1. Construct the decision rule according to this classification boundary. How would you classify a new observation that has $x\_1=6$ and $x\_2=10$?

If x\_1< 7.75 then A else B.

We would classify a new observation as A in this boundary.

1. What size is the margin here?

The size of the margin is 2 units to the left and 2 units right of the boundary.

1. Which observations receive a penalty? Which observations are the support vectors?

Points 6,7,8,9,10 are the points which receive the penalty.

1. What is the total penalty here?

The total penalty is 0.25(2)+1.25(1)+1.75(1)+2.25= 5.75

1. Can I choose a bigger margin if my total allowable penalty is 6?

Yes, as the penalty is 5.75, we can increase the margin.

1. Are the data separable? If so, what are the support vectors?

Yes, the data is separable with a line at an angle passing between the points 8 & 7, 9&11. The support vectors would be 4,9 and 8