1) Calculating the prior probability of each class =

$P(\text{Apartment}) = \frac{7}{20} = 0.35$

$P(\text{House}) = \frac{7}{20} = 0.35$

$P(\text{Condo}) = \frac{6}{20} = 0.3$

2) Computing the conditional probabilities for features.

a) Bathroom feature = Apartment :-

$$\mu = \frac{1+1+1+2.5+1+1+1.5+1}{7}$$

$$= \frac{9}{7} = 1.28$$

$$\text{Standard deviation} = \sqrt{\frac{(0.28)^2 + (0.28)^2 + (0.28)^2 + (1.22)^2 + (0.28)^2 + (0.28)^2 + (0.22)^2 + (0.28)^2}{7-1}}$$

$$= 0.6$$

~~15)~~ ~~Garages~~ :-

Condo :-

$$\text{mean} = \frac{1+1+1+2.5+1+1.5}{6} = 1.33$$

$$\text{Standard deviation} = \sqrt{\frac{(0.33)^2+(0.33)^2+(0.33)^2+(1.17)^2+(0.33)^2+(0.17)^2}{6-1}}$$

$$= 0.6$$

House :-

$$\text{mean} = \frac{1+1+1+1+1+1+1.5}{7} = 1.07$$

$$\text{standard deviation} = \sqrt{\frac{(0.7)^2+(0.07)^2+(0.07)^2+(0.07)^2+(0.07)^2+(0.07)^2+(0.43)^2}{6}}$$

$$= 0.2$$

b) Garages feature =

Apartment :-

$$\text{mean} = \frac{1+1+1+2+0+2+5}{7} = 1.7$$

$$\text{standard deviation} = \sqrt{\frac{(0.7)^2+(0.7)^2+(0.7)^2+(0.3)^2+(1.7)^2+(0.3)^2+(3.5)^2}{6}}$$

$$= 0.6$$

Condo :-

$$\text{mean} = \frac{1+1+1+2+2+1}{6} = 1.33$$

$$\text{Standard deviation} = \sqrt{\frac{(0.33)^2 + (0.33)^2 + (0.33)^2 + (0.67)^2 + (0.67)^2 + (0.33)^2}{5}}$$

$$= 0.5$$

House :-

$$\text{mean} = \frac{2+0+2+1+1+0+1.5}{7} = 1.07$$

$$\text{standard deviation} = \sqrt{\frac{(0.93)^2 + (1.07)^2 + (0.93)^2 + (0.07)^2 + (0.07)^2 + (1.07)^2 + (0.43)^2}{6}}$$

$$= 0.7$$

Total Table.

Class	Feature	Mean	S.D
	Bathroom feature		
Apartment		1.3	0.6
Condo		1.3	0.6
House		1.1	0.2
	Land area feature		
Apartment		5.1	0.7
Condo		6	0.9
House		6.5	0.2

	Living area feature	
Apartment	1.5	0.7
condo	1.6	0.9
House	1.4	0.2
	Local Price feature	
Apartment	7.3	3.7
condo	7.4	4.6
House	5.8	0.6
	Age of home	
Apartment	38.6	14.7
condo	39.5	14
House	34.4	12.6
	Garage feature	
Apartment	1.2	0.6
Condo	1.3	0.5
House	1.1	0.7

→ Calculating the conditional Probability bore the test data using the formula.

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

i) House ID = '25'

P(Bedroom = 4 / Apt) = 0.34
P(Age of Home = 48 / Apt) = 0.02
P(Rooms = 8 / Apt) = 0.2
P(garages = 2 / Apt) = 0.3
P(Living area = 1.77 / Apt) = 0.52
P(Land area = 9.15 / Apt) = 0.05
P(Bathroom = 1.5 / Apt) = 0.6
P(Local Price = 8.36 / Apt) = 0.1

P(Bedroom = 4 / House) = 0.15
P(Age of home = 48 / House) = 0.002
P(Rooms = 8 / House) = 0.01
P(Garages = 2 / House) = 0.25
P(Living area = 1.77 / House) = 0.35
P(Land area = 9.15 / House) = 0.09
P(Bathroom = 1.5 / House) = 0.15
P(Local Price = 8.36 / House) = 0.00002

P(Bedroom = 4 / Condo) = 0.35
P(Age of home = 48 / Condo) = 0.02
P(Rooms = 8 / Condo) = 0.19
P(Garages = 2 / Condo) = 0.33

P(Living area 1.77 / Condo) = 0.4
P(Land area 9.15 / Condo) = 0.07
P(Bathroom 1.5 / Condo) = 0.6
P(Local Price 8.36 / Condo) = 0.08

House ID = 27

	Apt	Condo	House
P(Bedroom = 4)	0.34	0.35	0.15
P(Age of home = 31)	0.02	0.02	0.03
P(Rooms = 8)	0.2	0.14	0.015
P(Garages = 1.5)	0.53	0.5	0.42
P(Livingarea = 1.831)	0.5	0.4	0.2
P(Landarea = 7.32	0.047	0.138	0.169
P(Bathroom = 1.5	0.61	0.63	0.095
P(Local Price = 9.14)	0.09	0.08	0000 0015