ALBERTA WEIGHTLIFTING ASSOCIATION

AFFILIATED WITH THE WCH AND IWF

The Sinclair Coefficients for the Olympiad
January 1, 2021 to December 31, 2024
For Men's and Women's Olympic Weightlifting

The Sinclair coefficients, derived statistically, are adjusted each Olympic year and are based on the World Record Totals in the various bodyweight categories as of the previous several years.

The Answer to the question "What would be the total of an athlete weighing *x* kg if he/she were an athlete in the heaviest category of the same level of ability?" is given by the formula:

Actual Total x Sinclair Coefficient = Sinclair Total

The Sinclair coefficient (abbreviated to S.C.) is given by:

$$S.C. = \begin{cases} 10^{AX^2} & (x \leq b) \\ 1 & (x > b) \end{cases}$$

where $X = log_{10}\left(\frac{x}{b}\right)$

x = athlete bodyweight (kg)

	Men	Women
A	0. 722762521	0. 787004341
b	193.609 kg	153.757 kg

Comments

I. The formulas given above are suitable for either a calculator or a computer. In words, they state that the Sinclair Coefficient is:

a) If his/her bodyweight of *x* kg is less than or equal to *b* kg then the Sinclair Coefficient is equal to *10* raised to the exponent *A* times *X* squared, where *X* equals the logarithm to the base *10* of the ratio of *x* to *b*.
b) If his/her bodyweight of *x* kg exceeds *b* kg then the Sinclair Coefficient is equal to *1*.

As an example, suppose a female athlete weighing 67.8 kg has a total of 257 kg. For her:

A = 0.787004341
$X = \log_{10}(67.9/153.757) = -0.355605203$
$AX^2 = 0.099520681$
S.C. = $10^{AX^2} = 10^{0.099520681} = 1.257536738$
Sinclair Total = Actual Total x S.C.
Sinclair Total = 257 kg x 1.257536738 = 323.187 kg

II. In 2018, the IWF Executive Board approved the technical rule modification increasing the number male and female bodyweight categories to 10 for each. The 10 bodyweight categories for Junior and Senior Women are: 45kg, 49kg, 55kg, 59kg, 64kg, 71kg, 76kg, 81kg, 87kg and +87kg. The 10 bodyweight categories for Junior and Senior Men are: 55kg, 61kg, 67kg, 73kg, 81kg, 89kg, 96kg, 102kg, 109kg and +109kg.

III. In addition to the above, two tables are given, one for men and one for women. In each table, the athlete's bodyweight, *x* kg, appears in the first column and the Sinclair coefficient in the second. As noted above, the Sinclair Coefficients are derived statistically and are based on the World Record Totals of athletes in the prime of life, that is, mainly in their twenties, early thirties or late teens. This implies that the athlete's bodyweight, *x* kg, should not be too far below the upper limit for the lightest bodyweight category. Nevertheless, as a guideline for very young athletes who often are very light, the analytic curve 10^{AX^2} is extended to $x = 32.0$ for males and $x = 28.0$ for females.

IV. Two graphs are appended, one for Men and one for Women. The branch of mathematics called Dimensional Analysis leads one to plotting, not the World Record Total *y* kg against the bodyweight category, *x* kg, but rather $Y = Log(y/240)$ against $X = log(x/52)$ for men and $Y = Log(y/140)$ against $X = log(x/44)$ for women. The "best-fit" parabola is then obtained statistically.

Calculations for Men (December 31, 2020)

1.

ACTUAL				CALCULATED		
x_i	$X_i = \log(x_i / 52)$	y^1_i	$Y^1_i = \log(y^1_i / 240)$	$Y_i = -AX_i^2+BX_i+C$	y_i	$y^1_i - y_i$
55	0.024359345859	294	0.088136088701	0.088544799186	294.28	-0.28
61	0.069326491376	318	0.122215878273	0.122610501139	318.29	-0.29
67	0.110071459066	339	0.149988456491	0.150953482829	339.75	-0.75
73	0.147319516486	363	0.179695383325	0.174764257389	358.90	4.10
81	0.192481675244	378	0.197280558126	0.200944117058	381.20	-3.20
89⊗	0.233386663010	387	0.207499723307	0.222111615309	400.24	-13.24
96	0.266267889405	416	0.238882088915	0.237373427583	414.56	1.44
102⊗	0.292596828127	412	0.234685974322	0.248467253329	425.28	-13.28
109	0.321423154306	435	0.258278015243	0.259464228135	436.19	-1.19
+109	log(b/52)	484	0.304634119933	0.304455775688	483.80	0.20

⊗ World Standard (Assigned November 1, 2018)

2. The two body weight categories with assigned World Standard totals were excluded from the calculation as they skewed the resulting data which can be observed when you look at the resulting plotted curve and compare it to historical data. There are enough data points to calculate a curve that better represents a normalized curve based on historical data, albeit with the curve vertically lower due to lower world record totals at this point in time.

