Day	Temperature	Outlook	Humidity	Windy	Play Golf?
07-05	hot	sunny	high	false	no
07-06	hot	sunny	high	true	no
07-07	hot	overcast	high	false	yes
07-09	cool	rain	normal	false	yes
07-10	cool	overcast	normal	true	yes
07-12	mild	sunny	high	false	no
07-14	cool	sunny	normal	false	yes
07-15	mild	rain	normal	false	yes
07-20	mild	sunny	normal	true	yes
07-21	mild	overcast	high	true	yes
07-22	hot	overcast	normal	false	yes
07-23	mild	rain	high	true	no
07-26	cool	rain	normal	true	no
07-30	mild	rain	high	false	yes

9 yes $-$ 5 no

$$E(s) = -\frac{9}{14}\log_2\frac{9}{14} - \frac{5}{14}\log_2\frac{5}{14}$$

$$= 0,94$$

$$\text{Tem} \begin{cases} 4 \text{ hot} \begin{cases} 2Y \\ 2N \end{cases} \to E = 1 \\ 4 \text{ cool} \begin{cases} 3Y \\ 1N \end{cases} \to E = 0,811 \\ 6 \text{ mild} \begin{cases} 4Y \\ 2N \end{cases} \to E = 0,918 \end{cases}$$

$$\text{Gain}(\text{Tem}) = 0,94 - \left(\frac{4}{14} \cdot 1 + \frac{4}{14} \cdot 0,811 + \frac{6}{14} \cdot 0,918 \right)$$

$$= 0,029$$

$$\text{Outlook} \begin{cases} 5 \text{ sunny} \begin{cases} 2Y \\ 3N \end{cases} \to E = 0,971 \\ 4 \text{ overcast} \begin{cases} 4Y \\ 0N \end{cases} \to E = 0 \\ 5 \text{ rain} \begin{cases} 3Y \\ 2N \end{cases} \to E = 0,971 \end{cases}$$

$$\text{Gain}(\text{Outlook}) = 0,94 - \left(\frac{5}{14} \cdot 0,971 + \frac{4}{14} \cdot 0 + \frac{5}{14} \cdot 0,971 \right)$$

$$= 0,247$$

$$\text{Humidity} \begin{cases} 7 \text{ high} < \begin{array}{c} 3Y \\ 4N \end{array} \rightarrow E = 0,985 \\ 7 \text{ normal} < \begin{array}{c} 6X \\ 1N \end{array} \rightarrow E = 0,591 \end{cases}$$

$$\text{Gain (Humidity)} = 0,94 - \left(\frac{7}{14} \cdot 0,985 + \frac{7}{14} \cdot 0,591\right)$$
$$= 0,152$$

$$\text{Windy} \begin{cases} 6 \text{ true} < \begin{array}{c} 3Y \\ 3N \end{array} \rightarrow E = 1 \\ 8 \text{ false} < \begin{array}{c} 6Y \\ 2N \end{array} \rightarrow E = 0,811 \end{cases}$$
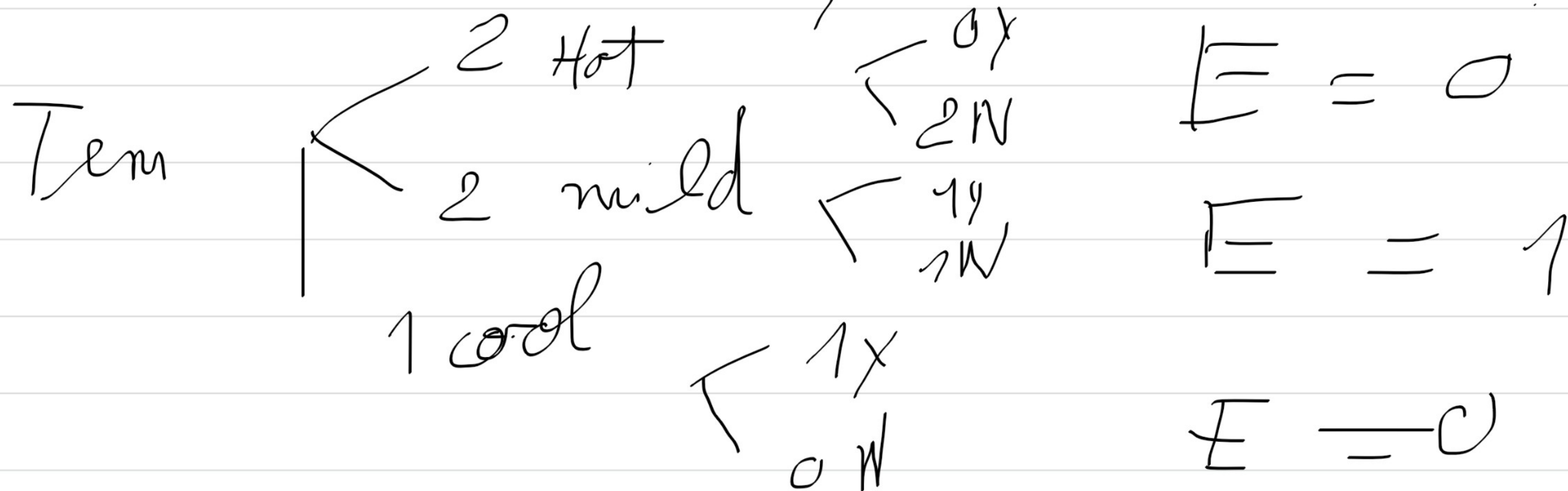
$$\text{Gain(Windy)} = 0,94 - \left(\frac{6}{14} \cdot 1 + \frac{8}{14} \cdot 0,811\right)$$

