Ceramic Drinking Vessels in Dollarama, Other Dollar Stores, and Value Village: A Comparison

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Abstract: Ceramic drinking vessels from Dollarama, other dollar stores, and Value Village are compared in various quantitative attributes, including mass, internal volume, and heat retention. Hypotheses are advanced as to why dollar store vessels tend to be significantly more conically shaped in nature, and why no significant differences in heat retention capacities were found. This study selects the Dollarama assemblage as the basis from which comparisons are made, and concludes with a brief discussion of how this research can be applied by all those who come into contact with discounted ceramic drinking vessels.

Introduction

With the popularity of dollar stores increasing in recent years (Goliath, "Dollar Stores Grow in Popularity"), concerns about the differences between dollarware and goods in other retail stores become more relevant. Dollarama, "Canada's largest buck-an-item chain" (Silcoff, "Dollarama Undergoes Major Transformation"), is of particular interest because of its rapid growth and increasing sales. In this project, I examine the quantitative characteristics of ceramic drinking vessels from Dollarama, non-Dollarama dollar stores, and Value Village; attributes considered include mass, height, density, rim thickness, temperature retention, and top external diameter to base diameter ratio. I attempt to delineate differences between the three assemblages, with the prediction that significant statistical differences can be found in at least one attribute. These differences are then discussed, and possible social and economic explanations advanced for their existence. I do not attempt to delineate all differences and similarities in the attributes that have been found, but rather only the ones that have presented themselves as striking and may offer useful insights for the producers, marketers, and consumers of discount ceramics. Finally, to conclude, I consider the overall quality of the ceramic vessels from all three assemblages and how the findings of my report can be of use to readers.

It is worthy to note that I chose the Dollarama assemblage as the basis from which most comparisons are made, both because Dollarama is the largest dollar chain and because it is easier to analyze and elucidate the differences in attributes from the standpoint of one assemblage. Value Village was chosen as a source for a comparative collection of ceramic drinking vessels, considered to be mostly of non-dollar store origin, and is designated in my report to represent ceramic drinking vessels from general retail stores. Thus, in this report, "dollarware" refers to the vessels from both Dollarama and non-Dollarama stores combined, to the exclusion of Value Village vessels.

Methods

A total of 289 ceramic drinking vessels (henceforth referred to as "vessels") were collected from 13 dollar stores and one Value Village store; 61 were purchased from Value Village (Assemblage N), 21 were purchased from Dollarama (Assemblage F), and 207 from non-Dollarama dollar stores. A fundamental criterion in the selection of these vessels was that their selling price could not exceed one dollar before taxes. In addition, as many varieties of vessels as possible were bought at each site. To assess whether our Dollarama collection was a representative sample, a revisit was made to Dollarama to count the total population number of vessels in Dollarama (Table 3).

Once obtained, the vessels were sorted according to their site of collection, labelled, photographed, and measured for top external diameter, top internal diameter, base diameter, height, and rim thickness. Displacement volume was obtained by submerging the vessels in water and recording the amount of water displaced. Heat retention was evaluated as the temperature decrease of water contained within the vessels over a period of ten minutes.

Following these measurements, density for each mug was calculated as the mass divided by the displacement volume, and a ratio of top to bottom external diameters was also calculated. In this study, vessels with ratios ≤1.3 are designated as "cylindrical", and those of ratio>1.3 are designated as "conical". 1.3 is certainly not the only cut-off ratio that could have been chosen, but was selected because, by visual inspection, the conical nature of a vessel only becomes apparent when the top/bottom diameter ratio exceeds 1.3 (Figure A shows a vessel of ratio 1.308; the conical nature is just becoming apparent), and consumers of vessels tend to judge the shape of a vessel by visual inspection.

Results

	Mass (g)	Top External Diameter (mm)	Top Internal Diameter (mm)	Base Diameter (mm)	Ratio of Top/Bottom External Diameters	Height (mm)	Rim Thickness (mm)	Internal Volume (mL)	Displacement Volume (mL)	Density (g/mL)	Heat change after 10 minutes (°C)
Dollarama Averages	321.9	87.4	77.4	63.5	1.40	99.0	4.2	348.0	131.3	2.90	38.28
Value Village Averages	316.2	82.9	73.4	72.9	1.17	96.0	4.2	314.6	132.0	2.80	38.40
Non-Dollarama Averages	319.1	83.0	74.5	68.6	1.25	97.6	4.1	314.7	142.3	2.39	38.38

Table 1: Quantitative attributes and their means.

