Stats Review
Chapter 7

Revised 8/16

Note:

This review is composed of questions similar to those found in the chapter review and/or chapter test. This review is meant to highlight basic concepts from the course. It does not cover all concepts presented by your instructor. Refer back to your notes, unit objectives, handouts, etc. to further prepare for your exam.

The questions are displayed on one slide followed by the answers are displayed in red on the next.

This review is available in alternate formats upon request.

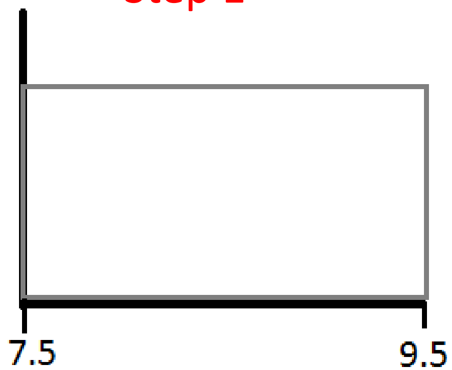
Uniform Distribution

The diameter of ball bearings produced in a manufacturing process can be explained using a uniform distribution over the interval 7.5 to 9.5 millimeters. What is the probability that a randomly selected ball bearing has a diameter greater than 8.6 millimeters?

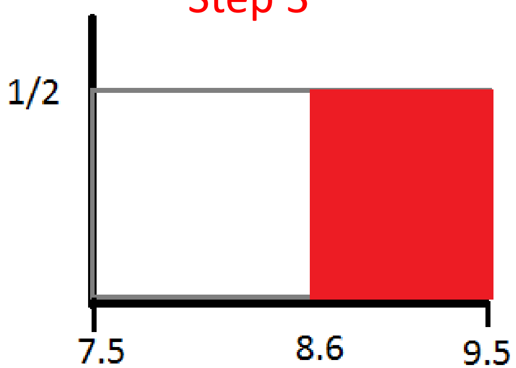
Uniform Distribution

The diameter of ball bearings produced in a manufacturing process can be explained using a uniform distribution over the interval 7.5 to 9.5 millimeters. What is the probability that a randomly selected ball bearing has a diameter greater than 8.6 millimeters?

Step 1



Step 3



1) Draw the distribution
2) Calculate the height
   =1/(max-min)=1/(9.5-7.5)=1/2
3) Shade the desired range
4) Find the area of the shaded range
   (length times height)=(9.5-8.6)(1/2)=**0.45**

This is the probability.

For a standard normal curve, find the z-value, z_α, $z_{\alpha/2}$

a) Area to the left is .1

b) Area to the right is .25

c) $Z_{.01}$

d) For 93% Confidence

For a standard normal curve, find the z-value, z_α, $z_{\propto/2}$

a) Area to the left is .1

Look for where the probability is .1, **z= -1.28**

b) Area to the right is .25

Area is to the right so first 1-.25=.75

The z-value where the probability is .75 is **.67**

c) $Z_{.01}$

This is the same as asking to find the z-value where the area to the right is .01

1-.01=.99; The z-value where the probability is .99 is **2.33**

d) For 93% Confidence

This is asking for $z_{\propto/2}$

$$\frac{1-.93}{2} = 0.035$$

- Can Look up this probability where the z-value would be -1.81 and take the positive so **1.81** or
- Can add 0.035 to .93 to get .965, look up this probability, z= **1.81**

Normal Distribution Probability

A study for Wendy's found the mean time spent in the drive-through was 138.5 seconds. Assuming the drive-through times are normally distributed with a standard deviation of 29 seconds.

a) P(120 seconds<x< 180 seconds)?

b) Would it be unusual for a car to spend more than 3 *minutes* in the drive-through? Why?

Normal Distribution Probability

μ=138.5 σ=29

a) P(120 seconds<x< 180 seconds)?

