Q1. (b)

(d.) Variance $= E(\hat{f}(x) - E[\hat{f}(x)]^2)$

Variance represents the derivation of the predicted value from the mean of the predicted values.

$Var(x_1) = (8)^2 - 8^2 = 0$

$Var(x_2) = (88)^2 - (88)^2 = 0$

$Var(x_3) = (588)^2 - (588)^2 = 0$

$Var(x_4) = (21)^2 - (21)^2 = 0$

$Var(x_5) = (16)^2 - (16)^2 = 0$

$Var(x_6) = (37)^2 - (37)^2 = 0$

So, here we used a single model that had very high bias and 0 variance.

(f.) $MR_2 = \{9, 84, 589, 23, 17, 38\}$

$MR_1 = \{9, 89, 590, 22, 16, 36\}$

Variance of 1st model = 0

Average MSE of 1st model $= \frac{1}{6}(1+1+4+1+0+1) = \frac{8}{6} = 4/3.$

For the 2^{nd} model

The MSE $= (y - \hat{f}(x))^2$

$B(x_1) = 9 - 9 = 0$

$B(x_2) = 89 - 87 = 2$

$B(x_3) = 589 - 590 = -1$

$B(x_4) = 22 - 22 = 0$

$B(x_5) = 17 - 16 = 1$

$B(x_6) = 38 - 36 = 2$

$V(x_i) = 0$

$$\begin{aligned} MSE &= B(x_i)^2 \\ &= 0^2 + 2^2 + (-1)^2 + 0^2 + 1^2 + 2^2 \\ &= 4 + 1 + 0 + 0 + 4 \\ &= 10 \end{aligned}$$

Average MSE $= \frac{MSE}{6} = 10/6$

Clearly $MSE_2 = 10/6$ and $MSE_1 = 8/6$

So $MSE_2 > MSE_1$

Hence Model 1 is better than model 2.