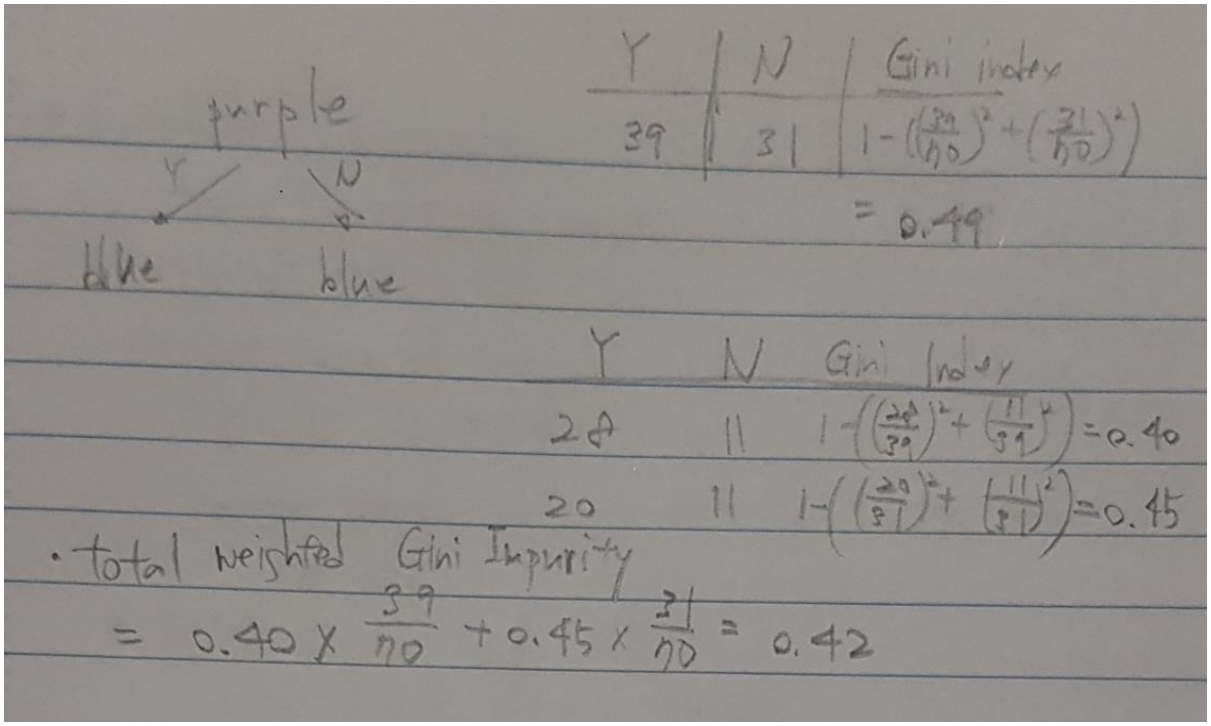
**Q1a: Given the task of predicting blue preference, what's the Total Weighted Gini Impurity of this split?**

