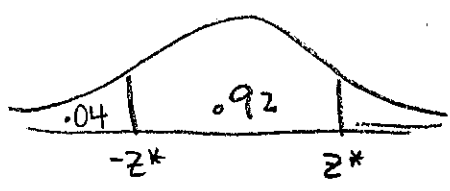1. What is the critical value z* for a 92% confidence interval?

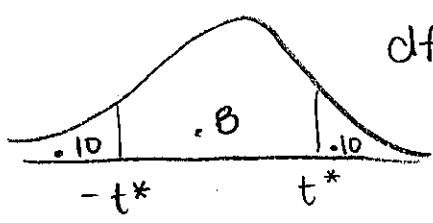   a. 1.41
   b. 1.645
   c. 1.75
   d. 1.96
   e. 2.576

$\text{inv Norm}(\text{area} = .04, \mu = 0, \sigma = 1)$

$z^* = 1.75$

2. What is the critical value t* that satisfies the condition that the t distribution with 8 degrees of freedom has a probability 0.10 to the right of t*?

   a. 0.90
   b. 1.282
   c. 1.397
   d. 1.415
   e. 1.860

$df = 8$ $\text{invT}(\text{area} = .1, df = 8)$

$t^* = 1.397$

3. The critical value used to construct a confidence interval for a proportion depends upon

   a. The confidence level being used and the size of the sample.
   b. The size of the sample and the sample proportion.
   c. The confidence level, the size of the sample, and the standard deviation of the population.
   d. Only on the sample size.
   e. Only on the confidence level.

4. The college newspaper of a large Midwestern university periodically conducts a survey of students on campus to determine the attitude on campus concerning issues of interest. Students are interviewed by a reporter "roaming" the campus selecting students to interview. On a particular day, the reporter interviews five students and asks them if they feel there is adequate student parking on campus. Four of the students say, "no." Which of the following conditions for inference about a proportion using a confidence interval are violated in this example?

   I. The data are an SRS from the population of interest. – violated
   II. The population is at least ten times as large as the sample. ✓
   III. $n\hat{p} \geq 10$ and $n(1 - \hat{p}) \geq 10$ – violated

   a. I only
   b. II only
   c. III only
   d. I and III
   e. All three conditions are violated

   $5(\frac{4}{5}) = 4 \not\geq 10$

5. Which of the following confidence intervals has the largest critical value?

   a. A 95% z-interval   1.96
   b. A 95% t-interval with 1 degree of freedom   12.71
   c. A 95% t-interval with 10 degrees of freedom   2.23
   d. A 90% t-interval with 1 degree of freedom   6.32
   e. A 90% t-interval with 10 degrees of freedom   1.82

   t-dist has more area in tails, gets narrower as d.f. increases

6. A marketing company discovered the following problems with a recent poll:

    I.   Some people refused to answer questions
    II.   People without telephones could not be in the sample
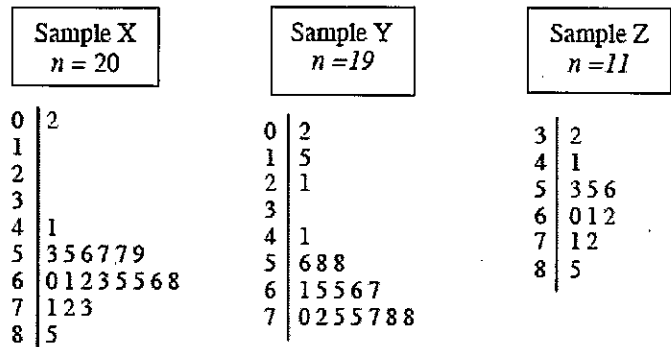   III.   Some people never answered the phones in several calls

Which of these sources is included in the ±2% margin of error announced for the poll?

    a. Only source I
    b. Only source II
    c. Only source III
    d. All three sources of error.
    (e.) None of these sources of error.

* only sampling variability is accounted for

7. In preparation for constructing confidence interval for a population mean, it's important to plot the distribution of sample data. Below are stem plots describing samples from three different populations. For which of the three samples would it be safe to construct a t-interval?

    a. Sample X only
    b. Sample Y only
    (c.) Sample Z only
    d. Sample X and Z
    e. None of the plots.

Sample X $n = 20$	Sample Y $n = 19$	Sample Z $n = 11$
0 | 2	0 | 2	3 | 2
1 |	1 | 5	4 | 1
2 |	2 | 1	5 | 3 5 6
3 |	3 |	6 | 0 1 2
4 | 1	4 | 1	7 | 1 2
5 | 3 5 6 7 7 9	5 | 6 8 8	8 | 5
6 | 0 1 2 3 5 5 6 8	6 | 1 5 5 6 7	
7 | 1 2 3	7 | 0 2 5 5 7 8 8	
8 | 5		

outlier   *obvious skewness*

Use for Questions #8-10: A 95% confidence interval for p, the proportion of all shoppers at a large grocery store who purchase cookies, was found to be (0.236, 0.282).

