**Normal Distribution.**

1) The standard error of the mean is given by

A) $|\mu - \bar{x}|$ B) $\mu - \bar{x}$

C) $\frac{\sigma}{\sqrt{n}}$ D) $\mu \pm \sigma$

2) Furnace repair bills are normally distributed with a mean of 273 dollars and a standard deviation of 25 dollars. If 100 of these repair bills are randomly selected, find the probability that they have a mean cost between 273 dollars and 275 dollars. Sketch a graph.

3) $N = 20{,}000$, $n = 600$, $p = 0.3$
Check if the distribution is normal, verify independence then find $\mu_p$ & $\sigma_p$ .

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4) The National Association of Realtors estimates that 23% of all homes purchased in 2004 were considered investment properties. If a sample of 800 homes sold in 2004 is obtained what is the probability that at most 200 homes are going to be used as investment property? Sketch a graph.

**Minimum sample size**

5) Determine the sample size required to estimate the mean score on a standardized test within 4 points of the true mean with 90% confidence. Assume that $s = 15$ based on earlier studies.

**Confidence Intervals.**

6) A survey of 700 non–fatal accidents showed that 167 involved uninsured drivers.
a)Sketch a graph,
b)find the point estimater,
c)construct a 99% confidence interval for the proportion of fatal accidents that involved uninsured drivers
d) find the error
e) and find the critcal values .
f) Would it be a correct assumption to say 245 out of 700 accidents will result as non–fatal?

7) A sample of 25 randomly English majors has a mean test score of 81.5 with a standard deviation of 10.2.
a)Sketch a graph,
b)find the point estimater,
c)construct a 95% confidence interval for the population mean, $\mu$. Assume the population has a normal distribution
d) find the error
e) and find the critcal values .
f) is it correct to assume a score of 80 is lickly?

8) The June precipitation (in inches) for 10 randomly selected cities are listed below.. Assume the data are normally distributed.
a)Sketch a graph,
b)find the point estimater,
c)Construct a 90% confidence interval for the population standard deviation, $\sigma$.
d) find the error
e) and find the critcal values .

| | | | | |
|---|---|---|---|---|
| 2.0 | 3.2 | 1.8 | 2.9 | 0.9 |
| 4.0 | 3.3 | 2.9 | 3.6 | 0.8 |

**Hypothese testing. (4 steps)**

9) A local group claims that the police issue 56 parking tickets a day in their area. To prove their point, they randomly select two weeks. Their research yields the number of tickets issued for each day. The data are listed below. At $\alpha = 0.01$, test the group's claim. Round the test statistic to the nearest thousandth.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 70 | 48 | 41 | 68 | 69 | 55 | 70 | 57 | 60 | 83 |
| 32 | 60 | 72 | 58 | | | | | | |

10) Fifty percent of registered voters in a congressional district are registered Democrats. The Republican candidate takes a poll to assess his chances in a two–candidate race. He polls 1200 potential voters and finds that 621 plan to vote for the Democratic candidate. Does the Republican candidate have a chance to win? Use $\alpha = 0.05$.

11) A statistics professor at an all–men's college determined that the standard deviation of men's heights is 2.5 inches. The professor then randomly selected 41 female students from a nearby all–female college and found the standard deviation to be 3.3 inches. Test the professor's claim that the standard deviation of female heights is greater than 2.5 inches. Use $\alpha = 0.01$.

**HypTest Step1:**

12) The mean repair bill of cars is greater than $150. Write the null and alternative hypotheses.

13) A popular referendum on the ballot is favored by more than half of the voters. Write the null and alternative hypotheses.

**Hyp Test Step 4:**

14) The mean age of judges in Dallas is greater than 58.8 years. If a hypothesis test is performed, how should you interpret a decision that fails to reject the null hypothesis?
   A) There is sufficient evidence to reject the claim $\mu > 58.8$.
   B) There is sufficient evidence to support the claim $\mu > 58.8$.
   C) There is not sufficient evidence to reject the claim $\mu > 58.8$.
   D) There is not sufficient evidence to support the claim $\mu > 58.8$.

15) The mean monthly gasoline bill for one household is greater than $120. If a hypothesis test is performed, how should you interpret a decision that rejects the null hypothesis?
   A) There is not sufficient evidence to reject the claim $\mu > \$120$.
   B) There is not sufficient evidence to support the claim $\mu > \$120$.
   C) There is sufficient evidence to reject the claim $\mu > \$120$.
   D) There is sufficient evidence to support the claim $\mu > \$120$.

