NAME_____ Honor _____

Exam 3

Answer each question. **Show your work**, even if you do most of the answer on a calculator you need to set up the problem and show me what you were using to get that answer. **Circle your final answer**. The honor code is in affect.

1. Election day has passed. Every news station conducted their own exit polls where they ask voters as they come out of the voter booth who they voted for and why.
   a. One station asked 1000 voters in Ohio whom they voted for, 515 had voted for Bush. What is the best estimate of the proportion of Ohioans that voted for Bush?

$\frac{515}{1000} = .515$

   b. What is the 99% confidence interval around the estimated proportion?

$\alpha = .01$
$\frac{\alpha}{2} = .005$

$.515 \pm 2.576\sqrt{\frac{(.515)(.485)}{1000}}$ $[.4743, .5557]$

$.0407$

   c. An exit poll in Florida asked 1050 voters whom they had voted for. 560 of those asked had voted for Bush. What is the difference in proportion of Florida voters and Ohio voters that voted for Bush?

$\frac{560}{1050} = .533$ $.533 - .515 = .018$

OR

$.515 - .533 = -.018$

   d. Construct a 95% confidence interval around the difference in proportions.

$.018 \pm 1.96\sqrt{\frac{(.515)(.485)}{1000} + \frac{(.533)(.467)}{1050}}$

$.043344$ $= [-.025844, .061744]$

OR

$-.018 \pm .043344 = [-.061344, .025344]$

e. Can you say with 95% confidence that there is a difference in the proportion of voters for Bush in Florida and Ohio? Why? (You do not need to use a hypothesis test here)

you cannot say there is difference because zero is in your interval

2. You are interested in the demographics of voters in Orange County. You suspect that registered Republicans are on average richer than registered Democrats. You talk to 12 Republicans and 15 Democrats. You find that the average income of the Republicans you surveyed is \$62,000 with a standard deviation of \$2000. For Democrats the average was \$58,000 with at standard deviation of \$4000. to test this

a. Set up a null and alternative hypothesis to test this assumption.

$H_0: \mu_R - \mu_D = 0$ or $H_0: \mu_D - \mu_R = 0$

$H_A: \mu_R - \mu_D > 0$ $H_A: \mu_D - \mu_R < 0$

b. Should you use a normal (z) distribution or a t distribution?

$12+15-2 = 25 < 30$ use the t

c. List two differences between the t and z distribution.

the t has thicker tails
and
the t changes with the # of degrees of freedom

d. What is your critical value at a 95% confidence level?

$t_{crit} = 1.708$ or -1.708

$\alpha = .05$
one tail d.f. = 25

e. What is your observed values or test statistic?

$t_{obs} = \frac{62,000 - 58,000 - 0}{3274.14 \sqrt{\frac{1}{12} + \frac{1}{15}}} = 3.154$ or $\frac{58,000 - 62,000 - 0}{1268.07} = -3.154$

1268.07

$s^2 = \frac{11(2000)^2 + 14(4000)^2}{12+15-2} = 10720000$

$s = 3274.14$

f. What is the result of your hypothesis test? Explain it in words.

$t_{obs} > t_{crit}$ reject H_0

You can be 95% confident that Republicans are richer than Democrates

3. Americanassembler.com reported that the average IQ of those states that voted Democrat is 105 (well above that of the Republican states). You don't trust anything you see on the web (as you shouldn't) and decide to conduct your own survey to see if Democrats have a different average IQ than the web site reported.
   a. If the range of IQ scores is expected to be 100 and you wish to estimate Democrats average IQ with in 2 points at a 95% level of confidence, how many Democrats should you survey?

$\mu_s = 100$

$s = 25$

$R = 100 \quad D = 2 \quad \alpha = .05 \quad z_{\alpha/2} = 1.96$

$1.96\left(\frac{25}{\sqrt{n}}\right) = 2$

$\sqrt{n} = 24.5 \quad n = 600.25$ or 601 people

   b. You survey the number of Democrats found in part (a) and find that their average IQ is 102 with a standard deviation of 30. What is the p-value associated with the hypothesis test that Democrats have an IQ of 105?

$n = 601 \quad \mu = 102 \quad s = 30$

$H_0: \mu = 105$

$H_A: \mu \neq 105$

$z_{obs} = \frac{102 - 105}{\frac{30}{\sqrt{601}}} = -2.45$

$p = .0142$

.4929 .0071

-2.45 -2.45

   c. Give an example of a significant level at which you would reject the null hypothesis and an example of when you would fail to reject the null hypothesis.

any $\alpha > .0142$ Reject H_0 eg .05

any

$\alpha < .0142$ fail to Reject H_0. eg .01