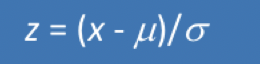
QUESTIONS:

Z-table: <https://www.ztable.net/>

1. (1 point) Given that z is a standard normal random variable, compute the following probabilities.

Z- score: if the z-score is positive, indicating that the score is higher than the mean value; If the z-score is negative, this indicates that the score is lower than the mean value.



a) P(z ≤ −1.0)

The z score of -1 is .15866.

P(z ≤ −1.0) = .15866.

b) P(z ≥ −1)

P(z ≥ −1) = 1 - P(z ≤ -1). Then we should focus on the z-table. according to the z-table, the z score of -1 is .15866.

P(z ≥ −1.0) = 1-P(z < -1.0) = 1 - .15866 = .84134

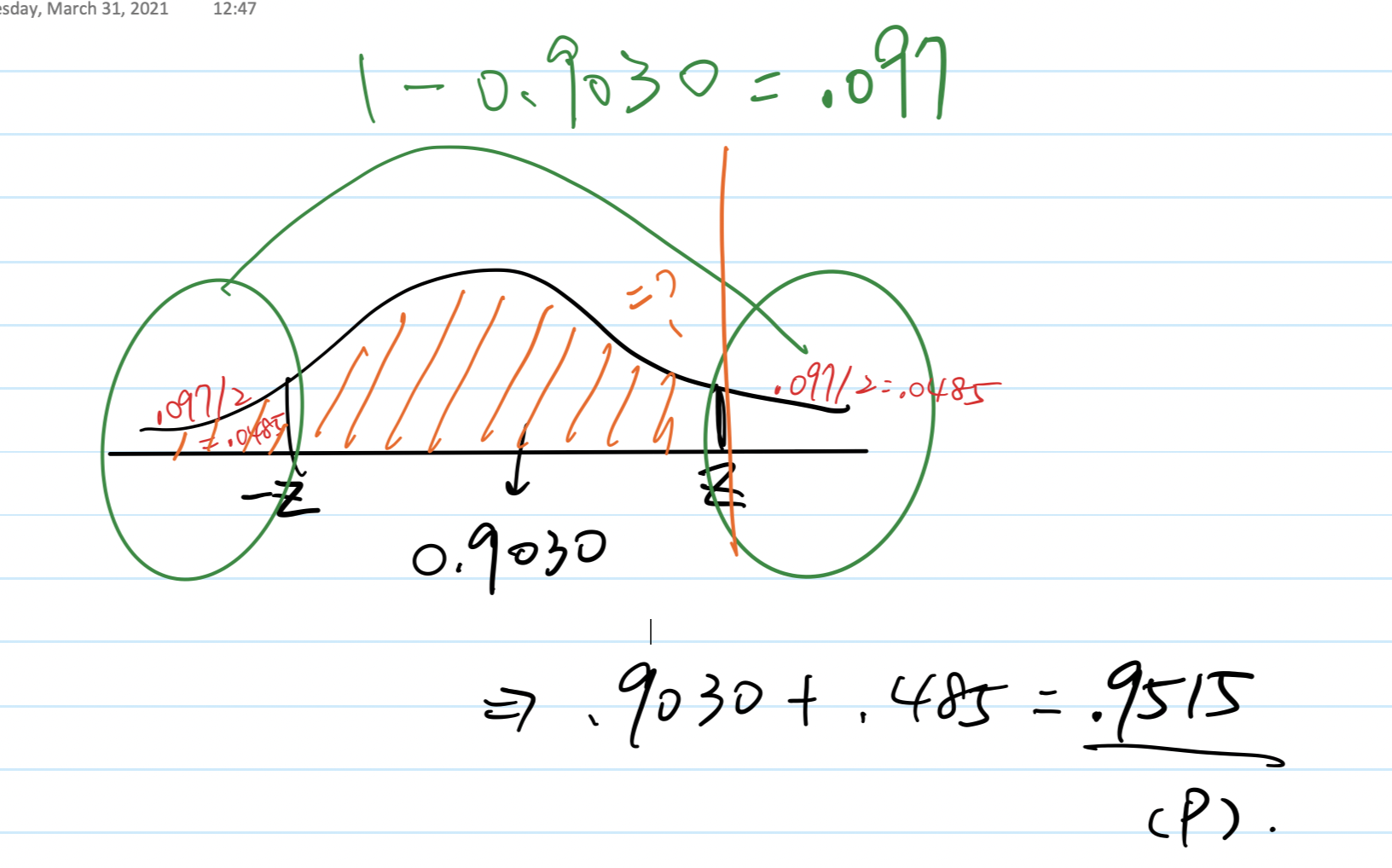
2. (1 point) Given that z is a standard normal random variable, find z for each situation.

a) The area to the left of z is .2119.

