Name _____

Lab for Single-sample *t*-tests

With *t*-tests, you have a practical statistical device at your fingertips. The single-sample *t*-test is of somewhat limited utility, but it's more useful than the *z*-score. For any sample of data, for example, you can test simple hypotheses about the mean of the population from which the sample was drawn.

For example, below are the results of the weight-lifting competition in the 2004 Olympics (Athens) for men over 105 kg (~231 pounds) in weight. Notice, of course, that we have no idea of the population parameters for any of the variables here. Nonetheless, you could ask some interesting questions about the possibility that the population mean was some (hypothetical) value.

Place	Name	BirthYear	Body Wt (kg)	Snatch	Clean & Jerk	Total
1	REZA ZADEH Hossein	1978	162.95	210	262.5	472.5
2	SCERBATIHS Viktors	1974	140.72	205	250	455
3	CHOLAKOV Velichko	1982	161.31	207.5	240	447.5
4	KRASILNIKOV Gennadiy	1977	118.43	200	240	440
5	KOLOKOLTSEV Oleksiy	1981	125.07	195	242.5	437.5
6	NAJDEK Pawel	1973	140.44	190	240	430
7	HAMMAN Shane	1972	158.93	192.5	237.5	430
8	AN Yong Kwon	1982	136.9	202.5	225	427.5
9	KHALILOV Igor	1972	145.33	187.5	232.5	420
10	KLESZCZ Grzegorz	1977	124.33	190	225	415
11	MASOUD Mohamed	1984	142.72	185	220	405
12	IWAZAKI Takanobu	1975	127.7	170	215	385
13	BRAN Joel	1981	134.26	160	210	370
14	DETENAMO Itte	1986	137.65	155	192.5	347.5
	Mean		139.77	189.29	230.89	420.18
	Standard Deviation		13.89	17.025	17.856	33.89

For example, test the null hypothesis that the mean weight that these athletes can snatch is 200 kg. In other words, given these results, how likely is it that these athletes were sampled from a population of weight-lifters who can snatch 200 kg?

Here are some more recent data. Below are the times (in minutes) for women speed skaters in the 1000m race in Torino.

Women's 1000m Speed Skating Results, Torino 2006

Place	Name	Time
1	TIMMER Marianne	1.268
2	KLASSEN Cindy	1.268
3	FRIESINGER Anni	1.268
4	WUST Ireen	1.273
5	GROVES Kristina	1.275
6	DE LOOR Barbara	1.278
7	ZHUROVA Svetlana	1.285
8	WOJCICKA Katarzyna	1.288
9	ABRAMOVA Yekaterina	1.288
10	RODRIGUEZ Jennifer	1.292
11	BARYSHEVA Varvara	1.292
11	LOBYSHEVA Yekaterina	1.292
13	SIMIONATO Chiara	1.292
14	NESBITT Christine	1.292
15	YOSHII Sayuri	1.293
16	OKAZAKI Tomomi	1.293
17	TABATA Maki	1.293
17	TONOIKE Aki	1.293
19	SANG HWA Lee	1.297
20	WANG Manli	1.298
21	VOELKER Sabine	1.300
22	HESSE Judith	1.300
23	GERRITSEN Annette	1.305
24	REMPEL Shannon	1.307
25	SANNES Amy	1.308
26	JU-YOUN Lee	1.312
27	WITTY Chris	1.312
28	YOU LIM Kim	1.313
29	WANG Beixing	1.317
30	ZOELLNER Pamela	1.322
31	ZHANG Shuang	1.332
32	OCHOWICZ Elli	1.332
33	RADKEVICH Svetlana	1.335
34	BO RA Lee	1.353
35	OLTEAN Daniela	1.362
	Mean	1.301
	Standard Deviation	.023

Test a hypothesis that makes sense to you, given these race results.

Billboard Top 40/Adult Contemporary for 2/25/2006

Artist	Title	Time
Nickelback	Photograph	4.3
James Blunt	You're Beautiful	3.5
Rob Thomas	Ever the Same	4.25
Kelly Clarkson	Because of You	3.65
Goo Goo Dolls	Better Days	3.5
Howie Day	She Says	4.68
INXS	Pretty Vegas	3.42
Lifehouse	You and Me	3.25
Staind	Right Here	4.22
Fall Out Boy	Sugar, We're Goin' Down	3.82
The Fray	Over My Head (Cable Car)	3.97
Train	Cab	3.37
Daniel Powter	Bad Day	3.88
Santana/Steven Tyler	Just Feel Better	4.2
Green Day	Wake Me Up When September Ends	4.75
Bon Jovi	Who Says You Can't Go Home	4.67
Collective Soul	How Do You Love?	4.33
The All-American Rejects	Dirty Little Secret	3.22
Coldplay	Talk	5.18
Natasha Bedingfield	Unwritten	4.25
Kelly Clarkson	Walk Away	3.13
Lifehouse	Blind	5.0
O.A.R.	Love and Memories	3.5
Madonna	Hung Up	5.6
Anna Nalick	In the Rough	4.17
	Mean	4.07
	Standard Deviation	0.66

These are the top-25 songs from Billboard Magazine. If you were interested in writing a hit song, how long would you make the song? For these data, test the hypothesis that the song lengths were randomly sampled from a population of hit songs with a mean of 3.5 minutes.

You need to become comfortable with using StatView to compute these same analyses. For example, using the weight-lifting data from the 2004 Olympics, you tested the hypothesis that the Snatch weights were sampled from a population with $\mu = 200$ kg.

In StatView the output for that statistical test would look like this:

One Sample t-test
Hypothesized Mean = 200

	Mean	DF	t-Value	P-Value
Snatch	189.286	13	-2.355	.0349

Note that with the computer output, you no longer need the statistical tables. That is, you can immediately assess H_0 using the P-Value provided. In this case, you would reject H_0: $\mu = 200$ because $p = .035$. Thus, it appears that these athletes (however strong they may be) are not sampled from a population able to Snatch 200 kg.

On the other hand, how about the Clean & Jerk? If we were to test the same H_0, we would also reject H_0. However, we would now conclude that these athletes were sampled from a population that can Clean & Jerk more than 200 kg.

One Sample t-test
Hypothesized Mean = 200

	Mean	DF	t-Value	P-Value
Clean&Jerk	230.893	13	6.473	<.0001