$\text{Info}(D) = I(2,3) = -\frac{2}{5}\log_2\left(\frac{2}{5}\right) - \frac{3}{5}\log_2\left(\frac{3}{5}\right) = 0.5288 + 0.4422 = 0.971$

$\text{Info}_{\text{Income}}(D) = \frac{2}{5}I(0,2) + \frac{2}{5}I(1,1) + \frac{1}{5}I(1,0)$

$= \frac{2}{5}\left(-\frac{0}{2}\log_2\frac{0}{2}\right) - \frac{2}{2}\log_2\left(\frac{2}{2}\right) + \frac{2}{5}\left[-\frac{1}{2}\log_2\left(\frac{1}{2}\right) - \frac{1}{2}\log_2\left(\frac{1}{2}\right)\right]$

$\quad + \frac{1}{5}\left[-\frac{1}{1}\log_2\left(\frac{1}{1}\right) - \frac{0}{1}\log_2\left(\frac{0}{1}\right)\right]$

$= 0 + \frac{2}{5}\left(0.5 + 0.5\right) + 0 = 0.40$
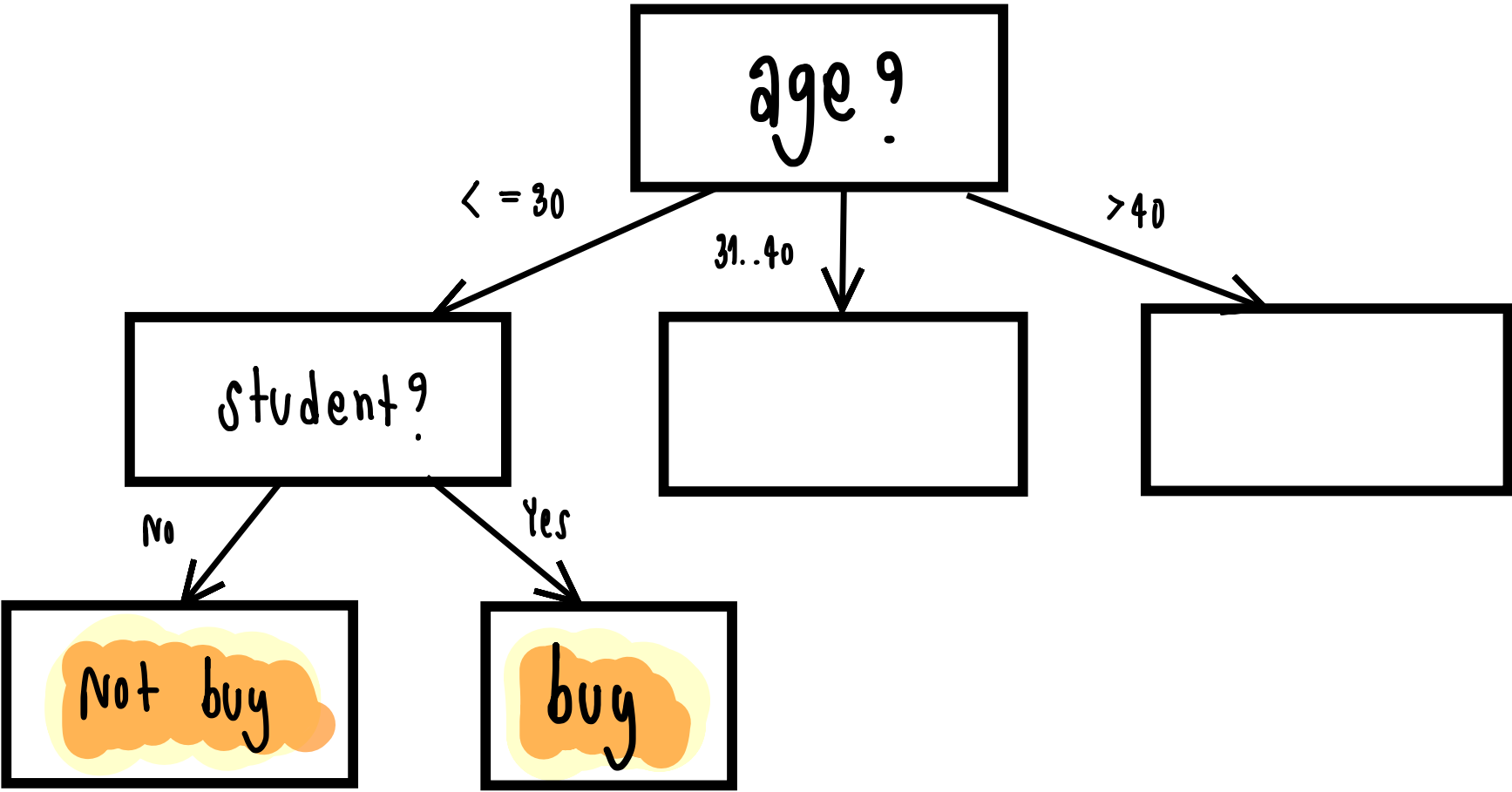
$\text{Info}_{\text{student}}(D) = \frac{2}{5}I(2,0) + \frac{3}{5}I(0,3)$

