Q1.

Fruit	Yellow	Sweet	Long	Total
Mango	350	450	0	650
Banna	400	300	350	400
Others	50	100	50	150
Total	800	850	400	1200

Finding likelihood:

P(Mango/Yellow) = 350/800

P(Banna/Yellow) = 400/800

P(Others/Yellow) = 50/800

P(Mango/Sweet) = 450/850

P(Banna/Sweet) = 300/850

P(Others/Sweet) = 100/850

P(Mango/Long) = 0/400 = 0

P(Banna/Long) = 350/400

P(Others/Long) = 50/400

P(Yellow) = 800/1200

P(Sweet) = 850/1200

P(Egg) = 400/1200

P(Mango) = 650/1200

P(Bama) = 400/1200

P(others) = 150/1200

$$P(\text{Yellow}/\text{Mango}) = \frac{P(\text{Mango}/\text{Yellow}) \times P(\text{Yellow})}{P(\text{Mango})}$$

$$= \frac{\frac{350}{800} \times \frac{800}{1200}}{\frac{650}{1200}}$$

$$= \frac{350}{1200} \times \frac{1200}{650}$$

$$= 0.5384$$

$$P(\text{Sweet}/\text{Mango}) = \frac{P(\text{Mango}/\text{Sweet}) \times P(\text{Sweet})}{P(\text{Mango})}$$

$$= \frac{\frac{450}{850} \times \frac{850}{1200}}{\frac{650}{1200}}$$

$$= 0.6923$$

$$P(Long/Mango) = \frac{P(Mango/Long) \times P(Long)}{P(Mango)}$$

$$= \frac{10}{400} \times \frac{400}{1200}$$

$$\frac{650}{1200}$$

$$= 0$$

$$P(Yellow/Banna) = \frac{P(Banna/Yellow) \times P(Yellow)}{P(Banna)}$$

$$= \frac{400}{800} \times \frac{800}{1200}$$

$$\frac{400}{1200}$$

$$= 1$$

$$P(Sweet/Banna) = \frac{P(Banna/Sweet) \times P(Sweet)}{P(Banna)}$$

$$= \frac{300}{850} \times \frac{850}{1200}$$

$$\frac{400}{1200}$$

$$= 0.75$$

$$P(Long/Banana) = \frac{P(Banana/Long) \times P(Long)}{P(Banana)}$$

$$= \frac{350}{\cancel{4058}} \times \frac{\cancel{406}}{1200}$$

$$= \frac{406}{1200}$$

$$= 0.875$$

$$P(Yellow/others) = \frac{P(others/Yellow) \times P(Yellow)}{P(others)}$$

$$= \frac{\cancel{50}}{\cancel{800}} \times \frac{\cancel{800}}{1200}$$

$$= \frac{\cancel{150}}{1200}$$

$$= 0.33$$

$$P(Sweet/others) = \frac{P(others/Sweet) \times P(Sweet)}{P(others)}$$

$$= \frac{\cancel{100}}{\cancel{850}} \times \frac{\cancel{850}}{1200}$$

$$= \frac{\cancel{150}}{1200}$$

$$= 0.66$$

$$P(Long/others) = \frac{P(others/Long) \times P(Long)}{P(others)}$$

$$= \frac{\cancel{50}}{\cancel{400}} \times \frac{\cancel{400}}{1200}$$

$$= \frac{\cancel{150}}{1200}$$

$$= 0.33$$

Likelihood of Mango:

= P (Yellow / Mango) × P(Sweet / Mango) × P(long / Mango)
= 0.5384 × 0.6923 × 0
= 0

Likelihood of Banna:

= P(Yellow / Banna) × P (Sweet / Banna) × P(long / Banna)
= 1 × 0.75 × 0.875
= 0.656

Likelihood of Others:

= P(Yellow / others) × P(Sweet / others) × P(long / others)
= 0.33 × 0.66 × 0.33
= 0.071

Now we Normalize;

P(Mango) = 0
P(Banna) = 0.656 / 0.727 = 0.9023 = 90.23%
P(others) = 0.071 / 0.727 = 0.0976 = 9.76%

∴ According to Naive Bayes Algorithm, the most accurate fruit is Banna on the base of properties [Yellow, Sweet, Long]

Q:

Irritation in eyes & ears	Throat infection	Headache	Fever	Viral infection
y	n	Medium	y	N
y	y	No	n	Y
y	n	High	y	Y
n	y	Medium	y	Y
n	n	No	n	N
n	y	High	y	Y
n	y	High	n	N
n	y	Medium	y	Y
y	y			

Use Bayes classification to conclude that the patient with the following symptoms has the viral infections?

Y N Medium Y ?

Total Number of Data = 8

P(Viral infection = Yes) = 5/8

P(Viral infection = No) = 3/8

		Viral Infection	
Irritation		Yes	NO
in eyes	Yes	3/4	1/4
& ears	NO	2/4	2/4

		Viral ~~Thoat~~ infection	
		Yes	NO
Thoat	Yes	4/5	1/5
Infection	NO	1/3	2/3

		Viral infection	
		Yes	NO
	NO	1/2	1/2
Headache	High	2/3	1/3
	Medium	2/3	1/3

		Viral Infection	
		Yes	NO
Fever	Yes	4/5	1/5
	NO	1/3	2/3

P(Irriation in eyes & ears = Y/Y) = 3/4
P(Irratin in eyes & ears = N/Y = 2/4
P(Irriatin in eyes & ears = Y/N) = 1/4
P(Irriatin in eyes & ears = N/N) = 2/4
P(Thoat Infection = Y/Y) = 4/5
P(Thoat Infection = N/N) = 1/3
P(Thoat Infection = Y/N) = 1/5
P(Thoat Infection = N/N) = 2/3

P(No Headache /Y) = 1/2
P(No Headache /N) = 1/2

P(High Headache / Y) = 2/3
P (High Hadache /N) = 1/3

P(Medium Headache / Y) = 2/3
P(Medium Headache /N) = 1/3

P (Fever Yes / Yes) = 4/5
P (Fever Yes / No) = 1/5
P (Fever No / Yes) = 1/3
P (Fever No / No) = 2/3

Likelihood of having Viral Infection (Yes):

= P(Irritation = Y / Y) × P(Thorat = N/Y)
× P(Headache = Medium / Y) × P(Fever = Y/Y)
× P(Viral infection = Yes)

= $\frac{3}{4} \times \frac{1}{3} \times \frac{2}{3} \times \frac{4}{5} \times \frac{5}{8}$

= 0.0833

Likelihood of having Viral Infection (NO):

$= P(\text{Irritation} = Y/N) \times P(\text{Throat} = N/N)$
$\times P(\text{Headache} = \text{Medium}/N) \times P(\text{Fever} = Y/N)$
$\times P(\text{Viral Infection} = NO)$

$= \frac{1}{4} \times \frac{2}{3} \times \frac{1}{3} \times \frac{1}{5} \times \frac{3}{8}$

$= 0.0041$

Now, we normalize;

$P(\text{Yes}) = 0.0833/0.0874 = 0.9530 = 95.30\%$
$P(NO) = 0.0041/0.0874 = 0.0469 = 4.69\%$

∴ According to Naive Bays Algorithm, the most accurate result is that person is suffering from viral infection.

Y	N	Medium	Y	Y