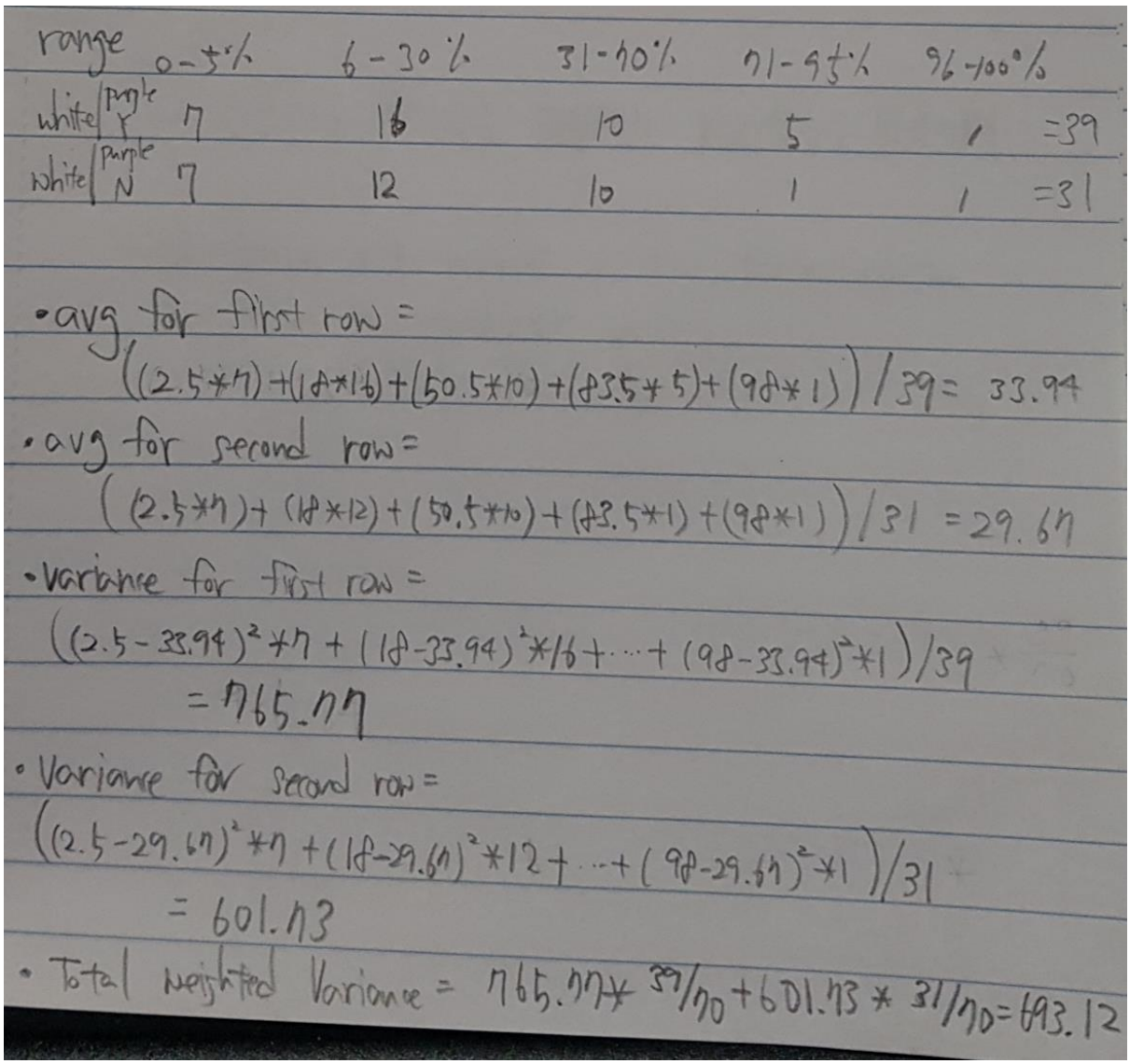



**Q1b: What would be the predicted labels of the left and right leaves?**
**blue**

Left leaf: Blue

Right Leaf: Blue

**Q1c: Given the task of predicting percentage of white t-shirts, what's the Total Weighted Variance of this split?**




**Q1d: What would be the predicted values of the left and right leaves?**

Left leaf: 6-30%

Right leaf: 6-30%

**Q2a.**

I would not recommend ‘k-Means Clustering’.

Since the distributions of the data intersect each other, k-Means, which evaluates the distance from the center point, is not suitable. k-Means is suitable for circular distributions. As in the example, when the shape of the cluster is not circular, accurate results cannot be derived.

**Q2b.**

I would not recommend ‘k-Means Clustering’.