$= \frac{2}{5}\left[-\frac{2}{2}\log_2\left(\frac{2}{2}\right) - \frac{0}{2}\log\left(\frac{0}{2}\right)\right] + \frac{3}{5}\left[-\frac{0}{3}\log\left(\frac{0}{3}\right) - \frac{3}{3}\log_2\left(\frac{3}{3}\right)\right]$

$\text{Info}_{\text{credit}}(D) = \frac{3}{5}I(1,2) + \frac{2}{5}I(1,1)$

$= \frac{3}{5}\left[-\frac{1}{3}\log_2\left(\frac{1}{3}\right) - \frac{2}{3}\log\left(\frac{2}{3}\right)\right] + \frac{2}{5}\left[-\frac{1}{2}\log_2\left(\frac{1}{2}\right) - \frac{1}{2}\log_2\left(\frac{1}{2}\right)\right]$

$= \frac{3}{5}\left[(-0.3333)(-1.5851) + (0.6667)(0.5849)\right] + \frac{2}{5}\left[(-0.5)(0.1) + (-0.5)(-1)\right]$

$= 0.5510 + 0.4 = 0.9510$

$\text{Gain(income)} = \text{Info}(D) - \text{Info}_{\text{income}}(D) = 0.971 - 0.40 = 0.571$

$\boxed{\text{Gain(student)} = \text{Info}(D) = \text{Info}_{\text{student}}(D) \doteq 0.971 - 0 = 0.971}$

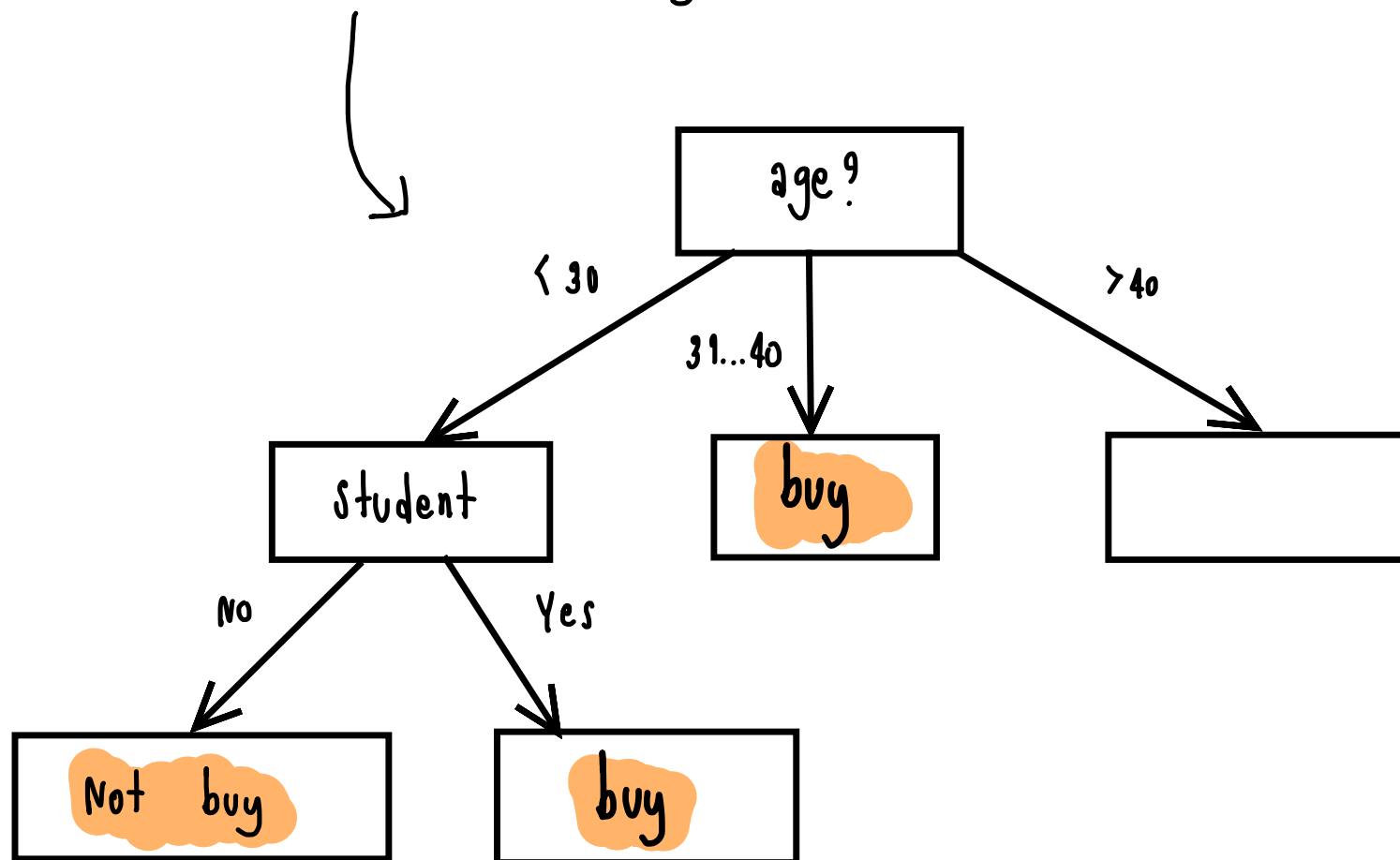$\text{Gain(credit)} = \text{Info}(D) - \text{Info}_{\text{credit}}(D) = 0.971 - 0.9510 = 0.02$

