Ch2 - Ex1 - Age and Memory

```
 DATA LIST FREE / age mem.
BEGIN DATA
 1 36  1 32  1 29  1 31  1 28  1 34  1 32  1 27  1 34  1 30  1 26  1 31
 2 26  2 30  2 28  2 31  2 31  2 24  2 27  2 29  2 32  2 26  2 30  2 25
END DATA.
```

$H_0: \mu = 32$
$H_a: \mu \neq 32$

*On average, younger adults remember 32 words on this task. Do results suggest that this sample comes from a population that remembers more or fewer words.

```
TTEST TESTVALUE = 32 / VARI = mem.
```

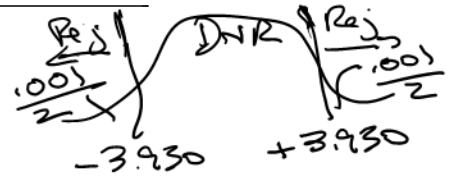
	N	Mean	Std. Deviation	Std. Error Mean
mem	24	29.54167	3.064228	.625483

	Test Value = 32			
	t	df	Sig. (2-tailed)	Mean Difference
mem	-3.930	23	.001	-2.458333

$t = \frac{\bar{Y} - \mu_0}{S/\sqrt{n}}$

$\left(\frac{3.06423}{\sqrt{24}}\right) = \frac{-2.458333}{.6255} = -3.930$

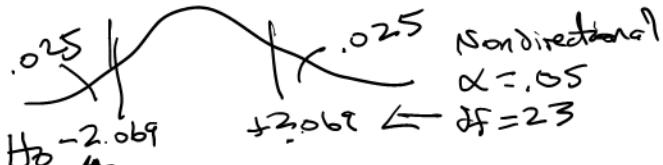
$< .05$ Rej H_0 Acc H_a




```
 COMPUTE mem32 = mem-32.
GLM mem32 /PRINT = DESCR.
```

Dependent Variable: mem32

Mean	Std. Deviation	N
-2.45833	3.064228	24



Dependent Variable: mem32

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.000	0	.	.	.
Intercept	145.042	1	145.042	15.45	.001
Error	215.958	23	9.389		
Total	361.000	24			
Corrected Total	215.958	23			

$\frac{145.042}{9.389}$

$n \times (\bar{Y} - \mu_0)^2 = 24 \times -2.4583 = 145.038$

$= F_t$ (nondir)

SS

S^2

Rej H_0

```
 *Sampling Distribution: 100,000 samples, mu = 32, sigma = 5, n = 24.
SET SEED = 14222318.
INPUT PROGRAM.
 LOOP sample = 1 TO 100000.
 DO REPEAT y = y1 TO y24.
    COMPUTE #a = RV.NORM(0,1).
    COMPUTE y = 32+5*(-.707107*#a + .707107*RV.NORM(0,1)).
```

$\sqrt{F} = 3.93 = t$

$t^2 = F$

$df = 1, 23$

$F_\alpha = 4.28 = 2.069^2 = t_\alpha^2$

```
   END REPEAT.
 END CASE.
 END LOOP.
END FILE.
END INPUT PROGRAM.

COMPUTE mean = MEAN(y1 TO y24).
COMPUTE variance = SD(y1 TO y24)**2.
COMPUTE t = (mean-32)/SQRT(variance/24).
COMPUTE pobs = ABS(t) GE 3.930297.
COMPUTE palpha = ABS(t) GE 2.069.
MEANS pobs palpha.
```

$t = \frac{\bar{y} - \mu_0}{s/\sqrt{n}}$

≤ -3.93 OR $\geq +3.93$

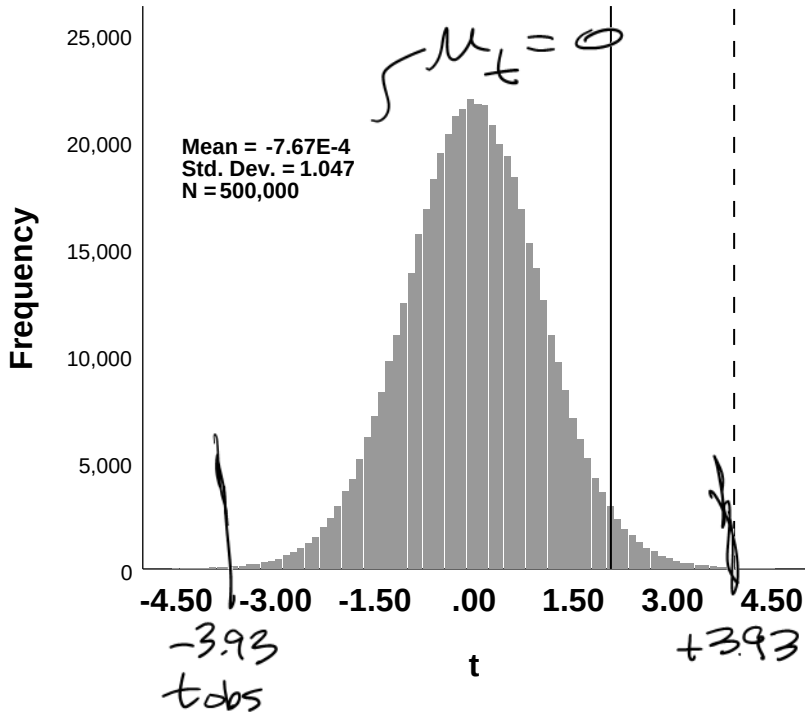
$p = \frac{73}{100{,}000} = .0007$

	pobs	palpha
Mean	.00073	.04863

Our t-test

$p = .001 = .00066$

```
FREQ t /FORM = NOTABLE /HISTOGRAM.
```



```
*Independent groups.
TTEST VARI = mem /GROUP = age.
```

