

620.370 Statistics for Mechanical Engineers — Semester 2, 2009

Homework set 5

Problems to be discussed at next week's tutorial: Quiz5; 88, 89, 92 (91).

Homework questions

Questions 5.1–5.2 refer to the following information:

A random sample of twenty observations on a discrete random variable gave the following observations:

1, 0, 4, 3, 6, 2, 0, 3, 1, 2, 1, 2, 2, 5, 2, 1, 0, 1, 2, 4.

5.1 Which one of the following is true?

[A.] sample mode = 2.2; [B.] sample median = 2.2; [C] sample mean = 2.2;
 [D.] $\hat{F}(2.2) = 0.7$ [E.] $\hat{p}(2.2) = 0.3$; [F.] $\hat{c}_{0.7} = 2.2$.

5.2 The sample standard deviation is equal to:

[A.] 1.65; [B.] 2.73; [C.] 1.96; [D.] 2.59; [E.] 1.61; [F.] 2.20.

5.3 If a large data set has mean 15 and standard deviation 3, then we can expect about 95% of the data values to lie in the range

[A.] $6 < x < 24$; [B.] $9 < x < 21$; [C.] $10 < x < 20$; [D.] $11 < x < 19$; [E.] $12 < x < 18$.

5.4 A good approximation to the Bi(60, 0.4) distribution is

[A.] N(60, 0.4); [B.] Pn(24); [C.] N(24, 24); [D.] Pn(14.4); [E.] N(24, 14.4).

5.5 If $X \stackrel{d}{=} N(\mu=1, \sigma^2=2)$, then $\Pr(X^2 > 2)$ is equal to

[A.] 0.148; [B.] 0.615; [C.] 0.429; [D.] 0.385; [E.] 0.578.

5.6 (a) Consider a Normal population $\mathcal{D} = N(240, 25^2)$. Use matlab to generate a random sample of 80 observations from \mathcal{D} as follows:

- Set the random seed to your enrolment number:
`>> randn('state', EN)`, where EN denotes your enrolment number.
- Then use:
`>> x=normrnd(240, 25, 80, 1)`;
 which gives a 80×1 array of observations on $N(240, 25^2)$.

Generate descriptive statistics (count; mean, sd; min, Q1, med, Q3, max) and a histogram for your sample. (Note: The matlab quantiles are quite acceptable.)

(b) Using your random sample from \mathcal{D} , obtained in (a), specify values of the following statistics for your sample; and give the values these statistics should be close to.

statistic	your observed value	theoretical/expected (population) value
sample mean, \bar{x}		
sample sd, s		
freq($X < 200$)		
sample minimum, $x_{(1)}$		
Q1 = $\hat{c}_{0.25}$		
sample median, $\hat{c}_{0.5}$		
Q3 = $\hat{c}_{0.75}$		
sample maximum, $x_{(80)}$		

Quiz 5

Questions Q5.1–Q5.2 refer to the following information:

A random sample of twenty observations on the discrete random variable X gave the following observations:

1, 4, 3, 2, 0, 3, 2, 1, 5, 2, 2, 6, 1, 2, 3, 4, 0, 3, 1, 2.

Q5.1 $x_{(6)}$ is equal to:

[A.] 0; [B.] 1; [C.] 2; [D.] 3; [E.] 4.

Q5.2 $\hat{F}(2)$ is equal to:

[A.] 0.3; [B.] 0.4; [C.] 0.5; [D.] 0.6; [E.] 0.7.

Questions Q5.3–Q5.5 refer to the following information:

A random sample of twenty observations on the continuous random variable X gave the following frequency table:

observations	frequency
1.0–1.4	2
1.5–1.9	6
2.0–2.4	5
2.5–2.9	4
3.0–3.4	3

Q5.3 Which *one* of the following is correct?

[A.] $\hat{F}(1.5) = 0.4$; [B.] $\hat{F}(1.7) = 0.4$; [C.] $\hat{F}(1.9) = 0.4$;
[D.] $\hat{F}(1.95) = 0.4$; [E.] $\hat{F}(2.0) = 0.4$.

Q5.4 The sample median is approximately equal to:

[A.] 1.95; [B.] 2.00; [C.] 2.05; [D.] 2.15; [E.] 2.20.

Q5.5 $\hat{f}(1.5)$ is equal to:

[A.] 0.15; [B.] 0.3; [C.] 0.6; [D.] 0.75; [E.] 6.