#cog wav & plot

```
import numpy as np
import matplotlib.pyplot as plt

#define A & B
np.random.seed(42)
x=np.random.randint(1,101,20) #takes 20 rarndom values in b/w 1 to 100(x==A==B)


#define membership vals of A & B
membership_A=np.random.rand(len(x))
membership_B=np.random.rand(len(x))


#Calculate the Center of Gravity (COG) for A and B
COG_A = np.sum(x * membership_A) / np.sum(membership_A)
COG_B = np.sum(x * membership_B) / np.sum(membership_B)

#Calculate the Weighted Average Value (WAV) for A and B
WAV_A = np.sum(x * membership_A) / np.sum(membership_A)
WAV_B = np.sum(x * membership_B) / np.sum(membership_B)


# Print the results
print("A & B:", x)
print("\nMembership Values for Set A:", membership_A)
print("\nMembership Values for Set B:", membership_B)
print("\nCOG for Set A:", COG_A)
print("\nCOG for Set B:", COG_B)
print("\nWAV for Set A:", WAV_A)
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print("\nWAV for Set B:", WAV_B)



#plot
#set A
plt.figure(figsize=(12,8))
plt.scatter(x,membership_A,color="orange",label='Membership Values')
plt.plot(x,membership_A,color="orange")
plt.axvline(COG_A,color="red",linestyle="--",label=f'COG:{COG_A:.2f}')
plt.axvline(WAV_A,color="green",linestyle=":",label=f'WAV:{WAV_A:.2f}')
plt.title("fuzzy set A")
plt.xlabel("elements(vals of set A)")
plt.ylabel('memebership vals')
plt.legend()
plt.show()

#set B
plt.figure(figsize=(12,8))
plt.scatter(x,membership_B,color="orange",label='Membership Values')
plt.plot(x,membership_B,color="orange")
plt.axvline(COG_B,color="red",linestyle="--",label=f'COG:{COG_B:.2f}')
plt.axvline(WAV_B,color="green",linestyle=":",label=f'WAV:{WAV_B:.2f}')
plt.title("fuzzy set B")
plt.xlabel("elements(vals of set B)")
plt.ylabel('memebership vals')
plt.legend()
plt.show()
```

```
A & B: [ 52  93  15  72  61  21  83  87  75  75  88 100  24   3  22  53   2  88
  30  38]

Membership Values for Set A: [7.78765841e-04 9.92211559e-01 6.17481510e-01 6.11653160e-01
 7.06630522e-03 2.30624250e-02 5.24774660e-01 3.99860972e-01
 4.66656632e-02 9.73755519e-01 2.32771340e-01 9.06064345e-02
 6.18386009e-01 3.82461991e-01 9.83230886e-01 4.66762893e-01
 8.59940407e-01 6.80307539e-01 4.50499252e-01 1.32649612e-02]

Membership Values for Set B: [0.94220176 0.56328822 0.3854165  0.01596625 0.23089383 0.24102547
 0.68326352 0.60999666 0.83319491 0.17336465 0.39106061 0.18223609
 0.75536141 0.42515587 0.20794166 0.56770033 0.03131329 0.84228477
 0.44975413 0.39515024]

COG for Set A: 52.243889907745356

COG for Set B: 58.49118391372735

WAV for Set A: 52.243889907745356

WAV for Set B: 58.49118391372735
```