STATS HW 1:

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1. a) $\sum_{i=1}^{n}(x_i - \bar{x})$

$= \sum_{i=1}^{n}(x_i) - n\bar{x}$

$= n\bar{x} - n\bar{x}$ by definition of mean

$\boxed{= 0}$

b) $\sum_{i=1}^{n}(x_i - \bar{x})^2$

$= \sum_{i=1}^{n}(x_i^2 - 2x_i\bar{x} + \bar{x}^2)$

$= \sum(x_i^2 - 2x_i\bar{x}) + n\bar{x}^2$

$= \sum(x_i^2) - 2(n\bar{x})\bar{x} + n\bar{x}^2$ because $\sum_{i=1}^{n} x_i = n\bar{x}$, as seen in part (a)

$= \sum_{i=1}^{n} x_i^2 - 2n\bar{x}^2 + n\bar{x}^2$

$\boxed{= \sum_{i=1}^{n} x_i^2 - n\bar{x}^2}$

in sorted order

2. a) $\bar{x} = \frac{\sum_{i=1}^{45} x}{45}$ | $Q_2 = x_i$ where $i = \left(\frac{n+1}{2}\right)^{th}$ value

$\bar{x} = \frac{3331}{45} = \boxed{74.02}$ mins | $Q_2 = \boxed{78}$ mins

b) $s = \sqrt{s^2}$, where s^2 (variance) $= \sum_{i=1}^{n} \frac{(x_i - \bar{x})^2}{n-1}$

$s^2 = 1541.159$

$\boxed{\sqrt{s^2} = 39.258 = s}$

c) Q_1 = median between Q_0 and Q_2
$= \boxed{37}$
Q_3 = median between Q_2 and Q_4
$= \boxed{102}$

$IQR = Q_3 - Q_1 = \boxed{65}$

Outliers:
$1.5 \cdot Q_3 = 97.5$

$Q_3 + 97.5 = 199.5$ => No potential outliers exceed this

$Q_1 - 97.5 = -60.5$ => No potential outliers

3. using alternates $A_1, A_2, A_3, A_4,$

sample space $\boxed{S = \{A_1A_2, A_1A_3, A_1A_4, A_2A_3, A_2A_4, A_3A_4\}}$

*note that $A_iA_j \equiv A_jA_i$

4. $P(TF) = 0.6$; $P(MF) = 0.3$; $P(TF) \cap P(MF) = 0.15$

a) $P(TF) \cup P(MF) = P(TF) + P(MF) - P(TF) \cap P(MF)$

$= 0.6 + 0.3 - 0.15$

$= \boxed{0.75}$

b) $P(TF') \cap P(MF') = (P(MF) \cup P(TF))'$

$= 1 - 0.75$

$= \boxed{0.25}$

HW1

5. $P(H) = 0.21$; $P(W) = 0.28$; $P(H) \cap P(W) = 0.15$

a) $P(H) \cup P(W) = P(H) + P(W) - P(H) \cap P(W)$

$= 0.21 + 0.28 - 0.15$

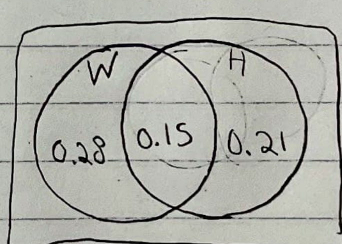
$= \boxed{0.34}$

b) $P(W|H) = \dfrac{(P(H) \cap P(W))}{P(H)}$

$= \dfrac{0.15}{0.21}$

$= \boxed{0.71}$

c) $P(H|W') = \dfrac{(P(W') \cap P(H))}{P(W')}$



$P(W') = 1 - P(W) = 0.72$

$P(W') \cap P(H) = P(H) - P(H) \cap P(W)$

$= 0.13$

$\therefore P(H|W') = \dfrac{0.13}{0.72}$

$= \boxed{0.18}$

HW1

6. $P(C) = P(L_1)P(C|L_1) + P(L_2)P(C|L_2) + P(L_3)P(C|L_3) + P(L_4)P(C|L_4)$

Theorem 2.13

$= (.40)(.2) + (.30)(.1) + (.20)(.5) + (.30)(.2)$

$= \boxed{0.27}$

7. $P(\text{John}|E') = \dfrac{P(\text{John})P(E'|\text{John})}{P(\text{Tom})P(E'|\text{Tom}) + P(\text{Jeff})P(E'|\text{Jeff}) + P(\text{Pat})P(E'|\text{Pat})}$

Baye's Rule

$= \dfrac{(0.20)(1/200)}{(.60)(1/100) + (.15)(1/90) + (.05)(1/200)}$

$= \boxed{0.13}$