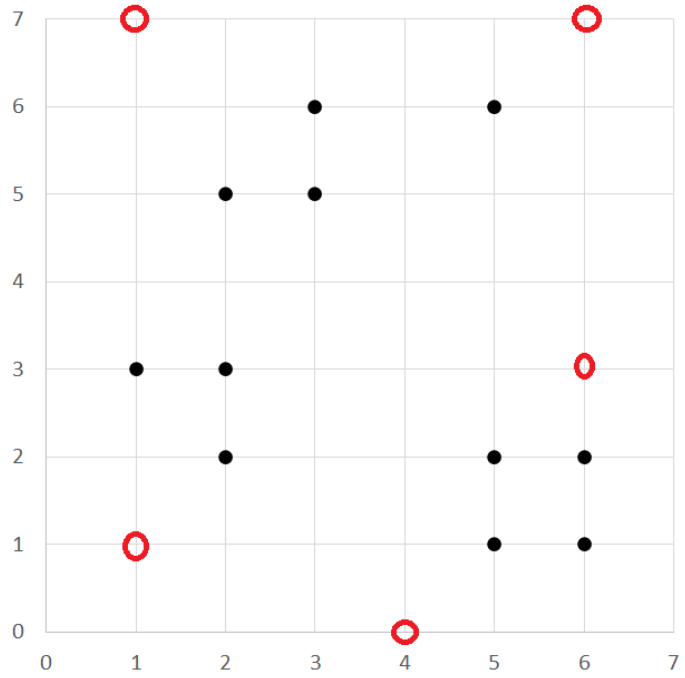
k-Means is not suitable if the distribution of the data is not linearly divisible.

**Q2c.**

I would not recommend ‘k-Means Clustering’

Although the distribution of data can be classified as linear, k-Means is not suitable because the distribution is elongated rather than circular. k-Means is suitable for circular distributions.

QC. Draw a distortion plot of the slide page 15 in Clustering.pptx




Let’s pick random k position.