16) The mean age of professors at a university is 52.2 years. If a hypothesis test is performed, how should you interpret a decision that fails to reject the null hypothesis?
   A) There is sufficient evidence to reject the claim $\mu = 52.2$.
   B) There is not sufficient evidence to reject the claim $\mu = 52.2$.
   C) There is sufficient evidence to support the claim $\mu = 52.2$.
   D) There is not sufficient evidence to support the claim $\mu = 52.2$.

**Errors**

17) The mean cost of textbooks for one class is greater than $130. Identify the type I and type II errors for the hypothesis test of this claim.

18) The level of significance, $\alpha$, is the probability of making a
    A) Correct decision
    B) Type $\beta$ error
    C) Type II error
    D) Type I error

19) If we do not reject the null hypothesis when the null hypothesis is in error, then we have made a
    A) Type $\beta$ error
    B) Correct decision
    C) Type II error
    D) Type I error

20) If we reject the null hypothesis when the null hypothesis is true, then we have made a
    A) Type I error
    B) Type $\alpha$ error
    C) Type II error
    D) Correct decision

1) C

2) normalcdf(273,275,273,$\frac{25}{\sqrt{100}}$) = 0.2881

3) Approximately normal since **npq** >10;
independent since n < .05N
$\mu_p = 0.3$, $\sigma_p = 0.019$

4) normalcdf(–E9, .25 , .23, $\sqrt{\frac{(.23)(.77)}{800}}$) = 0.9099

5) 39
n=(z*s/E)$^2$
always round up

6) point estimater = .239
1–prop Z Int
n=700 x= 167 $\hat{p}$ = .239
(0.197, 0.280)
error= .041
crit val Z = invnorm(.005,0,1) = ± 2.58
no since .35 is outside the interval.

7) point estimater = 81.5
T Interval
n=25 $\bar{x}$ = 81.5 s= 10.2
(77.29, 85.71)
error= 4.21
crit val t = invT(.025,24) = ± 2.06
yes , since 80 is inside the interval

8) point estimater = 1.11
Infer about σ
n=10 $\bar{x}$ = 2.54 s= 1.11 C.L.=.90
(0.81, 1.83)
error= .72

critical $\chi^2$.

d.f=9

$\chi^2_{\alpha/2}$ =16.92

$\chi^2_{1-\alpha/2}$ =3.33

9) **Step1: Nulll, Alt&Claim**
$H_0 : \mu = 56$ (claim)
$H_1 : \mu \neq 56$
**Step2: Statistics**
1–varstat
$\bar{x} = 60.21$, $s = 13.43$
n=14 $\alpha = 0.01$
**Step3: Graph&Calculations**
InvT
area to left=.005
d.f.=13
Crit value t=±3.01
T–Test
Test Stat t=1.17
p–value = .2619
**Step4: Dissision&Conclusion**
null: do not reject
alt: reject
claim: do not reject
There is not sufficient evidence to reject the claim that the police issue 56 parking tickets in a day.

10) **Step1: Null,Alt&Claim**
$H_0 : p = 0.50$
$H_1 : p < 0.50$ (claim)
**Step2: Statistics**
n=1200 $\hat{p} = .5175$
x=621 $\alpha = 0.05$
**Step3: Graph&Calculations**
Invnorm
area to left=.05
Crit value z=–1.65
1–propZtest
Test Stat z=1.21
p–value = .8873
**Step4: Dissision&Conclusion**
null: do not reject
alt: reject
claim: reject
There is not sufficient evidence to support the claim that the proportion of voters who vote democrat will be in the minority ($p < 0.5$). Thus, it does not appear the Republican candidate will win the eleection.

11) **Step1: Nulll, Alt&Claim**

$H_0 : \sigma = 2.5$

$H_1 : \sigma > 2.5$ (claim)

**Step2: Statistics**

n=41 s = 3.3

$\alpha = 0.01$

**Step3: Graph&Calculations**

critical $\chi^2$

area to right=.01

d.f.=40

Crit value $\chi^2$ =63.69

T–Test

Test Stat $\chi^2$=69.70

p–value = .0025

**Step4: Dissision&Conclusion**

null: reject

alt: do not reject

claim: do not reject

There is sufficient evidence to support the claim that the standard deviation of female heights is greater than 2.5 inches.

12) $H_0$: $\mu = \$150$, $H_1$: $\mu > \$150$ (claim)

13) $H_0$: p = 0.5, $H_1$: p > 0.5 (claim)

14) D

15) D

16) B

17) type I: rejecting $H_0$: $\mu = \$130$ when infact $\mu \leq \$130$

type II: failing to reject $H_0$: $\mu = \$130$ when $\mu > \$130$

18) D

19) C

20) A