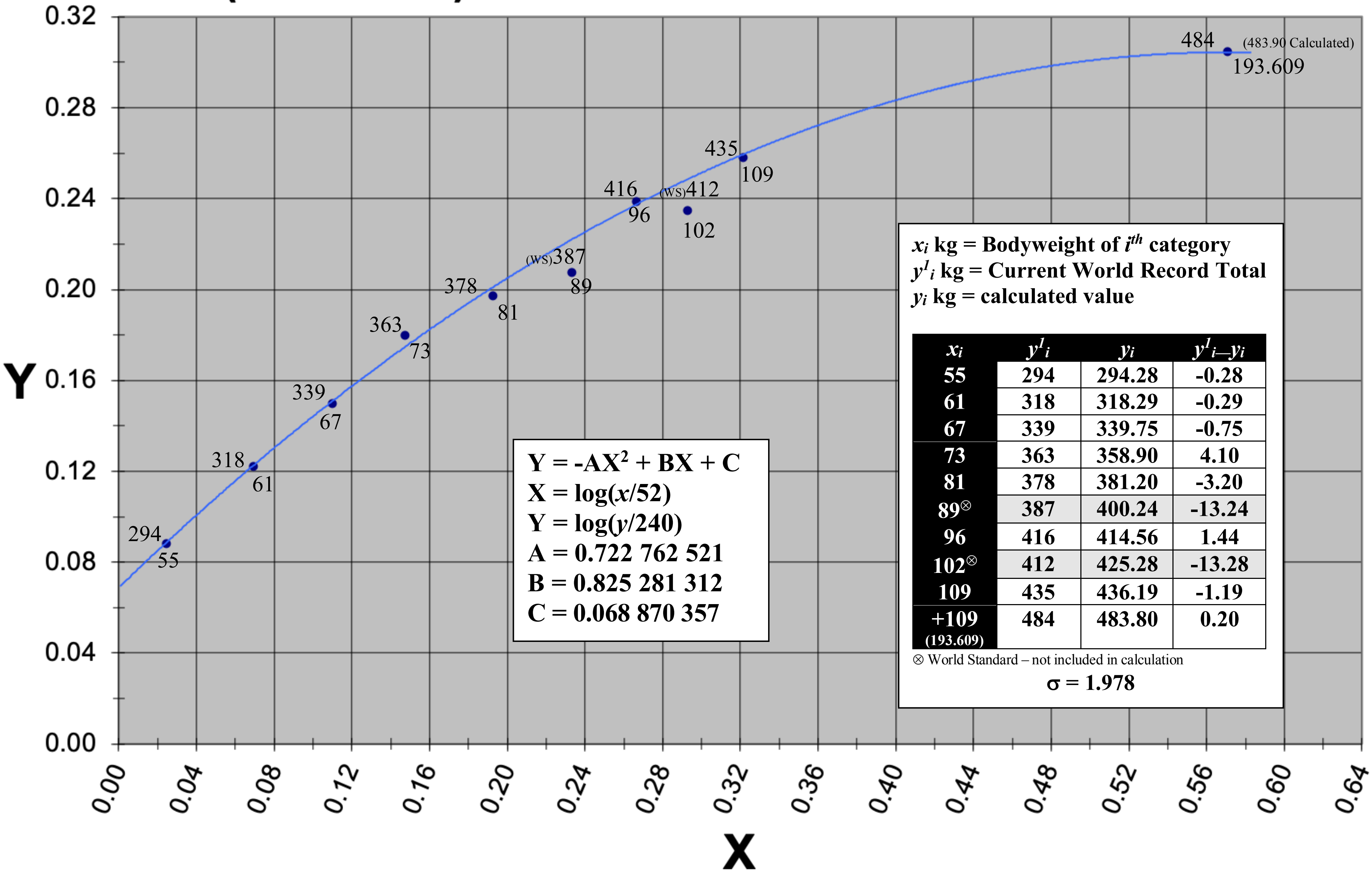
3. For men we have as input 8 (excluding the two categories with assigned World Standard Totals) points (X_i, Y_i^1) plus Y_8^1 but not X_8. By choosing various values for the superheavyweight (b kg) and monitoring the value of the sum S of least squares resulting we have b = 193.609 and the minimum sum of $S = 4.270\ 668\ 105 \text{ x } 10^{-5}$ for which

