Ch. 13 Review AP Statistics Name: Key

Directions: Work on these sheets. Answer completely, but be concise.

Part 1: Multiple Choice. *Circle the letter corresponding to the best answer.*

1. To use the two-sample *t* procedure to perform a significance test on the difference between two means, we assume that

B

(a) the populations' standard deviations are known.
(b) the samples from each population are independent.
(c) the distributions are exactly Normal in each population.
(d) the sample sizes are large.
(e) all of the above

2. In a large midwestern university (the class of entering freshmen being on the order of 6000 or more students), an SRS of 100 entering freshmen in 1993 found that 20 finished in the bottom third of their high school class. Admission standards at the university were tightened in 1995. In 1997 an SRS of 100 entering freshmen found that 10 finished in the bottom third of their high school class. Let p_1 and p_2 be the proportion of all entering freshmen in 1993 and 1997, respectively, who graduated in the bottom third of their high school class. What conclusion should we draw?

$\hat{p}_1 = \frac{20}{100}$

$\hat{p}_2 = \frac{10}{100}$

$H_0: p_1 = p_2$

$H_A: p_1 > p_2$

D

(a) We are 95% confident that the admissions standards have been tightened.
(b) Reject H_0 at the $\alpha = 0.01$ significance level.
(c) Fail to reject H_0 at the $\alpha = 0.05$ significance level.
(d) There is significant evidence at the 5% level of a decrease in the proportion of freshmen who graduated in the bottom third of their high school class that were admitted by the university.
(e) If we reject H_0 at the $\alpha = 0.05$ significance level based on these results, we have a 5% chance of being wrong.

$z = 1.98$

$p = 0.024$

3. What would be the appropriate hypotheses for a research company who wants to see if there is a difference in the amount of vitamin D in a brand name multi-vitamin and generic brand multi-vitamin?

C

(a) H_0: $\mu_b - \mu_g = 0$, H_a: $\mu_b - \mu_g > 0$
(b) H_0: $\mu_b - \mu_g = 0$, H_a: $\mu_b - \mu_g < 0$
(c) H_0: $\mu_b - \mu_g = 0$, H_a: $\mu_b - \mu_g \neq 0$
(d) H_0: $p_b - p_g = 0$, H_a: $p_b - p_g > 0$
(e) H_0: $p_b - p_g = 0$, H_a: $p_b - p_g \neq 0$

4. A soup manufacturer is deciding which company to use for their mushroom purchases. A random sample of 20 mushrooms for each company found 30% from one company were damaged and 35% from the other company were damaged. What assumptions for the two proportions *z* test would not be a concern?

B

I. We don't know that they are random samples from both companies.
II. The samples may not be independent
III. The sample size is not large enough

(a) I only
(b) II only
(c) III only
(d) I and II only
(e) I, II, and III

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5. The Excellent Drug Company claims its aspirin tablets will relieve headaches faster than any other aspirin on the market. To determine whether Excellent's claim is valid, random samples of size 15 are chosen from aspirins made by Excellent and the Simple Drug Company. An aspirin is given to each of the 30 randomly selected persons suffering from headaches and the number of minutes required for each to recover from the headache is recorded. The sample results are:

C

	$\bar{x}$	s^2
Excellent (E)	8.4	4.2
Simple (S)	8.9	4.6

A 5% significance level test is performed to determine whether Excellent's aspirin cures headaches significantly faster than Simple's aspirin. The appropriate hypotheses to be tested are

(a) H_0: $\mu_E - \mu_S = 0$; H_a: $\mu_E - \mu_S > 0$
(b) H_0: $\mu_E - \mu_S = 0$; H_a: $\mu_E - \mu_S \neq 0$
(c) H_0: $\mu_E - \mu_S = 0$; H_a: $\mu_E - \mu_S < 0$
(d) H_0: $\mu_E - \mu_S < 0$; H_a: $\mu_E - \mu_S = 0$
(e) H_0: $\mu_E - \mu_S > 0$; H_a: $\mu_E - \mu_S = 0$

6. 42 of 65 randomly selected people at a baseball game report owning an iPod. 34 of 52 randomly selected people at a rock concert occurring at the same time across town reported owning an iPod. A researcher wants to test the claim that the proportion of iPod owners at the two venues is not the same. A 90% confidence interval for the difference in population proportions is $(-0.154, 0.138)$. Which of the following gives the correct outcome of the researchers' test of the claim?

B

(a) Since the confidence interval includes 0, the researcher can conclude that the proportion of iPod owners at the two venues is the same.
(b) Since the confidence interval includes 0, the researcher can conclude that the proportion of iPod owners at the two venues may be the same.
(c) Since the confidence interval includes 0, the researcher can conclude that the proportion of iPod owners at the two venues is different.
(d) Since the confidence interval includes more positive than negative values, we can conclude that a higher proportion of people at the baseball game own iPods than at the rock concert.
(e) We cannot draw a conclusion about a claim without performing a significance test.

7. A hypothesis test comparing two population proportions results in a P-value of .032. Which of the following is a proper conclusion?

