STA304 A1 Q1

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(a) $\mu = (5.82 + 5.33 + 5.76 + 6.20 + 5.89)/2 = 5.80$

$median = 5.82$

$\sigma^2 = [(5.82 - 5.80)^2 + (5.33 - 5.80)^2 + (5.76 - 5.80)^2 + (6.20 - 5.80)^2 + (5.89 - 5.80)^2]/5 = 0.0782$
$\sigma = 0.2796436$

all possible sample of size n=3:
(y1, y2, y3), (y1, y2, y4), (y1, y2, y5), (y1, y3, y4), (y1, y3, y5),(y1, y4, y5), (y2, y3, y4), (y2, y3, y5), (y2, y4, y5), (y3, y4, y5)

$probability = \frac{1}{10}$

(b) sample distribution of $\bar{y}$

	Sample	Total	Y Mean
1	(y1, y2, y3)	16.91	5.63666666666667
2	(y1, y2, y4)	17.35	5.78333333333333
3	(y1, y2, y5)	17.04	5.68
4	(y1, y3, y4)	17.78	5.92666666666667
5	(y1, y3, y5)	17.47	5.82333333333333
6	(y1, y4, y5)	17.91	5.97
7	(y2, y3, y4)	17.29	5.76333333333333
8	(y2, y3, y5)	16.89	5.63
9	(y2, y4, y5)	17.42	5.80666666666667
10	(y3, y4, y5)	17.85	5.95

(c) $E(\bar{y}) = (5.64 + 5.78 + 5.68 + 5.93 + 5.82 + 5.97 + 5.76 + 5.63 + 5.81 + 5.95)/10 = 5.797$

$V(\bar{y}) = [(5.64 - 5.797)^2 + (5.78 - 5.797)^2 + ... + (5.95 - 5.797)^2]/10 = 0.027922$

$Bias(\bar{y}) = E(\bar{y} - \mu) = 5.797 - 5.80 = -0.01$

$MSE(\bar{y}) = E[(\bar{y} - \mu)^2] = 0.01397$