Barnett

AP Statistics

Packets 22 - 31

AP Statistics Packets 22-31

Packet #22:

1. 4-Step Practice Questions

Packet #23:

1. Chapter 8 Practice Test in Textbook page 549-550

Packet #24:

1. Read through Section 9.1 Notes and look over examples on pages 555-562 in textbook.

Packet #25:

1. Watch the following videos: ***They are not examples from your book (ignore page numbers), but walks you through examples very similar.
   a. https://www.youtube.com/watch?v=AfV5LDh02FU
   b. https://www.youtube.com/watch?v=phG7OgPRQD0

Packet #26:

1. Complete the following problems on textbook pages 563-565 problems 2, 12, 18, 22, and 24.

Packet #27:

1. 9.1 Worksheet

Packet #28:

1. Read through Section 9.2 Notes and look over examples on pages 569 – 580 in textbook.

Packet #29:

1. Watch the following videos: ***They are not examples from your book (ignore page numbers), but walks you through examples very similar.

   a. https://www.youtube.com/watch?v=WR2P6Pd_52A
   b. https://www.youtube.com/watch?v=gR6zVooKfJ4

Packet #30:

1. Complete the following problems on textbook pages 581 – 583 problems 36, 40, 42, and 44.

Packet #31:

1. Potato Chip Problem

Name: _____ Hour: _____ Date: _____

4-step practice questions

1. Suppose we are interested in finding out the proportion of the population at EKHS that has seen The Office. We contact an SRS of 100 students in the school. Of these 100 students, 63 report seeing The Office. Find a 95% confidence interval for the true proportion of EKHS students who have seen The Office.

2. Mr. Wilcox has done over 50 track days at Gingerman Raceway in South Haven Michigan. He keeps track of each lap time (in seconds) and has found that they follow an approximately normal distribution. A random sample of 9 laps shows a mean laptime of $\bar{x} = 102.4$ seconds with a standard deviation of $s_x = 3.2$ seconds. Create a 90% confidence interval for Mr. Wilcox's career average lap time.

3. Mrs. Gallas was an all-star basketball player in high school. To prove that she still has skills, she took 50 free throws and made 31 of them. Think of these 50 shots as being a random sample of all the free throws she has ever taken. Find a 99% confidence interval for the true proportion of free throws Mrs. Gallas would make.

9.1 Significance Tests: The Basics

Significance Test: formal procedure for using observed data to ~~describe~~ decide between two competing claims (called hypotheses)

null hypothesis (H_o): claim that we weigh evidence against in a significant test

alternative hypothesis (H_a): claim that we are trying to find evidence for

one-sided H_a: states that a parameter is ~~#~~ $>$ or $<$ ~~#~~ H_o

two-sided H_a: states that parameter is different from H_o

Example pg. 555

Check Your Understanding pg. 556
① $H_o : p = 0.85$ $H_A : p \neq 0.85$, where $p =$ proportion of all students at Jannie's high school who got fewer than 8 hrs of sleep at night.

② $H_o : \mu = 10$ $H_A : \mu > 10$, where $\mu =$ true mean amount of time that it takes to complete the census form

9.1 Continued

P-value: probability of getting evidence for the H_a as strong or stronger than the observed evidence when H_0 is true

Example pg. 557

How to Make a Conclusion in a Significance Test
① If P-value is small, ~~eve~~ reject H_0 & conclude that there is convincing evidence for H_a

② If P-value is not small, fail to reject H_0 and conclude that there is not convincing evidence for H_a

significance level α (alpha) : value that we use as boundary for deciding whether an observed result is unlikely to happen by chance alone when H_0 is true

Example pg. 559

Type I error : test rejects H_0 when H_0 is true

Type II error : test fails to reject H_0 when H_a is true

* Example pg. 561 *

9.1 Continued

Probability of making a Type I error in a significance test is equal to the significance level α.