The probability of .2119 corresponds to a z score of -0.8.

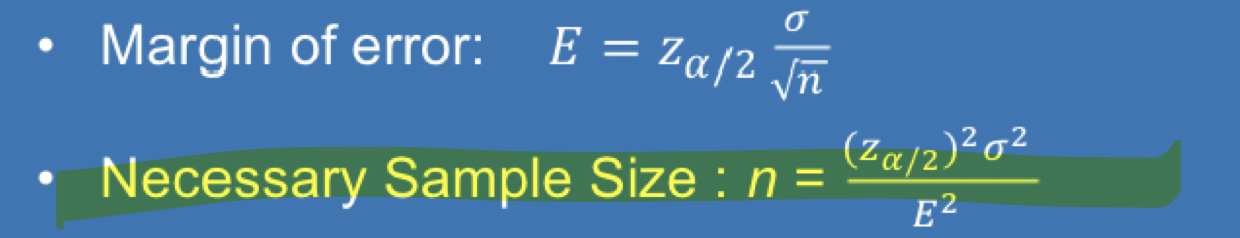
b) The area between −z and z is .9030.

The probability is .9515, so the z-score is 1.66, according to the z-table.



3. (2 point) The U.S. Energy Information Administration (US EIA) reported that the average price for a gallon of regular gasoline is $2.94. The US EIA updates its estimates of average gas prices on a weekly basis. Assume the **standard deviation is $.25** for the price of a gallon of regular gasoline and **recommend the appropriate sample size** for the US EIA to use if they wish to report each of the following margins of error at **95% confidence**.

Because this question is about how we estimate sample size, the following equation is :



a) The desired margin of error is $.10.

A margin of error tells us how many percentage points your results will differ from the real population value.

E = .10

Critical value of 95% confidence interval = Z $\alpha$/2 = NORM.S.INV(0.975) = 1.96

n = (1.96)^2 \* (.25)^2 / (.1)^2 = 24.01

**Ans: the appropriate sample size is 24 for the US EIA if the desired margin of error is $.10.**

b) The desired margin of error is $.07.

E = .07

Critical value of 95% confidence interval = Z $\alpha$/2 = NORM.S.INV(0.975) = 1.96

n = (1.96)^2 \* (.25)^2 / (.07)^2 = 49

**Ans: the appropriate sample size is 49 for the US EIA if the desired margin of error is $.07.**

c) The desired margin of error is $.05.

E = .05

Critical value of 95% confidence interval = Z $\alpha$/2 = NORM.S.INV(0.975) = 1.96

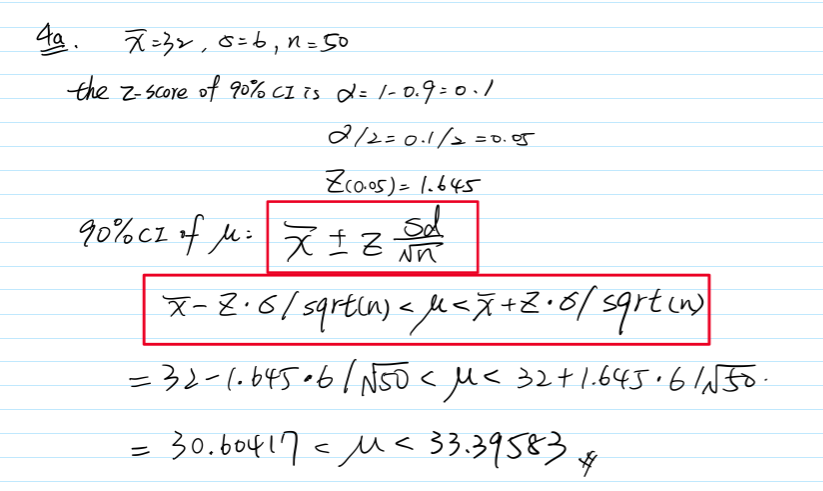
n = (1.96)^2 \* (.25)^2 / (.05)^2 = 96.04

**Ans: the appropriate sample size is 96 for the US EIA if the desired margin of error is $.05.**

4. (1 point) A simple random sample of 50 items from a population with sigma = 6 resulted in a sample mean of 32.

