

STAT 2220: Engineering Statistics, Fall 2007

Solution to Assignment 1

2-2. **Sample average:** $\bar{x} = \frac{\sum_{i=1}^n x_i}{n} = \frac{\sum_{i=1}^{19} x_i}{19} = \frac{272.82}{19} = 14.36 \text{ min}$

Sample standard deviation:

$$\sum_{i=1}^{19} x_i = 272.82 \qquad \sum_{i=1}^{19} x_i^2 = 10334$$

$$s = \sqrt{\frac{\sum_{i=1}^n x_i^2 - \frac{\left(\sum_{i=1}^n x_i\right)^2}{n}}{n-1}} = \sqrt{\frac{10334 - \frac{(272.82)^2}{19}}{19-1}} = \sqrt{\frac{6416.59}{18}} = \sqrt{356.48 \text{ (min)}^2} = 18.88 \text{ min}$$

Dot diagram

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Breakdown time

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2-12. Stem-and-leaf of Suspended solids

$$N = 60$$

Leaf Unit = 1.0

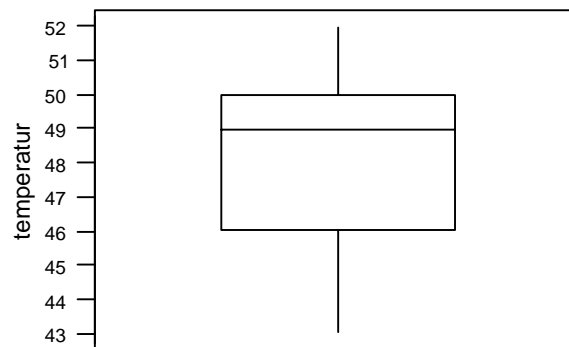
Frequency	Stem	leaf
1	2	9
2	3	1
3	3	9
8	4	22223
12	4	5689
20	5	01223444
(13)	5	5666777899999
27	6	11244
22	6	556677789
13	7	022333
7	7	6777
3	8	01
1	8	9

(Note: data can also be rounded up to construct this plot)

2-18.	Variable	N	Median	Q1	Q3	5 th	95 th
	Solids	60	59.45	52.03	68.35	39.455	79.965

Mean=59.87

- 2-32. a) Sample Mean: 48.125, Sample Median: 49
b) Sample Variance: 7.247, Sample Standard Deviation: 2.692
c) The data appear to be skewed.



- d) 5th Percentile: 43.25, 95th Percentile: 52

- 3-12. a) $P(X \in A') = 1 - P(X \in A) = 1 - 0.3 = 0.7$
b) $P(X \in B') = 1 - P(X \in B) = 1 - 0.25 = 0.75$
c) $P(X \in C') = 1 - P(X \in C) = 1 - 0.6 = 0.4$
d) A and B are mutually exclusive if $P(X \in A \cap B) = 0$. To determine if A and B are mutually exclusive, solve the following for $P(X \in A \cap B)$:

$$P(X \in A \cup B) = P(X \in A) + P(X \in B) - P(X \in A \cap B)$$

$$0.55 = 0.3 + 0.25 - P(X \in A \cap B)$$

$$0.55 = 0.55 - P(X \in A \cap B) \text{ and } P(X \in A \cap B) = 0.$$
Therefore, A and B are mutually exclusive.
e) B and C are mutually exclusive if $P(X \in B \cap C) = 0$. To determine if B and C are mutually exclusive, solve the following for $P(X \in B \cap C)$:

$$P(X \in B \cup C) = P(X \in B) + P(X \in C) - P(X \in B \cap C)$$

$$0.70 = 0.25 + 0.60 - P(X \in B \cap C)$$

$$0.70 = 0.85 - P(X \in B \cap C) \text{ and } P(X \in B \cap C) = 0.15.$$
Therefore, B and C are not mutually exclusive.

3-14. A - Overfilled, B - Medium filled, C - Underfilled

a) $P(X \in C') = 1 - P(X \in C) = 1 - 0.15 = 0.85$

b) $P(X \in A \cup C) = P(X \in A) + P(X \in C) - P(X \in A \cap C) = 0.40 + 0.15 - 0$
 $= 0.55$ ($P(X \in A \cap C)$
 $= 0$ since A and C are mutually exclusive)

3-18. a) $P(X < 1) = P(X = 0) = 0.7$

b) $P(X > 3) = 1 - P(X \leq 3) = 1 - 1 = 0$

c) $P(X > 0) = 1 - P(X = 0) = 1 - 0.7 = 0.3$

d) $P(X = 0) = 0.7$