1) Find the z-score for both 120 seconds and 180 seconds.

$$z=\frac{x-\mu}{\sigma}=\frac{120-138.5}{29}=-.64 \qquad z=\frac{x-\mu}{\sigma}=\frac{180-138.5}{29}=1.43$$

2) Find the probabilities of both these values

Probability associated with -.64 is .2611; Probability associated with 1.43 is .9236

3) Since we want the proportion of cars between 120 and 180 seconds, we will subtract the probabilities from step 3. .9236-.2611=.6625

Conclusion: **About .6625 of cars spend between 120 and 180 seconds in the drive-through.**

b)Would it be unusual for a car to spend more than 3 minutes in the drive-through? Why?

3 minutes=180 seconds

1) Find the z-score $z=\frac{x-\mu}{\sigma}=\frac{180-138.5}{29}=1.43$

2) Probability associated with 1.43 is .9236

3) We want to know if it is unusual to spend *more than* 3 minutes in the drive through, we need to subtract the probability from 1. 1-.9236=.0764.

Conclusion: Since the probability of spending more than 3 minutes in the drive-through is greater than 5% (or .05), **it is not unusual to spend more than 3 minutes in the drive-through**.

Finding the Value Given the Probability

The mean incubation time of fertilized chicken eggs kept at $100.5°F$ in an incubator is 21 days. Suppose that the incubation times are approximately normally distributed with a standard deviation of 1 day.

a) Determine the 17^{th} percentile for incubation time for fertilized eggs.

b) Determine the incubation times that make up the middle 93% of fertilized eggs.

Finding the Value Given the Probability

μ=21 σ=1

a) Determine the 17th percentile for incubation time for fertilized eggs.

1) First find the z-score that corresponds to .17.

Look it up in the table or use technology.

z=-.95.

2) Find x using the formula $x = z\sigma + \mu$

$$x = (-.95)(1) + 21 = \mathbf{20.05\ days}$$

b) Determine the incubation times that make up the middle 93% of fertilized eggs.

1) Find the z-scores for the middle 93%. This is the same as finding $z_{\alpha/2}$

The bottom percent is $\frac{1-.93}{2} = .035$. Looking this value up we find a z-score of -1.81. Using symmetry the other z-score is 1.81. We need both since we are looking for the values where the middle is 93%