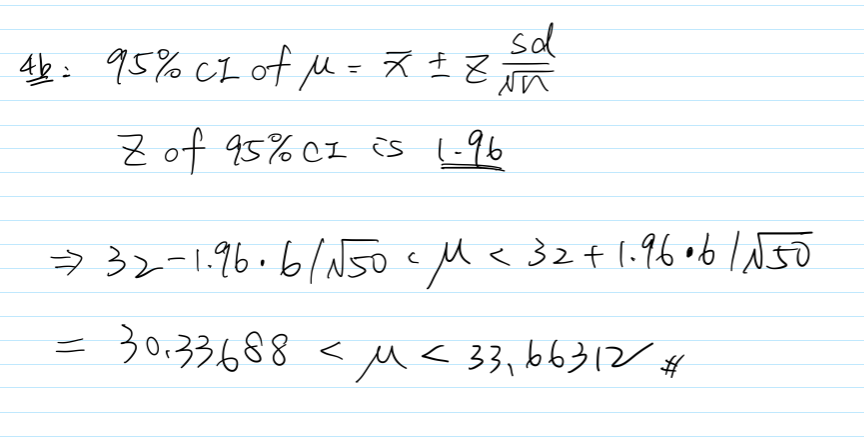
a) Provide a 90% confidence interval for the population mean.

Ans: [30.60417, 33.39583]



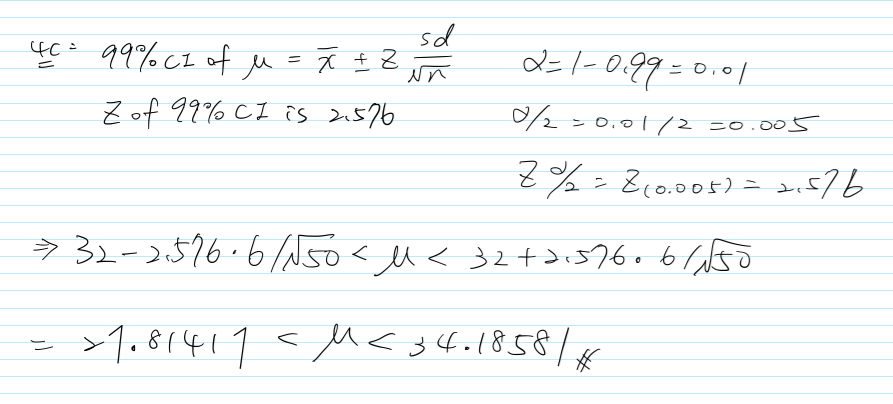
b) Provide a 95% confidence interval for the population mean.

Ans: [30.33688, 33.66312]



c) Provide a 99% confidence interval for the population mean.

Ans: [29.81419, 34.18581]



5. (2point) A simple random sample of 400 individuals provides 100 Yes responses.

That is, x = 100 (providing YES responses), n = 400.

a) What is the point estimate of the proportion of the population that would provide Yes responses?

point estimate of the proportion = phat = 100/400 = .25 = 25%

b) What is your estimate of the standard error of the proportion, sigma\_p?

Standard error = Sqrt( phat ( 1 - phat) / n) = sqrt(.25\*(1-.25)/400) = 0.02165064

c) Compute the 95% confidence interval for the population proportion

The formula is :

phat - Z \* sqrt(phat \* (1- phat) / n < phat < phat + Z \* sqrt(phat \* (1- phat) / n

= .25 - 1.96 \* sqrt(.25 \* (1- .25) / 400) < phat < .25 + 1.96 \* sqrt(.25 \* (1- .25) / 400)

= [0.2075648, 0.2924352]

6. (1 point) The random variable x is known to be uniformly distributed between 10 and 20.

a) Show the graph of the probability density function.

b) Compute P(x < 15).

= 1/10(15-10) = 1/10 \* 5 = 0.5

c) Compute P(12 ≤ x ≤ 18).

= 1/10(18-12) = 1/10 \* 6 = 0.6

d) Compute E(x).

= 10+20 / 2 = 30 / 2 = 15

e) Compute Var(x).

7. (2 point) Consider the following hypothesis test:

H0: Mu >= 20

Ha: Mu < 20

a) A sample of 50 provided a sample mean of 19.4. The population standard deviation is 2.

b) Compute the value of the test statistic.

c) What is the p-value?

d) Using alpha = .05, what is your conclusion?

e) What is the rejection rule using the critical value? What is your conclusion?