Statistics HW10 b03705002 林軒逸

9.17

Since the data is normally distributed, so we can use central limit theorem.

a.

Sample=1

X= length of randomly selected subcomponent

By central limit theorem, Mean=117, standard deviation=5.2.

P(X>=120)= P(X>120)

=P(Z>(120-117)/5.2)

=1- NORMDIST(120,117,5.2,1)=0.28199571

The probability of one selected subcomponent is longer than 120cm is 28.199571%.

b.

Sample=4.

X=The mean of length of randomly selected subcomponents

By central limit theorem, Mean=117, standard deviation=5.2/4^(1/2)=2.6

P(X>=120)=P(X>120)

=P(Z>(120-117)/2.6)

=1- NORMDIST(120,117,2.6,1)= 0.12428162

The probability of the mean of one selected four subcomponents is longer than 120cm is 12.428162%.

c.

0.28199581^4= 0.00632368

The probability of one selected four subcomponent are all longer than 120cm is 0.632368%.

9.21

Since the data is normally distributed, so we can use central limit theorem.

a.

X= The time of a randomly selected North American watches TV

Sample=1

By central limit theorem, Mean= 6, standard deviation=1.5.

P(X>=7)= P(X>7)

=P(Z>(7-6)/1.5)

=1- NORMDIST(7,6,1,5,1)= 0.25249254

The probability that a randomly selected North American adult watches TV more than seven hours is 25.249254%.

b.

X= The mean time of randomly selected North Americans watch TV

Sample=5

By central limit theorem, Mean= 6, standard deviation=1.5/5^(1/2)=0.67082039

P(X>=7)= P(X>7)

=P(Z>(7-6)/0.67082039)

=1- NORMDIST(7,6,0.67082039,1)= 0.06801856

The probability of the mean of five randomly selected North American adults watch TV more than seven hours is 6.801856%.

c.

0.25249254^5= 0.00102623

The probability of all the five randomly selected North American adults watch TV more than seven hours is 0.102623%.

9.29

Since the data is normally distributed, so we can use central limit theorem.

There are five days, that is, the samples are five.

X= faxes we received per day in a week

By central limit theorem,

Mean=275, standard deviation=75/5^(1/2)= 33.5410197

What we want to know is 1500 faxes per week. That is, 300 faxes per day.

P(X>=300) = P(X>300)

=P(Z>(300-275)/33.5410197)

= 1-NORMDIST(300,275,75/5^(1/2),1)= 0.22802827

The probability that in 1 week more than 1500 faxes will be received is 22.802827%.

9.35

Since the sample is more than 30 samples, we can use central limit theorem.

X= The defective rate of the assembly line

n=800, p=0.02, standard deviation=(0.02*0.98/800)^(1/2)= 0.00494975

P(X>=0.04)=P(X>0.4)

=P(Z>(0.04-0.02)/0.00494975)

=1-NORMDIST(0.04,0.02,0.00494975,1)= 0.0000266562

The probability of the defective rate of greater than 4% is 0.00266562%.

If the defective rate of our samples are 4%, that means that we are so "lucky" that we chose those samples in 0.00266562% of the assembly line, or we can claim that the defective rate of the assembly line of producing electronic components of missile system is wrong, and the defective rate is currently under-estimated.

9.43

Since the sample is more than 30 samples, we can use central limit theorem.

X= undergraduate business student will major in accounting

n=1200, p=0.25, standard deviation= (0.25*0.75/1200) ^(1/2)= 0.0125

P(X>=336/1200)= P(X>= 0.28)= P(X>0.28)

=P(Z>(0.28-0.25)/0.0125)

= 1- NORMDIST(0.28,0.25,0.0125,1)= 0.00819754

The probability of 336 or more students in 1200 undergraduate business students will major in accounting is 0.819754%.

9.51

Since the data is normally distributed, we can use central limit theorem.

X1= Worker 1

X2= Worker 2

What we want is P(X1-X2>0), that is, we need to know the mean and standard deviation of X1-X2.

Mean: Ux1-Ux2= 75-65= 10

Standard deviation: [(20^2)/1 + (21^2)/1]^(1/2)= 29

In this case, what we want to know is in “a week”, the probability of worker 1 produce more than worker 2. That is, the sample size is 5.

By central limit theorem,

Mean: 10

Standard deviation: 29/5^(1/2)= 12.9691943

P(X1-X2>0)

=P(Z>(0-10)/12.9691943)

=1-NORMDIST(0,10,12.9691943,1)= 0.7796637

The probability that worker 1 outproduce worker 2 in a week is 77.96637%.

9.53

Since the data is normally distributed, we can use central limit theorem.

X1= waiters and waitresses who introduce themselves

X2= waiters and waitresses who don’t introduce themselves.

What we want is P(X1-X2>0), that is, we need to know the mean and standard deviation of X1-X2.

By central limit theorem,

Sample size=10

Mean: 0.18-0.15= 0.03

Standard Deviation= [(0.03^2)/10+(0.03^2)/10]^(1/2)= 0.01341641

P(X1-X2>0)=

P(Z>(0-0.03)/0.01341641)

=1-NORMDIST(0,0.03,0.01341641,1)= 0.98732633

The probability of waiters and waitresses who introduce themselves get more tips than those who don’t is 98.732633%.