

18.05 homework 6 solution

1. (15.9)

- (a) Yes. The scatterplot shows a tendency of linear dependence of waiting time on the duration.
- (b) 75s. (or anywhere between 60s and 90s)
- (c) Two.

2. (16.10)

- (a) Sample mean = $3.36 + 0.2y \rightarrow \infty$ as $y \rightarrow \infty$
 Sample median = $\boxed{4.6}$ as $y \rightarrow \infty$
- (b) At least $\boxed{3}$.
- (c) At least $\boxed{1}$ for sample mean $\rightarrow \infty$.

At least $\frac{n}{2}$ for sample median $\rightarrow \infty$ if n is even.

In this case the sample median is the average of a finite number and an infinite number, which is infinite.

At least $\frac{n+1}{2}$ for sample median $\rightarrow \infty$ if n is odd.

or, collectively, at least $\boxed{\lfloor \frac{n+1}{2} \rfloor}$ for sample median $\rightarrow \infty$.

3. (19.2)

(a) Yes. $E[S] = (\frac{1}{2} + \frac{1}{3} + \frac{1}{6})\mu = \mu$

(b) $E[T] = (\sum_{i=1}^n a_i)\mu$

T is unbiased if $E[T] = \mu$, then either $\boxed{\sum_{i=1}^n a_i = 1}$, or $\mu = 0$.

4. (19.3)

$$E[T] = a(E[X_1] + E[X_2] + \dots + E[X_n]) + b \\ = an\mu + b$$

If T is unbiased, $an\mu + b = \mu$

Since μ is unknown, we need $an = 1$ $b = 0$

$$\boxed{a = \frac{1}{n} \quad b = 0}$$