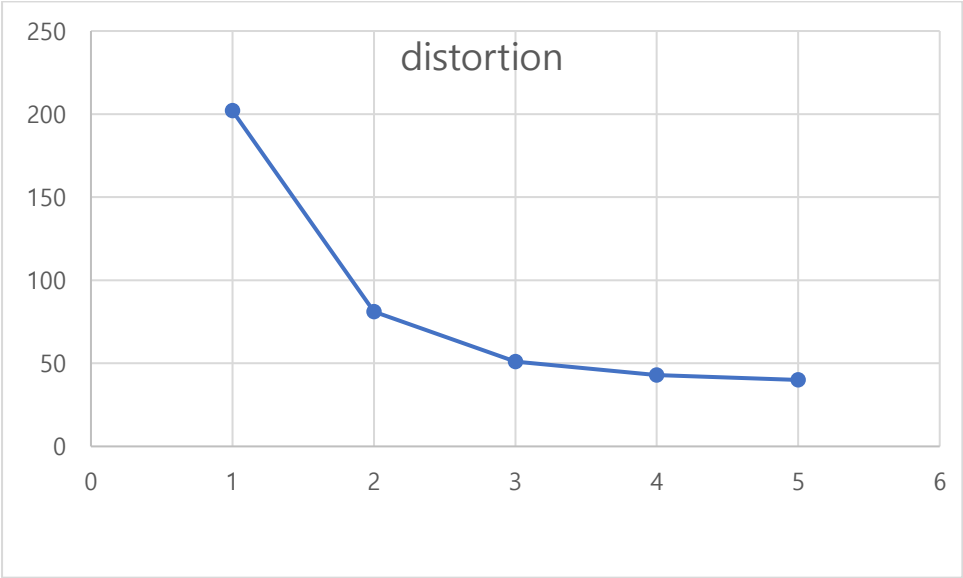
k = 1  (1,1): distortion = 202

k = 2  (1,1) (6,3): distortion = 81

k = 3  (1,1) (6,3) (1,7): distortion = 51

k = 4  (1,1) (6,3) (1,7) (6,7): distortion = 43

k = 5  (1,1) (6,3) (1,7) (6,7) (4,0): distortion = 40



| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | x | y | x | y | | | | | x | y | x | y | | | |
| 2 | 1 | 3 | 1 | 1 | 0 | 2 | 4 | | 1 | 3 | 1 | 1 | 0 | 2 | 4 |
| 3 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | | 2 | 2 | 1 | 1 | 1 | 1 | 2 |
| 4 | 2 | 3 | 1 | 1 | 1 | 2 | 5 | | 2 | 3 | 1 | 1 | 1 | 2 | 5 |
| 5 | 2 | 5 | 1 | 1 | 1 | 4 | 17 | | 2 | 5 | 1 | 1 | 1 | 4 | 17 |
| 6 | 3 | 5 | 1 | 1 | 2 | 4 | 20 | | 3 | 5 | 6 | 3 | -3 | 2 | 13 |
| 7 | 3 | 6 | 1 | 1 | 2 | 5 | 29 | | 3 | 6 | 6 | 3 | -3 | 3 | 18 |
| 8 | 5 | 1 | 1 | 1 | 4 | 0 | 16 | | 5 | 1 | 6 | 3 | -1 | -2 | 5 |
| 9 | 5 | 2 | 1 | 1 | 4 | 1 | 17 | | 5 | 2 | 6 | 3 | -1 | -1 | 2 |
| 10 | 5 | 6 | 1 | 1 | 4 | 5 | 41 | | 5 | 6 | 6 | 3 | -1 | 3 | 10 |
| 11 | 6 | 1 | 1 | 1 | 5 | 0 | 25 | | 6 | 1 | 6 | 3 | 0 | -2 | 4 |
| 12 | 6 | 2 | 1 | 1 | 5 | 1 | 26 | | 6 | 2 | 6 | 3 | 0 | -1 | 1 |
| 13 | | | | | k = 1 | (1,1) | 202 | | | | | | k = 2 | (6,3) | 81 |
| 14 | x | y | x | y | | | | | x | y | x | y | | | |
| 15 | 1 | 3 | 1 | 1 | 0 | 2 | 4 | | 1 | 3 | 1 | 1 | 0 | 2 | 4 |
| 16 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | | 2 | 2 | 1 | 1 | 1 | 1 | 2 |
| 17 | 2 | 3 | 1 | 1 | 1 | 2 | 5 | | 2 | 3 | 1 | 1 | 1 | 2 | 5 |
| 18 | 2 | 5 | 1 | 7 | 1 | -2 | 5 | | 2 | 5 | 1 | 7 | 1 | -2 | 5 |
| 19 | 3 | 5 | 1 | 7 | 2 | -2 | 8 | | 3 | 5 | 1 | 7 | 2 | -2 | 8 |
| 20 | 3 | 6 | 1 | 7 | 2 | -1 | 5 | | 3 | 6 | 1 | 7 | 2 | -1 | 5 |
| 21 | 5 | 1 | 6 | 3 | -1 | -2 | 5 | | 5 | 1 | 6 | 3 | -1 | -2 | 5 |
| 22 | 5 | 2 | 6 | 3 | -1 | -1 | 2 | | 5 | 2 | 6 | 3 | -1 | -1 | 2 |
| 23 | 5 | 6 | 6 | 3 | -1 | 3 | 10 | | 5 | 6 | 6 | 7 | -1 | -1 | 2 |
| 24 | 6 | 1 | 6 | 3 | 0 | -2 | 4 | | 6 | 1 | 6 | 3 | 0 | -2 | 4 |
| 25 | 6 | 2 | 6 | 3 | 0 | -1 | 1 | | 6 | 2 | 6 | 3 | 0 | -1 | 1 |
| 26 | | | | | k = 3 | (1,7) | 51 | | | | | | k = 4 | (6,7) | 43 |
| 27 | x | y | x | y | | | | | | | | | | | |
| 28 | 1 | 3 | 1 | 1 | 0 | 2 | 4 | | | | | | | | |
| 29 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | | | | | | | | |
| 30 | 2 | 3 | 1 | 1 | 1 | 2 | 5 | | | | | | | | |
| 31 | 2 | 5 | 1 | 7 | 1 | -2 | 5 | | | | | | | | |
| 32 | 3 | 5 | 1 | 7 | 2 | -2 | 8 | | | | | | | | |
| 33 | 3 | 6 | 1 | 7 | 2 | -1 | 5 | | | | | | | | |
| 34 | 5 | 1 | 4 | 0 | 1 | 1 | 2 | | | | | | | | |
| 35 | 5 | 2 | 6 | 3 | -1 | -1 | 2 | | | | | | | | |
| 36 | 5 | 6 | 6 | 7 | -1 | -1 | 2 | | | | | | | | |
| 37 | 6 | 1 | 6 | 3 | 0 | -2 | 4 | | | | | | | | |
| 38 | 6 | 2 | 6 | 3 | 0 | -1 | 1 | | | | | | | | |
| 39 | | | | | k = 5 | (4,0) | 40 | | | | | | | | |