2) Find both values of x using the formula $x = z\sigma + \mu$

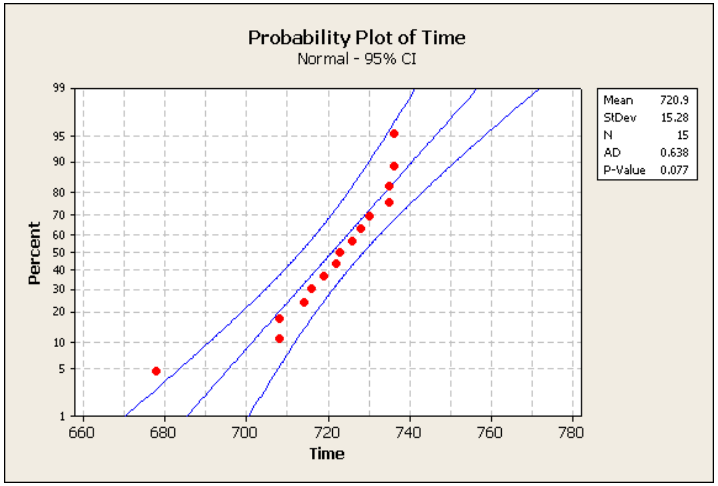
$$x = (-1.81)(1) + 21 = 19.19\ days$$

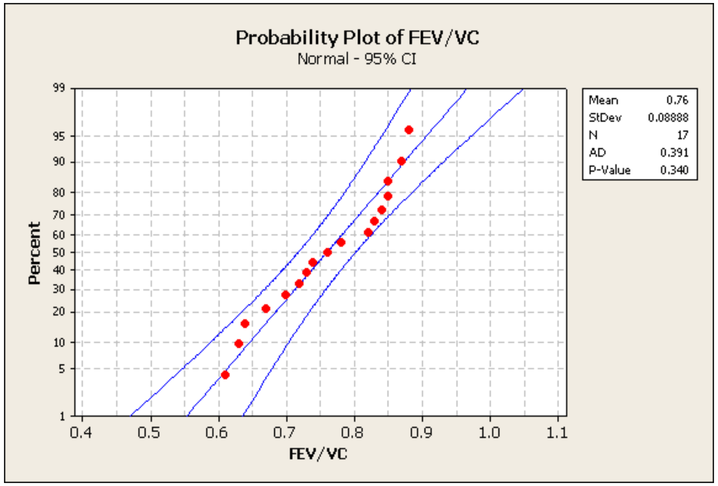
$$x = (+1.81)(1) + 21 = 22.81\ days$$

19.19-22.81 days make up the middle 93% percent

Assessing Normality

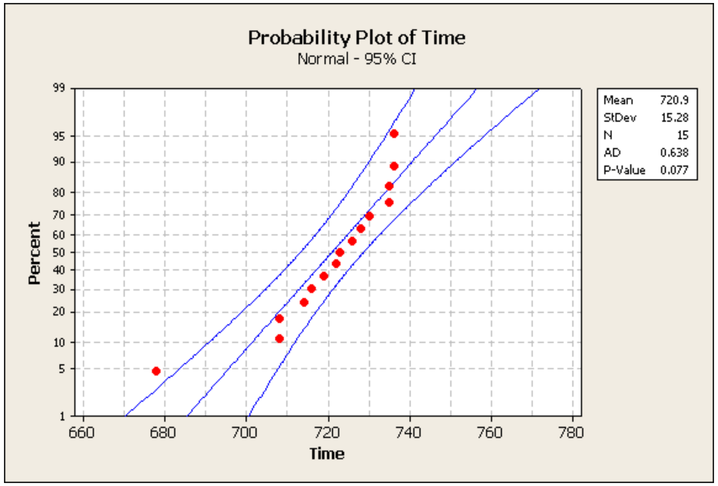
Determine whether the normal probability plot indicates that the sample data could have come from a population that is normally distributed.



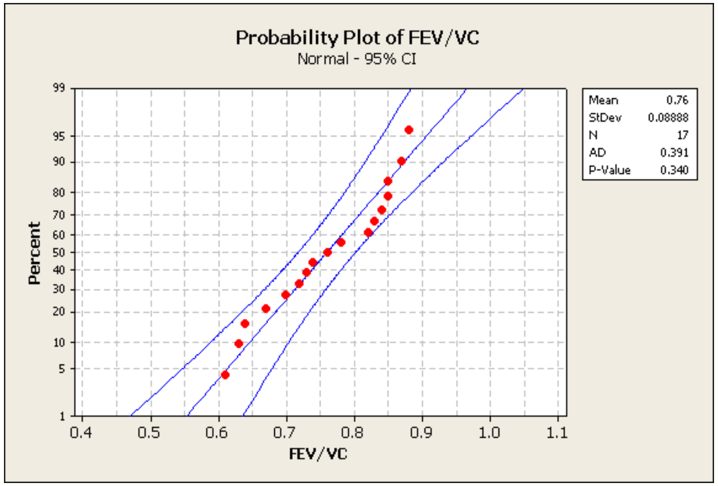


Assessing Normality

Determine whether the normal probability plot indicates that the sample data could have come from a population that is normally distributed.



Not Normal



Normal

A local rental car agency has 100 cars. The rental rate for the winter months is 60%. Find the probability that in a given winter month at least 70 cars will be rented. Use The Normal Approximation to the Binomial Probability Distribution.

The Normal Approximation to the Binomial Probability Distribution

A local rental car agency has 100 cars. The rental rate for the winter months is 60%. Find the probability that in a given winter month at least 70 cars will be rented. Use the normal approximation to the binomial probability distribution.

1) Can we use normal approximation?

   Yes; 100(.6)(1-.6)≥10

2) Find the mean and standard deviation

   $\mu_x = 100(.6) = 60;\ \sigma_x = \sqrt{100(.6)(1-.4)} = 4.899$

3) Want P(X≥70). When using the normal approximation to the binomial probability distribution for P(X≥70) use this is P(X≥70-0.5)=P(X≥69.5). See page 390

4) Find the z-score

   $z = \frac{x-\mu}{\sigma} = \frac{69.5-60}{4.899} = 1.94$

5) Look up the probability: probability is .9738

6) Subtract from 1: 1-.9738=.0262

The probability that in a given winter month at least 70 cars will be rented is .0262.