$$\text{Info (D)} = I(4,0) = -\frac{4}{4}\log_2\left(\frac{4}{4}\right) - \frac{0}{4}\log_2\left(\frac{0}{4}\right) = 0$$

$$\text{Info}_{income}(D) = \frac{2}{4}I(2,0) + \frac{1}{4}I(1,0) + \frac{1}{4}(1,0)$$

$$= \frac{2}{4}\left[-\frac{2}{0}\log_2\left(\frac{2}{0}\right) - \frac{0}{2}\log_2\left(\frac{0}{2}\right)\right] + \frac{1}{4}\left[-\frac{1}{0}\log_2\left(\frac{1}{0}\right) - \frac{0}{1}\log_2\left(\frac{0}{1}\right)\right]$$

$$+ \frac{1}{4}\left[-\frac{1}{0}\log_2\left(\frac{1}{0}\right) - \frac{0}{1}\log_2\left(\frac{0}{1}\right)\right] = 0$$

$$\text{Info}_{credit}(D) = \frac{2}{4}I(2,0) + \frac{2}{4}I(2,0)$$

$$= \frac{2}{4}\left[-\frac{2}{0}\log_2\left(\frac{2}{0}\right) - \frac{0}{2}\log_2\left(\frac{0}{2}\right)\right] + \frac{2}{4}\left[-\frac{2}{0}\log_2\left(\frac{2}{0}\right) - \frac{0}{2}\log_2\left(\frac{0}{2}\right)\right]$$

$$\text{Gain (income)} = \text{Info (D)} - \text{Info}_{income}(D) = 0 - 0 = 0$$

$$\text{Gain (credit)} = \text{Info (D)} - \text{Info}_{credit}(D) = 0 - 0 = 0$$

* เนื่องจาก age 31...40 buy เป็น yes หมดเลย

$$\text{Info}(D) = I(3,2) = -\frac{3}{5}\log_2\left(\frac{3}{5}\right) - \frac{2}{5}\log_2\left(\frac{2}{5}\right) = 0.4422 + 0.5288 = 0.9710$$

$$\text{Info}_{\text{income}}(D) = \frac{0}{5}I(0,0) + \frac{3}{5}I(2,1) + \frac{2}{5}(1,1)$$

$$= \frac{3}{5}\left[-\frac{2}{5}\log_2\left(\frac{2}{3}\right) - \frac{1}{3}\log_2\left(\frac{1}{3}\right)\right] + \frac{2}{5}\left[-\frac{1}{2}\log_2\left(\frac{1}{2}\right) - \frac{1}{2}\log_2\left(\frac{1}{2}\right)\right]$$

$$= 0.5510 + 0.4 = 0.9510$$

$$\text{Info}_{\text{credit}}(D) = \frac{3}{5}I(3,0) + \frac{2}{5}I(0,2)$$

$$= \frac{3}{5}\left[-\frac{3}{5}\log_2\left(\frac{3}{0}\right) - \frac{0}{3}\log_2\left(\frac{0}{3}\right)\right] + \frac{2}{5}\left[-\frac{0}{2}\log_2\left(\frac{0}{2}\right) - \frac{2}{0}\log_2\left(\frac{2}{0}\right)\right]$$

$$= 0$$

$$\text{Gain}(\text{income}) = \text{Info}(D) - \text{Info}_{\text{income}}(D) = 0.9710 - 0.9510$$

$$\boxed{\text{Gain}(\text{credit}) = \text{Info}(D) - \text{Info}_{\text{credit}}(D) = 0.9710 - 0 = 0.9710}$$