A = 0.722 762 520 996
B = 0.825 281 311 505
C = 0.068 870 357 471

4. For each bodyweight category (excluding the two categories with assigned World Standard Totals) X_i $(i = 1, 2, \dots, 7, 8)$ we can now calculate y_i and compare it to the actual y_i^1. A measure of the goodness of fit is the standard deviation

$$\sigma = \left[\frac{1}{8}\sum_{i=1}^{8}(y_i^1 - y_i)^2\right]^{1/2} = 1.978$$

Men (2021-2024)



$Y = -AX^2 + BX + C$

$X = \log(x/52)$

$Y = \log(y/240)$

$A = 0.722\ 762\ 521$

$B = 0.825\ 281\ 312$

$C = 0.068\ 870\ 357$

x_i kg = Bodyweight of i^{th} category

y^1_i kg = Current World Record Total

y_i kg = calculated value

x_i	y^1_i	y_i	$y^1_i - y_i$
55	294	294.28	-0.28
61	318	318.29	-0.29
67	339	339.75	-0.75
73	363	358.90	4.10
81	378	381.20	-3.20
89⊗	387	400.24	-13.24
96	416	414.56	1.44
102⊗	412	425.28	-13.28
109	435	436.19	-1.19
+109 (193.609)	484	483.80	0.20

⊗ World Standard – not included in calculation

σ = 1.978

Calculations for Women (December 31, 2020)

1.

ACTUAL				CALCULATED		
x_i	$X_i = \log(x_i / 44)$	y^1_i	$Y^1_i = \log(y^1_i / 140)$	$Y_i = -AX_i^2+BX_i+C$	y_i	$y^1_i - y_i$
45⊗	0.009759837289	191	0.134905331569	0.150509726752	197.99	-6.99
49	0.046743403542	212	0.180207825251	0.180496670103	212.14	-0.14
55	0.096910013008	227	0.209897821515	0.217731857275	231.13	-4.13
59	0.127399335156	246	0.244807071425	0.238426604281	242.41	3.59
64	0.162727297498	261	0.270512471660	0.260575662244	255.10	5.90
71	0.207805672233	267	0.280383225686	0.285985228542	270.47	-3.47
76	0.237360915795	278	0.297916760240	0.300908803458	279.92	-1.92
81⊗	0.265032342392	283	0.305658399846	0.313634911319	288.25	-5.25
87⊗	0.296066576132	294	0.322219294734	0.326473744916	296.89	-2.89
+87	log(b/44)	332	0.375010048026	0.374610397901	331.69	0.31

⊗ World Standard (Assigned November 1, 2018)

2. The three body weight categories with assigned World Standard totals were excluded from the calculation as they skewed the resulting data which can be observed when you look at the resulting plotted curve and compare it to historical data. There are enough data points to calculate a curve that better represents a normalized curve based on historical data, albeit with the curve vertically lower due to lower world record totals at this point in time.