8. The point estimate and margin of error for this interval are:

$$\frac{.236 + .282}{2} = .259$$

    a. Point estimate = 0.259;   Margin of error = 0.046
    (b.) Point estimate = 0.259;   Margin of error = 0.023
    ~~c.~~ Point estimate unknown;   Margin of error = 0.023
    ~~d.~~ Point estimate = 0.236;   Margin of error = 0.282
    ~~e.~~ Point estimate = 0.236;   Margin of error = 0.046

$.282 - .259 = .023$

9. Which of the following is a correct statement?

    a. About 95% of the shoppers have between a 023.6% and a 28.2% chance of purchasing cookies.
    b. There is a 95% probability that the sample proportion lies between 0.236 and 0.282.
    c. If a second sample was taken, there is a 95% chance that its confidence interval would contain 0.25.
    d. This confidence interval indicates that more than 25% of shoppers buy cookies.
    (e) We are reasonably certain the true proportion of shoppers who purchase cookies is between 24% and 28%.

10. Which of the following would be true about a 98% confidence interval constructed using the same data?

    (a.) The interval would be wider, because the critical value z* would be larger.
    b. The interval would be narrower, because the critical z* would be smaller.
    c. The interval would be wider, because the standard error would be larger.
    d. The interval would be narrower, because the standard error would be smaller.
    e. The interval would be about the same width, because the standard error would be smaller, but the critical z* would be larger.

11. A random sample of 900 individuals has been selected from a large population. It was found that 180 are regular users of vitamins. Thus, the proportion of the regular users of vitamins in the population is estimated to be 0.20. The standard error of this estimate is approximately

    a. 0.0002
    (b.) 0.0133
    c. 0.0267
    d. 0.1600
    e. 0.4000

$$SE_{\hat{p}} = \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} = \sqrt{\frac{.2(1-.2)}{900}} = .0133$$

$$\hat{p} = \frac{180}{900} = .2$$

12. A survey was conducted by calling land-line telephones, and those conducting the survey are concerned about the possibility of undercoverage, since some people do not own a phone or own only a cell phone. Which of the following is the best way for them to correct for this source of bias?

    a. Use a lower confidence level, such as 80%.
    b. Use a higher confidence level, such as 99%.
    c. Take a larges sample.
    d. Use a t-interval instead of a z-interval.
    (e.) Throw this sample out and start over again with a better sampling method.

13. Which of the following is the closest to the sample size you would need to estimate p with a margin of error of 0.05 with 95% confidence? Use 0.5 as an approximation of p.

    a. 269
    (b.) 385
    c. 538
    d. 768
    e. 1436

$$1.96 \sqrt{\frac{.5(1-.5)}{n}} \le \left(\frac{.05}{1.96}\right)^2$$

$$\frac{.25}{n} \le \left(\frac{.05}{1.96}\right)^2 \, n$$

$$\frac{}{\left(\frac{.05}{1.96}\right)^2} \quad \frac{}{\left(\frac{.05}{1.96}\right)^2}$$

$$384.16 \le n$$

14. A 98% confidence interval for the mean μ of a population is computed from a random sample and found to be 7 ± 5. We may conclude that

    ~~a.~~ There is a 98% probability that μ is between 2 and 12.
    ~~b.~~ 7 is the sample proportion.
    ~~c.~~ 5 is the critical value.
    (d.) 7 is the sample mean.
    e. All of the above are true.

15. You want to estimate the true proportion of students at FZE who take at least one AP class. You take an SRS of 40 students at your school and find that 10 of the students take at least one AP class. Construct a 90% confidence interval for the true proportion of students at FZE who take at least one AP class.

a. $.25 \pm 0.1126$
b. $.25 \pm 0.1342$
c. $.25 \pm 0.1300$
d. $.25 \pm 0.1227$
e. $.25 \pm 0.0924$

(a. circled)

$$\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$.25 \pm 1.645 \sqrt{\frac{.25(1-.25)}{40}}$$
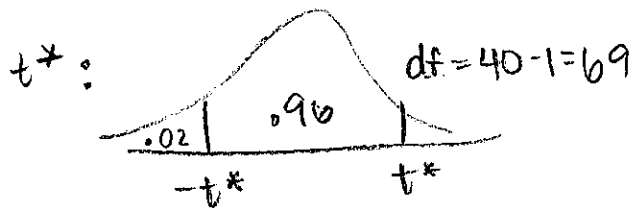
$$.25 \pm .1126$$

$\hat{p} = \frac{10}{40} = .25$

z^* — look at bottom row of Table B

16. You want to estimate the true mean height of all students at FZE. You take an SRS of 70 students and get an average height of 67.3 in. with a standard deviation of 4.2 inches. Construct a 96% confidence interval for the true mean height of all students at FZE.

a. $67.3 \pm 2.054 \frac{4.2}{\sqrt{70}}$

b. $67.3 \pm 2.054 \frac{4.2}{\sqrt{69}}$

c. $67.3 \pm 1.777 \frac{4.2}{\sqrt{70}}$

d. $67.3 \pm 2.093 \frac{4.2}{\sqrt{70}}$

e. $67.3 \pm 2.093 \frac{4.2}{\sqrt{69}}$

(d. circled)

$$\bar{x} \pm t^* \left(\frac{s_x}{\sqrt{n}} \right)$$

$$67.3 \pm 2.093 \left(\frac{4.2}{\sqrt{70}} \right)$$

t^*:

$df = 40-1 = 69$

$.02$ $.96$

$-t^*$ t^*

invT (area = .02, df = 69)

$t^* = 2.093$