Check Your Understanding pg. 562

① Type I error : finds evidence that ~~63%~~ less than 63%, when true proportion is .63.
Type II error : does not find convincing evidence when true proportion is less than .63

② Type I

③ No, Type I error is 10% of time just by chance

④ Assuming true proportion of all drive-thru customers who have to wait > 2 min to receive food after placing order is .63, there is .0385 probability of getting a sample proportion of .576 or less who have to wait longer than 2 min just by chance in a random sample of 250 drive-thru customers.

pg. 563-565
2, ~~4~~, 12, ~~14~~, 18, 22, 24

~~─────────~~

9.1 WS

A Better Golf Club?

Mike is an avid golfer who would like to improve his play. A friend suggests getting new clubs and lets Mike try out his 7-iron. Based on years of experience, Mike has established that the mean distance that balls travel when hit with his old 7-iron is $\mu = 175$ yards with a standard deviation of $\sigma = 15$ yards. He is hoping that this new club will make his shots with a 7-iron more consistent (less variable), so he goes to the driving range and hits 50 shots with the new 7-iron

(a) Describe the parameter of interest in this setting.

(b) State appropriate hypotheses for performing a significance test.

Based on 50 shots with the new 7-iron, the standard deviation was $s_x = 10.9$ yards. A significance test using the sample data produced a P-value of 0.002.

(c) Interpret the P-value in this context.

(d) Do the data provide convincing evidence against the null hypothesis? Explain.

(e) Interpret the result in part d in context.

9.2 Tests About a Population Proportion

Conditions For Performing a Significance Test
About a Proportion
① Random
② 10%
③ Large Counts

Example pg. 569

Standardized Test Statistic: measures how far
a sample statistic is from what we would
expect if the H_0 were true, in standard
deviation units

$$\frac{\hat{P} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} = \text{standardized test statistic} = \frac{\text{statistic - parameter}}{\text{stan. dev. of statistic}}$$

Example pg. 571-572

Significance Tests 4 Step Process
State: hypotheses, significance level, parameters
Plan: One-Sample z test for p (check conditions)
Do: Give sample statistic, calculate, find p-value
Conclude: about hypotheses

Example pg. 574-575
↳ use calculator

Example pg. 574-575
1- Prop Z Test
$p_0 = .08$, x :47
n = 500   > p_0
Calculate

9.2 Continued

Check Your Understanding pg. 576

State: $H_0 : p = 0.20$ $H_a : p > 0.20$, where
   $p =$ true proportion of all teens at the school
   who would say they have electronically sent
   or posted sexually suggestive images of
   themselves, using $\alpha = 0.05$

Plan: One-Sample z Test for p
  • Random: random sample of 250
  • 10%: $250 < .10N$
  • Large Counts: $np = 50 \geq 10$ $n(1-p) = 200 \geq 10$

Do: 1-Prop Z Test $p_0 = .2$, $x = 63$, $n = 250$, $> p_0$
   $z = 2.055480479$
   $p = .0199162423$
   $\hat{p} = .252$

Conclude: Because the P-value of $.0197 < \alpha = .05$,
   we reject H_0. We have convincing evidence
   that more than 20% of the teens in her
   school would say they have electronically sent
   or posted sexually suggestive images of
   themselves.

* Example pg. 577-578 *
     1-Prop Z Test
     $p_0 = .68$, $x = 90$, $n = 150$, $\neq p_0$

9.2 Continued

Check Your Understanding pg. 580

① State:

Plan:

Do: $\hat{p} = .68$, $z = ^-1.62$, P-Value = 0.1052

Conclude: Because the P-Value of 0.1052 > $\alpha = 0.10$, we fail to reject H_o. We do not have convincing evidence that the true proportion...

② Confidence interval gives values of p that are plausible. A two-sided test only allows us to reject (or fail to reject) hypothesized value.

pg. 581 - 583
36, 40, 42, 44, ~~46~~, ~~41~~ ~~48~~

A potato-chip producer has just received a truckload of potatoes from its main supplier. If the producer determines that more than 8% of the potatoes in the shipment have blemishes, the truck will be sent away to get another load from the supplier. A supervisor selects a random sample of 500 potatoes from the truck. An inspection reveals that 47 of the potatoes have blemishes. Carry out a significance test at the $\alpha = 0.10$ significance level. What should the producer conclude?