Q1. For the First split :-

True Node : (student 2, student 4)

Pass in Math : 2 yes, 0 No

$\therefore$ Gini $= 1 - \{(\frac{2}{2})^2 + (\frac{0}{2})^2\}$

$= 1 - (\frac{4}{4} + \frac{0}{4})$

$= 1 - 1$

$= 0$

False Node : (student 2, student 3, student 4, student 7)

Pass in Math : 3 yes, 1 No

$\therefore$ Gini $= 1 - \{(\frac{3}{4})^2 + (\frac{1}{4})^2\}$

$= 1 - (\frac{9}{16} + \frac{1}{16})$

$= 1 - (\frac{10}{16})$

$= \frac{6}{10}$

$= 0.6$

$\therefore$ Weighted Average for the first split :

$\frac{2}{7} \times 0 + \frac{5}{7} \times 0.6$

$= 0.34$

For the 2nd split :-

True Node (student 2, student 4).

Pass in Math : 2 Yes, 0 No

$\therefore$ Gini $= 1 - \left\{ \left(\frac{2}{2}\right)^2 + \left(\frac{0}{2}\right)^2 \right\}$

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

$= 1 - 1$

$= 0$

False Node (student 2, student 3, student 4)

Pass in Math : (3 Yes, 0 No)

$\therefore$ Gini $= 1 - \left\{ \left(\frac{3}{3}\right)^2 + \left(\frac{0}{3}\right)^2 \right\}$

$= 1 - \left(\frac{9}{9} + \frac{0}{9}\right)$

$= 1 - 1$

$= 0$

$\therefore$ weighted Average for second split :-

$\frac{2}{5} \times 0 + \frac{3}{5} \times 0$

$= 0 + 0$

$= 0$

$\therefore$ 1st split ~~wait~~ ~~is 0.489~~ is $= 0.34$

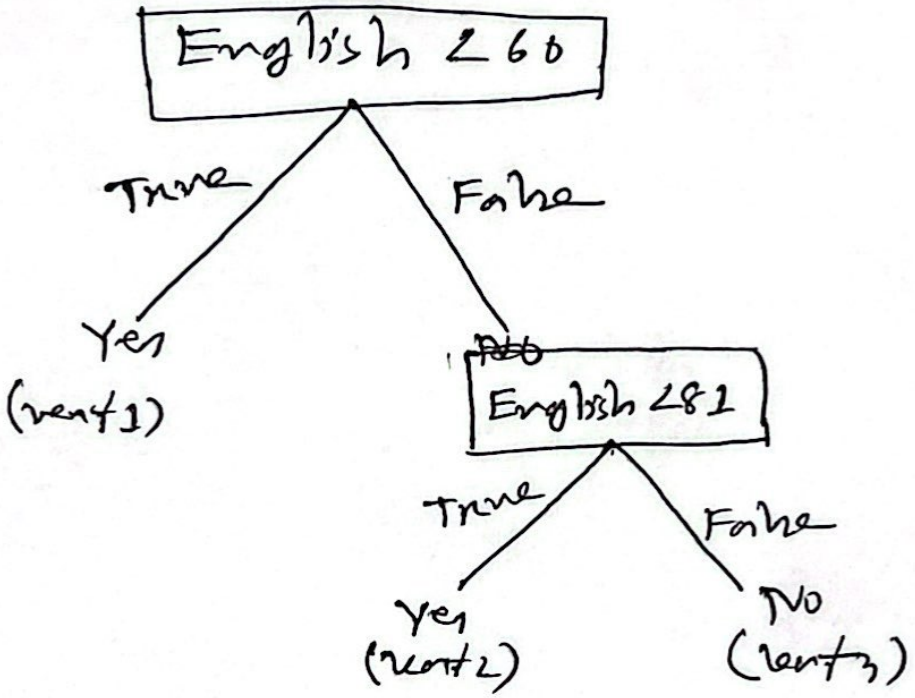
$\therefore$ 2nd split is $= 0$

the lowest value is 0.

So, the 2nd split is the best split.

Q:2

New split in Q1, the tree eventually has three leaf nodes as:



For each sample:-

Prediction:- Actual:-

Student 8: Yes ——— Yes
Student 9: Yes ——— Yes
Student 10: No ——— No
Student 11: Yes ——— Yes
Student 12: Yes ——— No

$$\therefore \text{Accuracy} = \frac{\text{Number of correct predictions}}{\text{Total number of samples}}$$

$$= \frac{4}{5}$$

$$= 0.8$$

So, accuracy of the model is 80%.