	Mass (g)	Top External Diameter (mm)	Top Internal Diameter (mm)	Base Diameter (mm)	Ratio of Top/Bottom External Diameters	Height (mm)	Rim Thickness (mm)	Interlal Volume (mL)	Displacement Volume (mL)	Density (g/mL)	Heat change after 10 minutes (°C)
Value Village vs. Dollarama	0.76	0.064	0.084	0.0005	0.0006	0.41	0.90	0.050	0.95	0.83	0.90
Non-Dollarama vs. Dollarama	0.88	0.049	0.18	0.063	0.024	0.73	0.70	0.045	0.15	0.060	0.95
Non-Dollarama vs. Value Village	0.80	0.96	0.40	0.015	0.039	0.51	0.67	0.99	0.043	0.019	0.93

Table 2: P- values.

Note that data on heat change is courtesy of Andre Bourgoin-Horne (Bourgoin-Horne, "___________"), who studied heat retention extensively by selecting a sample of our collection to evaluate. For simplicity I have chosen to adopt only the data on heat change after ten minutes, and readers are welcome to consult his study for a more thorough depiction of the gradual temperature decrease in fluids contained within the vessels.

	# of Cylindrical Vessels (ratio ≤1.3)	# of Conical Vessels (ratio >1.3)	Total # of Vessels
Dollarama Sample (Assemblage F)	15	6	21
Dollarama Population	853	287	1140
Total # of Vessels	868	293	1161
Chi-Square Value	0.129		
Degrees of Freedom	1		
Critical Chi-Square Value	3.841		
P-Value	P= 0.720		

Table 3: Chi-square values.
To assess if our Dollarama ceramic vessel sample is representative of the actual Dollarama ceramic population. Raw data is presented and a P-value is calculated to assess the probability that the sample is indeed from the population.

Notes:
The Dollarama vessel population data was compiled by Lisa Zimanyi (Zimanyi, Lisa. "__________"), and I was present to observe. Judgment of whether a vessel was conical or not was based on visual inspection only. I have chosen to divide cylindrical (≤1.3) and cone-shaped (>1.3) vessels at a top/base diameter ratio of 1.3, but this is certainly not the only cut-off ratio that I could have chosen. 1.3 was chosen because, by visual inspection, the conical nature of a vessel only becomes apparent when the top/bottom diameter ratio exceeds 1.3 (Figure A shows a vessel of ratio 1.308; the conical nature is just becoming apparent).

	Suppliers	# of Different Distributors/Importers (at minimum)
Dollarama	Dollarama Gryphonware Occasions Dollarama	3
Non-Dollarama	Bangsi Club House CTG Distributors Danson Décor Inc Dikei Enterprises Corp. Elica Home Trends Encore Sales Forum Design Hotzee Inc Importations C.J.S Les Ventes DOMAY Sales Inc Liberty Home Products Corp LuckyLucky M.H.I Moany Moda Concept Modern Houseware Imports Inc. PK Douglass Royal Norfolk Fine Porcelain S.Kayali Int'l Sabre Senator Collection Standa Verrerie Empire Trading Inc Wandfond Ceramics Xantia Yiyun	27

Table 4: Suppliers.
The suppliers of Dollarama vessels, non-Dollarama dollar stores, and Value Village. Data is courtesy of Bridget Sandison (Sandison, Bridget. "__________"); note that this data has omitted vessels of unknown origin. Therefore, there are at minimum the suppliers as listed below; unknown vessels may have come from other different suppliers. Value Village data is missing because these vessels were previously owned, and the original labels have been lost.

