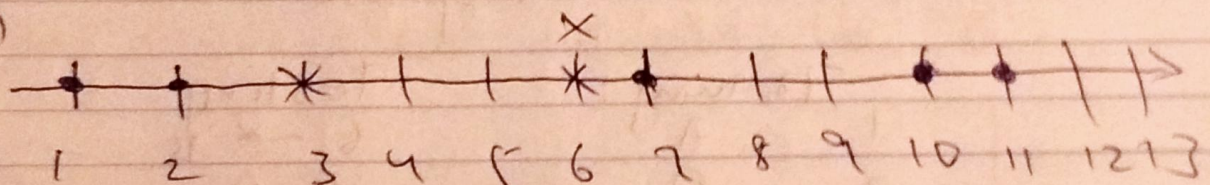
10) Given

(1)



& K=3

Let's say points with '•' are 'A' and points with 'x' are 'B'

Then, the data would be:

input	output
1	A
2	A
3	B
6	B
6	B
7	A
10	A
11	A

As per the requirements, we'll divide the data in the middle i.e., at input - 6

Consider the upper part as training set and lower part is testing set.

Training:	Testing:
1 - A	6 - B
2 - A	7 - A
3 - B	10 - A
6 - B	11 - A

Now, let's run KNN(K=3) on testing set

- for input 6,
  nearest 3 neighbours are 6, 3, 2, out of which 2 are B. So, the predicted output would be 'B'.
  (∵ Distance calculated by Euclidean)

for 7,
nearest 3 neighbours are 6, 3, 2.
So, predicted output would be 'B'.

for 10,
Distances are:
from 1: $\sqrt{(10-1)^2} = 9$
from 2: $\sqrt{(10-2)^2} = 8$
from 3: $\sqrt{(10-3)^2} = 7$
from 6: $\sqrt{(10-6)^2} = 4$
⇒ 3 nearest are 6, 3, 2
⇒ Predicted would be 'B'

Similarly for 11,

nearest 3 are 6, 3, 2
⇒ Predicted would be 'B'.

(2) ~~Confusion matrix~~:

So, the predicted outputs are:

	Predicted	Actual output
6	B	B
7	B	A
10	B	A
11	B	A

So, the confusion matrix is

Actual \ Predicted	A (Pos)	B (Neg)
A (Positive)	0	3
B (Neg)	0	1

TP = 0
FN = 3
FP = 0
TN = 1

Total 4

$$\text{Accuracy} = \frac{TP+TN}{P+N} = \frac{TP+TN}{TP+FN+TN+FP}$$

$$\Rightarrow \text{accuracy} = \frac{0+1}{4} = 0.25 //$$

$\Rightarrow$ Sensitivity $= \frac{TP}{TP+FN} = \frac{0}{0}$ // $(\because TP=0)$

$$\text{Specificity} = \frac{TN}{FP+TN} = \frac{1}{0+1}$$

$\Rightarrow$ Specificity $= 1$ //