

8.3 - Testing a Claim About a Mean

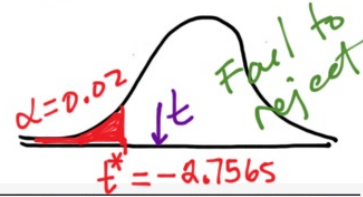
EXAMPLE 1 Oxygen tanks for SCUBA diving are to have enough oxygen for 2.1 hours of use. A sample of 6 tanks resulted in a mean time of 1.93 hours of oxygen with a standard deviation of 0.18 hours. Is there evidence at the $\alpha = 0.02$ level that the true mean is less than 2.1 hours? (Assume normality.)

$\mu = 2.1$ hours
 $n = 6$
 $\bar{x} = 1.93$ hr
 $s = 0.18$ hr
 $\alpha = 0.02$

$H_0: \mu = 2.1$ h
 $H_1: \mu < 2.1$ hr claim

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{1.93 - 2.1}{0.18/\sqrt{6}} = -2.3$$

$t > t^*$
 Fail to reject
 $P\text{-value} > \alpha$
 Fail to reject



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NORMAL FLOAT AUTO REAL RADIAN MP
T-Test
Inpt:Data Stats
mu:2.1
x:1.93
sx:0.18
n:6
mu:mu <mu_0 >mu_0
Color:BLUE
Draw
    
```

Hypothesis Test for a Mean Using Statistics	
Sample mean=	1.93
Standard Deviation=	0.18
Sample Size=	6
Hypothesized Mean: $\mu =$	2.1
Type:	$H_a: \mu < 2.1$
t-statistic=	-2.3134
P-Value=	0.0343
Confidence Interval	
Confidence Level=	0.96
	1.7274 2.1326

There is not enough evidence to support the claim that there is less than 2.1 hours of air in a tank.

EXAMPLE 2 Data set 3 includes samples of 106 body temperatures with a mean of 98.2°F and a standard deviation of 0.62°F. Use $\alpha = 0.05$ to test the claim that the mean body temperature of the population is not equal to 98.6°F.

$n = 106$ ($> 30!$)
 $\bar{x} = 98.2^\circ\text{F}$
 $s = 0.62^\circ\text{F}$
 $\alpha = 0.05$

$H_0: \mu = 98.6^\circ\text{F}$
 $H_1: \mu \neq 98.6^\circ\text{F}$ claim



```

NORMAL FLOAT AUTO REAL RADIAN MP
T-Test
Inpt:Data Stats
mu:98.6
x:98.2
sx:0.62
n:106
mu:mu <mu_0 >mu_0
Color:BLUE
Draw
    
```

```

NORMAL FLOAT AUTO REAL RADIAN MP
T-Test
mu=98.6
t=-6.642342026
p=1.403693407E-9
x=98.2
sx=0.62
n=106
    
```

$P\text{-value} < \alpha$
 REJECT H_0

Hypothesis Test for a Mean Using Statistics	
Sample mean=	98.2
Standard Deviation=	0.62
Sample Size=	106
Hypothesized Mean: $\mu =$	98.6
Type:	$H_a: \mu \neq 98.6$
t-statistic=	-6.6423
P-Value=	0.0000

There is enough evidence to support the claim that the mean body temperature is not equal to 98.6°F.

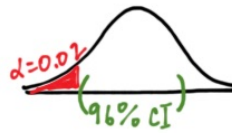
EXAMPLE 3 Chuck thinks the number of keys that most people carry is less than 5. Use the data we collected at the beginning the quarter to test that claim using $\alpha = 0.02$. Also, use the confidence interval method to make the same conclusion. What confidence level is necessary?

Number of keys carried:

2 2 5 1 2 3 5 4 3 10 5 3 3 1 10 4
3 2 7 3 3 6 2 6 2 3 12 7 3 2 3 3

$n > 30$ ✓

$H_0: \mu = 5$
 $H_1: \mu < 5$ claim
 $\alpha = 0.02$



Data:		Hypothesis Test for a Mean Using Data	
1	2	Sample mean =	4.0625
2	2	Standard Deviation =	2.6753
3	5	Sample Size =	32
4	1	Hypothesized Mean: $\mu =$	5
5	2	Type:	$H_a: \mu < 5$
6	3	t-statistic =	-1.9823
7	5	P-Value =	0.0282
8	4	Confidence Interval	
9	3	Confidence Level =	0.96
10	10		3.0486 5.0764
11	5		
12	3		
13	3		
14	1		
15	10		
16	3		
17	2		

T-Test

Inpt: Data Stats

$\mu_0: 5$

List: L1

Freq: 1

$\mu > \mu_0$ $\mu_0 > \mu_0$

Color: BLUE

Draw

T-Test

$\mu < 5$

$t = -1.982316187$

$p = 0.0281838553$

$\bar{x} = 4.0625$

$Sx = 2.675305228$

$n = 32$

$P > \alpha$
Fail to reject

96% Confidence Interval

Interval

(3.0486, 5.0764)

$\bar{x} = 4.0625$

$Sx = 2.675305228$

$n = 32$

5 is included

There is not enough evidence to support Chuck's claim that the mean number of keys is less than 5.