721    2.83264004 -14.60712142
```

```
    -21.47733049  -9.32234522  -5.62300188 -17.24950952 -11.96473332
     -7.73691236    1.7756848   25.55717771  18.15849103  -2.45213616
     13.40219245 -25.17667383 -10.37930046 -16.19255428  22.91478961
    -15.66407666  -9.85082284    3.36111766  19.21544627   6.00350577
     24.50022247    8.64589387 -22.53428573  10.23132673  -8.7938676
      2.83264004 -13.02168856 -11.4362557   19.21544627   0.19025194
     24.50022247 -20.42037525    8.11741625 -10.37930046 -20.42037525]
```

print(xm)

```
    [60.65476279 53.11040472 36.60712142 69.61368801 41.32234522 26.70515145
     27.17667383 62.06932993 39.4362557  55.46801661 36.13559904 27.17667383
     67.25607611 63.01237469 38.02168856 69.61368801 53.11040472 60.65476279
     47.92365854 43.67995712 32.36342001 48.8667033  35.66407666 27.17667383
     45.09452426 56.88258375 45.09452426 66.78455373 56.88258375 61.12628517
     63.95541945 39.90777808 62.54085231 51.2243152  38.96473332 64.89846421
     54.99649423 39.90777808 64.42694183 47.45213616 59.24019565 61.59780755
     54.52497185 53.11040472 62.06932993 36.60712142 58.29715089 38.96473332
     70.08521039 64.89846421 26.70515145 46.98061378 64.89846421 32.36342001
     61.59780755 43.67995712 59.71171803 45.56604664 38.96473332 70.55673277
     61.59780755 28.11971859 60.65476279 52.16735996 36.60712142 30.47733049
     41.32234522 44.62300188 34.24950952 38.96473332 42.73691236 51.2243152
     72.44282229 65.84150897 47.45213616 61.59780755 27.17667383 40.37930046
     35.19255428 70.08521039 35.66407666 40.85082284 52.63888234 66.78455373
     54.99649423 71.49977753 57.35410613 29.53428573 58.76867327 41.7938676
     52.16735996 38.02168856 39.4362557  66.78455373 49.80974806 71.49977753
     31.42037525 56.88258375 40.37930046 31.42037525]
```

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