E

(a) The probability that the null hypothesis is true is .032.
(b) The probability that the alternative hypothesis is true is .032.
(c) The difference in sample proportions is .032.
(d) The difference in population proportions is .032
(e) None of the above are proper conclustions.

8. In a random sample of 300 elderly men, 65% were married, while in a random sample of 400 elderly women, 48% were married. Which of the following is the 99% confidence interval estimate for the difference between the proportion of elderly men and the proportion of elderly women who are married?

B

(a) 0.17 ± 0.073
(b) 0.17 ± 0.096
(c) 0.55 ± 0.067
(d) 0.56 ± 0.067
(e) 0.565 ± 0.096

$\hat{p}_1 = \frac{195}{300} = .65$

$\hat{p}_2 = \frac{192}{400} = .48$

$(.074, .266)$

Part 2: Free Response

Answer completely, but be concise. Communicate your thinking clearly and completely.

9. A study of iron deficiency among infants compared samples of infants following different feeding regimens. One group contained breast-fed infants, while the children in another group were fed a standard baby formula without any iron supplements. Here are the results on blood hemoglobin levels at 12 months of age.

	Group	n	$\bar{x}$	s
μ_1	Breast-fed	23	13.3	1.7
μ_2	Formula	19	12.4	1.8

(a) Is there significant evidence that the mean hemoglobin level is higher among breast-fed babies? Give appropriate statistical evidence to support your conclusion.

$H_0: \mu_1 = \mu_2$ $\qquad \alpha = 5\%$

$H_A: \mu_1 > \mu_2$

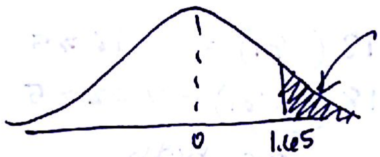
$$t = \frac{13.3 - 12.4}{\sqrt{\frac{1.7^2}{23} + \frac{1.8^2}{19}}} = 1.65$$

SRS: Assume for both; may not generalize results

Normal: sample sizes not large enough to use CLT theorem; no data for boxplots; proceed with caution

Indep: $N \geq 10(23) = 230$ At least 230 breastfed babies in pop
$N \geq 10(19) = 190$ At least 190 formula fed babies in pop.

Assume samples indep of each other



$p = 0.0533$

Because p value is larger than sig. level, I will fail to reject the H_0 that the mean hemoglobin level of the 2 groups is the same.

(b) Construct a 95% confidence interval for the mean difference in hemoglobin level between the two populations of infants. Interpret your interval in the context of this problem.

$$(13.3 - 12.4) \pm 2.101\sqrt{\frac{1.7^2}{23} + \frac{1.8^2}{19}}$$

$(-0.2021, \ 2.0021)$

I am 95% confident that the diff. in the mean hemoglobin levels of breastfed babies and formula fed babies falls between -0.2021 and 2.0021.

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10. The pesticide diazinon is in common use to treat infestations of the German cockroach, *Blattella germanica*. A study investigated the persistence of this pesticide on various types of surfaces. Researchers applied a 0.5% emulsion of diazinon to glass and plasterboard. After 14 days, they placed 18 cockroaches on each surface and recorded the number that died within 48 hours. On glass, 9 cockroaches died, while on plasterboard, 13 died.

$\hat{p}_1 = 0.5$

(a) Chemical analysis of the residues of diazinon suggests that it may persist longer on plasterboard than on glass because it binds to the paper covering on the plasterboard. The researchers therefore expected the mortality rate to be greater on plasterboard than on glass. Conduct a significance test to assess the evidence that this is true.

$\hat{p}_2 = 0.72$

$\hat{p}_c = \frac{22}{36} = 0.61$

p_1 = glass
p_2 = plasterboard

$H_0: p_1 = p_2$
$H_A: p_1 < p_2$

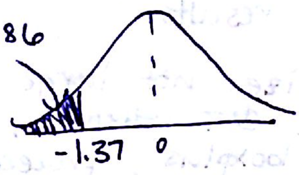
$\alpha = 5\%$

SRS: Assume for both; may not generalize results

$$z = \frac{.5 - .72}{\sqrt{(.61)(1-.61)\left(\frac{1}{18}+\frac{1}{18}\right)}} = -1.366$$

Normal: $18(.61) = 10.98 \geq 5$
$18(1-.61) = 7.02 \geq 5$
for both

p = .086



Indep: $N \geq 10(18) = 180$
At least 180 cockroaches in pop for both
Assume 2 samples indep of each other

Because p value is larger than the sig. level, I will fail to reject the Ho that the prop. of roaches that died on glass is the same as the prop. that died on plasterboard.

(b) Construct and interpret a 95% confidence interval for the difference in the two population proportions.

$$(.5 - .72) \pm 1.96\sqrt{\frac{.5(1-.5)}{18} + \frac{.72(1-.72)}{18}}$$

$(-0.532, 0.088)$

I am 95% confident that the difference in the proportion of roaches that died on glass and the prop. of roaches that died on plasterboard falls between -0.532 and 0.088.

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