	age		N	Mean	Std. Deviation
mem	1.000	Young	12	30.83333	3.010084
	2.000	Old	12	28.25000	2.632835

	t-test for Equality of Means				
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
mem	2.238	22	.036	2.583333	1.154427

```
GLM mem BY age /PRINT = DESCR.
```

Dependent Variable: mem

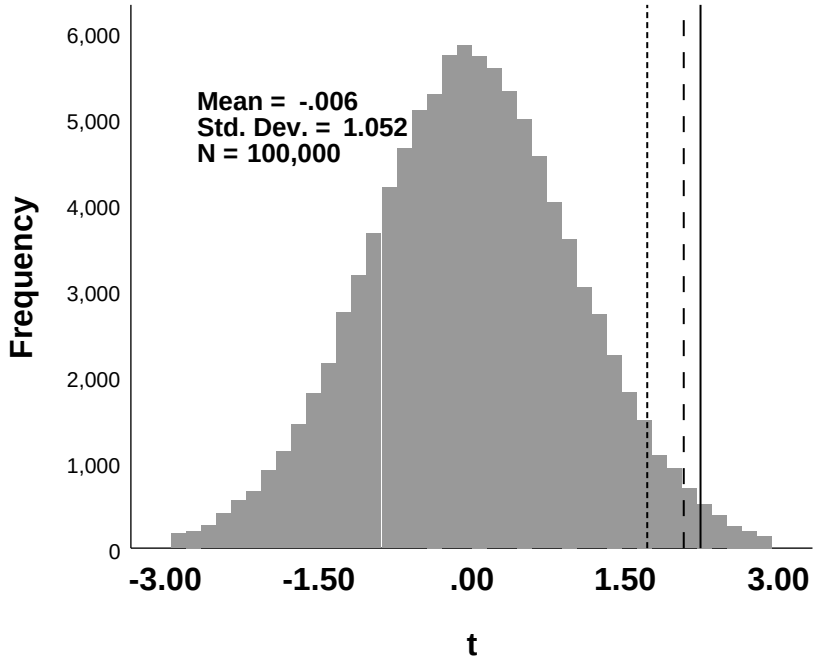
age	Mean	Std. Deviation	N
1.000	30.83333	3.010084	12
2.000	28.25000	2.632835	12
Total	29.54167	3.064228	24

Dependent Variable: mem

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
age	40.042	1	40.042	5.008	.036
Error	175.917	22	7.996		
Corrected Total	215.958	23			

```
 *Simulation H0 true: mu1 = mu2.
SET SEED = 14222318.
INPUT PROGRAM.
LOOP sample = 1 TO 100000.
 DO REPEAT y = y1 TO y12.
    COMPUTE y = 32+5*RV.NORM(0,1).
   END REPEAT.
 DO REPEAT o = o1 TO o12.
    COMPUTE o = 32+5*RV.NORM(0,1).
   END REPEAT.
  END CASE.
 END LOOP.
END FILE.
END INPUT PROGRAM.
COMPUTE diff = MEAN(y1 TO y12) - MEAN(o1 TO o12).
COMPUTE var = (SD(y1 TO y12)**2 + SD(o1 TO o12)**2)/2.
COMPUTE t = diff/SQRT(var*(1/12 + 1/12)).

FREQ t /FORMAT = NOTABLE /HIST.
```




```
 COMPUTE pobsnon = ABS(t) GE 2.238.
COMPUTE pobsdir = t GE 2.238.
COMPUTE palphanon = ABS(t) GE 2.074.
COMPUTE palphadir = t GE 1.717.
MEANS pobsnon pobsdir palphanon palphadir.
```

$H_a: \mu_1 \neq \mu_2$
$H_a: \mu_1 > \mu_2$

	pobsnon	pobsdir	palphanon	palphadir
Mean	.03564	.01735	.05030	.04984

```
 *SPSS commands to generate sample data.
SET SEED = 14222318.
INPUT PROGRAM.
LOOP #s = 1 TO 24.
END CASE.
END LOOP.
END FILE.
END INPUT PROGRAM.
COMPUTE #a = RV.NORM(0,1).
COMPUTE yrs = RND(55+10*#a).
COMPUTE mem = RND(30+5*(-.7071*#a + .7071*RV.NORM(0,1))).
SORT CASES BY yrs.
RANK yrs /NTILE(2) INTO age.
FORMAT mem yrs (F2.0) age (F1.0).
DELETE VARI yrs.
LIST age mem.
```