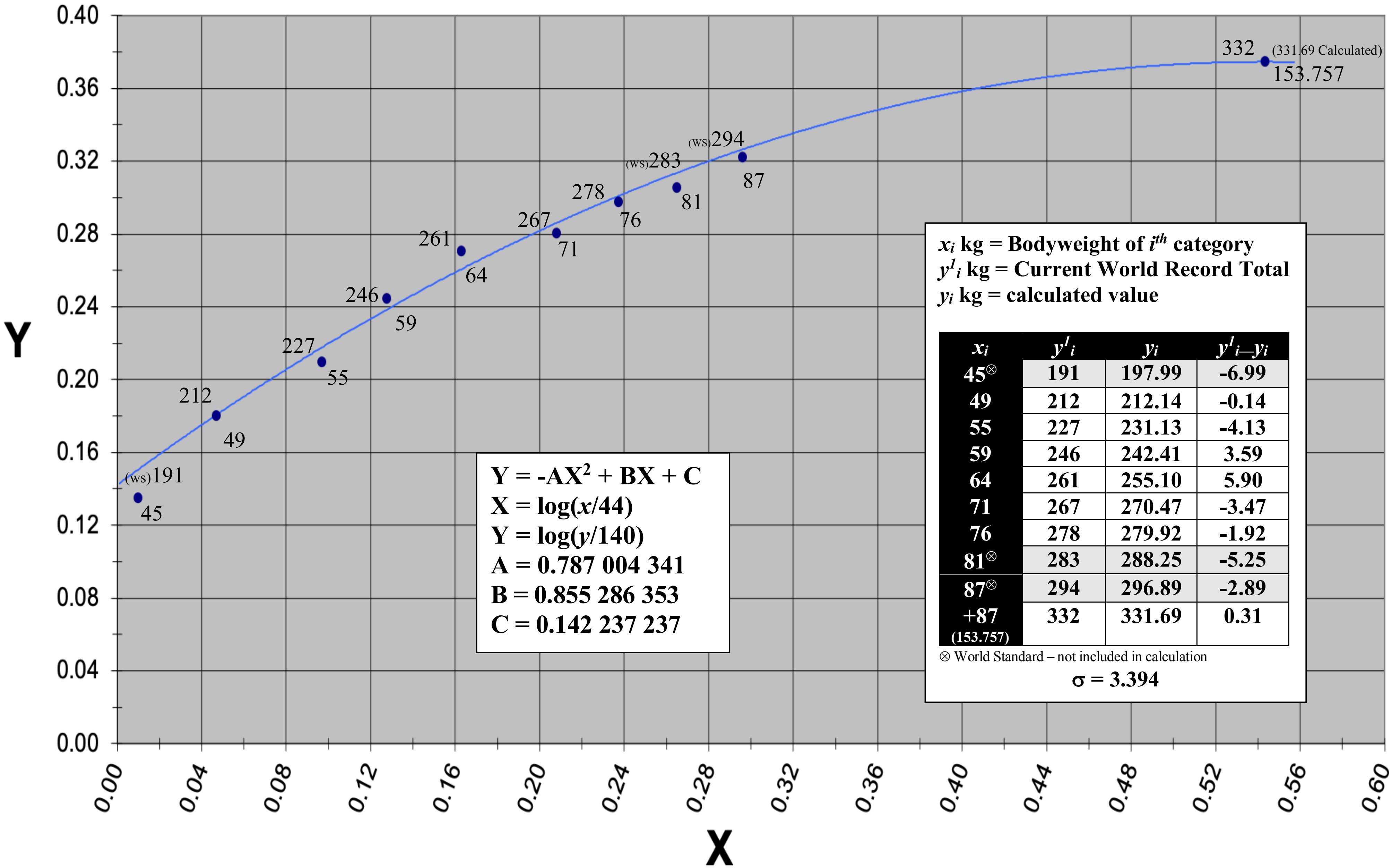
3. For women we have as input 7 (excluding the three categories with assigned World Standard Totals) points (X_i, Y_i^1) plus Y_7^1 but not X_7. By choosing various values for the superheavyweight (b kg) and monitoring the value of the sum S of least squares resulting we have b = 153.757 and the minimum sum of $S = 2.414\ 005\ 688\ 298 \times 10^{-4}$ for which

A = 0.787 004 341 02
B = 0.855 286 353 36
C = 0.142 237 236 75

4. For each bodyweight category (excluding the three categories with assigned World Standard Totals) X_i $(i = 1, 2, \ldots, 6, 7)$ we can now calculate y_i and compare it to the actual y_i^1. A measure of the goodness of fit is the standard deviation.

$$\sigma = \left[\frac{1}{7}\sum_{i=1}^{7}(y_i^1 - y_i)^2\right]^{1/2} = 3.39377$$

Women (2021-2024)



$Y = -AX^2 + BX + C$

$X = \log(x/44)$

$Y = \log(y/140)$

A = 0.787 004 341

B = 0.855 286 353

C = 0.142 237 237

x_i kg = Bodyweight of i^{th} category

y^1_i kg = Current World Record Total

y_i kg = calculated value

x_i	y^1_i	y_i	$y^1_i - y_i$
45⊗	191	197.99	-6.99
49	212	212.14	-0.14
55	227	231.13	-4.13
59	246	242.41	3.59
64	261	255.10	5.90
71	267	270.47	-3.47
76	278	279.92	-1.92
81⊗	283	288.25	-5.25
87⊗	294	296.89	-2.89
+87 (153.757)	332	331.69	0.31

⊗ World Standard – not included in calculation

σ = 3.394