$$= 0,048$$

$$\Rightarrow \text{Chọn Outlook (Gain lớn nhất)}$$

$$* \ E(S_{sunny}) = -\frac{2}{5}\log_2 \frac{2}{5} - \frac{3}{5}\log_2 \frac{3}{5}$$

$$= 0,971$$

Tem
$$\begin{cases} 2 \text{ Hot} \begin{cases} 0Y \\ 2N \end{cases} & E = 0 \\ 2 \text{ mild} \begin{cases} 1Y \\ 1W \end{cases} & E = 1 \\ 1 \text{ cool} \begin{cases} 1Y \\ 0W \end{cases} & E = 0 \end{cases}$$

$$\Rightarrow Gain\ (tem) = 0,971 - \left[\frac{2}{5} \cdot 0 + \frac{2}{5} \cdot 1 + \frac{1}{5} \cdot 0 \right]$$

$$= 0,571$$

$$Humidity \begin{cases} 3\ high & < \begin{array}{l} 0\ Y \\ 3\ N \end{array} \to E = 0 \\ 2\ normal & < \begin{array}{l} 2\ Y \\ 0\ N \end{array} \to E = 0 \end{cases}$$

$$\Rightarrow Gain\ (Humidity) = 0,971 - \left(\frac{3}{5} \cdot 0 + \frac{2}{5} \cdot 0 \right)$$

$$= 0,971$$

=> chọn Humidity

=> Hoàn thành nhanh sumy

$$* \ E\left(S_{rain}\right) = -\frac{3}{5} \cdot \log_2 \frac{3}{5} - \frac{2}{5} \log_2 \frac{2}{5}$$

$$= 0,971$$

$$Tem \begin{cases} 3 \ mild \begin{cases} 2Y \\ 1N \end{cases} \to E = 0,918 \\ 2 \ cool \begin{cases} 1Y \\ 1N \end{cases} \to E = 1 \end{cases}$$

$$Gain(Temp) = 0,971 - \left(\frac{3}{5} \cdot 0,918 + \frac{2}{5} \cdot 1\right)$$

$$= 0,02$$

$$Windy \begin{cases} 2 \ true \begin{cases} 0Y \\ 2N \end{cases} \to E = 0 \\ 3 \ false \begin{cases} 3Y \\ 0N \end{cases} \to E = 0 \end{cases}$$
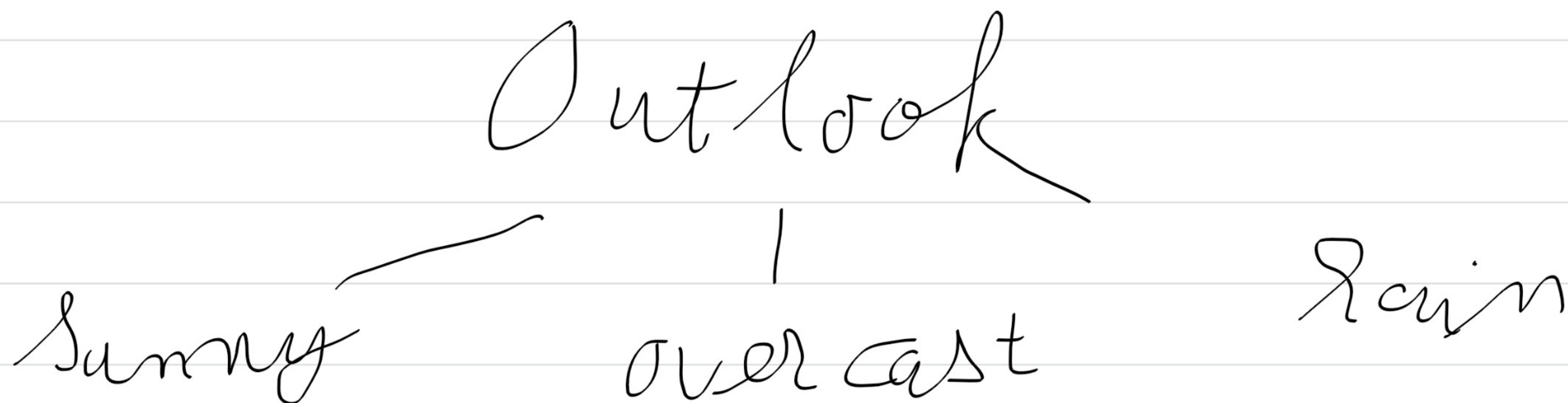
$$Gain(Windy) = 0,971 - \left(\frac{2}{5} \cdot 0 + \frac{3}{5} \cdot 0\right)$$

$$= 0,971$$

$\Rightarrow$ chọn Windy

$\Rightarrow$ Hoàn thành nhánh rain

$\Rightarrow$ Decision Tree :

Outlook

Sunny   overcast   Rain

humidity

yes

Windy

High   Normal

true   false

No   Yes

No   Yes