

Q.1 Calculating all the posterior & prior probabilities.

Prior probabilities:

Attribute	On time	Late	Very late	Cancelled
(DAY)				
Weekday	$\frac{9}{14} = 0.64$	$\frac{1}{2} = 0.5$	$\frac{1}{3} = \frac{1}{3}$	$0/1 = 0$
Saturday	$\frac{2}{14} = 0.14$	$\frac{1}{2} = 0.5$	$0/3 = 0$	$0/1 = 0$
Sunday	$\frac{1}{14} = 0.07$	$0/2 = 0$	$0/3 = 0$	$0/1 = 0$
Holiday	$\frac{2}{14} = 0.14$	$0/2 = 0$	$0/3 = 0$	$0/1 = 0$

(Season)

Spring	$\frac{4}{14} = 0.29$	$0/2 = 0$	$0/3 = 0$	$0/1 = 0$
Summer	$\frac{8}{14} = 0.43$	$0/2 = 0$	$0/3 = 0$	$0/1 = 0$
Autumn	$\frac{2}{14} = 0.14$	$0/2 = 0$	$\frac{1}{3} = 0.33$	$0/1 = 0$
Winter	$\frac{2}{14} = 0.14$	$2/2 = 1$	$2/3 = 0.67$	$0/1 = 0$

(Fog)

None	$\frac{5}{14} = 0.36$	$0/2 = 0$	$0/3 = 0$	$0/1 = 0$
High	$\frac{4}{14} = 0.29$	$1/2 = 0.5$	$\frac{1}{3} = 0.33$	$1/1 = 1$
Normal	$\frac{5}{14} = 0.36$	$1/2 = 0.5$	$2/3 = 0.67$	$0/1 = 0$

(Rain)

None	$\frac{5}{14} = 0.36$	$\frac{1}{2} = 0.5$	$\frac{1}{3} = 0.33$	$0/1 = 0$
Slight	$\frac{8}{14} = 0.07$	$0/2 = 0$	$0/3 = 0$	$0/1 = 0$
Heavy	$\frac{1}{14} = 0.07$	$1/2 = 0.5$	$2/3 = 0.67$	$1/1 = 1$

PRIOR

$$1/20 = 0.05 \quad 2/20 = 0.1 \quad 3/20 = 0.15 \quad 1/20 = 0.05$$

PROBABILITY

Instance - Weekday, winter, high, None ??

case 1. class = on-time

$$= 0.7 \times 0.64 \times 0.14 \times 0.29 \times 0.36 \\ = 0.006547$$

Case 2: class = late₁, resting₂ with no pref(=0)

$$= 0.10 \times 0.5 \times 1.0 \times 0.5 \times 0.5$$

$$= 0.0125$$

Case 3: class = very late

$$= 0.15 \times 1 \times 0.67 \times 0.33 \times 0.33$$

Case 4: class = cancelled

$$= 0.05 \times 0 \times 0 \times 0 \times 1 \times 0$$

$$= 0$$

∴ Case 2 is strong.
The instance will be categorized under class LATE.

Q.2 H₀: Preferred reading and Gender are not correlated in the group.

Computing χ^2 value,

$$\chi^2 = \frac{\text{count}(A=a_i) \times \text{count}(B=b_j)}{n}$$

$$\chi^2 = \frac{(250-90)^2}{90} + \frac{(50-210)^2}{210} + \frac{(200-360)^2}{360}$$

$$\frac{(1000-840)^2}{840}$$

$$\chi^2 = 284.4 + 121.9 + 71.11 + 30.48$$

$$\boxed{\chi^2 = 507.93}$$

$$25.0 \times 75.0 \times 41.0 \times 48.0 \times 5.0 =$$

$$542.000 \approx$$

For a 2×2 table, $DOF = (2-1) \times (2-1) = 1$

For $DOF = 1$, χ^2 value needed to reject the hypothesis at 0.001 significance level is 10.828 (taken from table).

Since the computed value is above this, we can reject the null hypothesis that states gender and preferred reading are independent.

∴ We conclude that 2 attributes are correlated for the given group.