Specimen	Top External Diameter (mm)	Base Diameter (mm)	Sum of Top external Diameter And Base Diameter (mm)
Dollarama Averages	87.4	63.5	150.8
Value Village Averages	82.9	72.9	155.8
Non-Dollarama Average	83.0	68.6	151.6

Table 5
Sum of Top external Diameter and Base Diameters

	P Value Sum of Top external Diameter and Base Diameters
Value Village vs. Dollarama	0.17
Non-Dollarama vs. Dollarama	0.82
Non-Dollarama vs. Value Village	0.068

Table 6
P-Vales of the Sum of Top external Diameter and Base Diameters

Discussion

It should first be noted that we collected a non-random sample of ceramic drinking vessels, comprised solely of vessels that had a purchase value of less than one dollar. Every vessel in our collection also had a handle, whereas ceramic drinking vessels in general can certainly be formed without one. Therefore, our sample is not representative of the vessels found in Canadian homes or even of downtown Montreal residences. Dollar store vessels may be perceived to be of lower quality, but are not yet purchased, whereas vessels from Value Village were used and then donated for whatever reason. Neither category especially attracts the average consumer when attempting to buy durable, quality vessels intended for years of possession.

Therefore, any conclusions derived from my research are limited to the dollarware and Value Village collections, and do not necessarily pertain to ceramic drinking vessels in general.

The various manufacturers of these three assemblages need to be discussed as a preliminary consideration. The vessels from Dollarama originate mostly from a company called Gryphonware, with other vessels either labelled as "Dollarama" or, in one instance, "Occasions Dollarama" (Table 4); though there are three vessels of unknown origin, the data suggests that Dollarama vessels come from a very limited number of manufacturers. In contrast, vessels from other dollar stores come from a much wider variety of distributors and importers; it can be inferred that these vessels also came from a wider variety of manufacturers than did the vessels of Dollarama. Because Value Village vessels were previously owned and many of the labels were missing, it was not possible to determine which distributors had originally handled these vessels. However, based on the non-Dollarama data, it is logical to infer that Value Village vessels also came from a wider range of distributors and manufacturers than did the Dollarama vessels. These findings will be utilized in the discussion of our first topic.

The Conical Question

My prediction was correct: at least one attribute was significantly different amongst all three assemblages, and this was the calculated ratio of top external diameter to base diameter ratio ($p=0.0006$, Value Village vs. Dollarama; $p=0.024$, Non-Dollarama vs. Dollarama; $p=0.039$, Value Village vs. Non-Dollarama; Table 2. Raw data available in Appendix C). Table 3 shows that our Dollarama sample indeed is representative of the Dollarama population in terms of the number of conical and cylindrical vessels ($p=0.720$). Dollarama vessels have the largest top external diameter and the smallest base diameters, and are therefore unsurprisingly the most conically shaped in nature with a ratio of 1.4 (Table 1). Value Village vessels are the most cylindrically shaped (ratio=1.17, Table 1), with non-Dollarama dollar stores in between (ratio=1.25, Table 1) the two extremes.

Dollarware in general are significantly more conically shaped than the Value Village vessels ($p=0.0006$, Value Village vs. Dollarama; $p= 0.039$, Value Village vs. Non-Dollarama). Why, then, do dollar stores like Dollarama prefer the conical shape? A tempting hypothesis, but one whose shortcomings I will soon explain, is that conically shaped vessels are preferred because they conserve shelf and packaging space in dollar stores. One way to conserve space, when it comes to hollow shapes like drinking vessels, is to stack them. Another way to arrange conical vessels, which we consider subsequently, is by arranging them in an alternating orientation fashion, in which one upright vessel is placed next to a upside down vessel. How effective both methods are in terms of conserving shelf and packaging space will be discussed.

It should be stressed that shelf space is valuable, and dry grocery shelf space costs at least $20 per square foot (Drèze et al, 1994). In addition, costs for packaging materials increase as the volume of the package increases, so that it is economically advantageous to conserve space while packaging ceramic vessels. Shelf and packaging space may be of particularly high importance in discount stores like dollar stores, especially where vessels are squeezed between other goods in the same shelf (Figure B). If conical vessels conserve more shelf and packaging space, there would be a high demand for them in such stores. In contrast, being previously owned, Value Village vessels come from various stores of origin, and are more likely to have originated from a store where vessels were displayed in more spacious and noticeable areas as gifts or collectibles (Figure C). There is less of a demand for these stores to display space conserving vessels. If conical vessels indeed take up less space, these stores do not utilize this advantage as readily as dollar stores.

Various patents for stackable and space conserving drinking vessels have been produced in which the vessels were all conically shaped (Gottlieb 2001; Karevaara 1978; Prothe 1993), demonstrating the space conserving properties of the general conical form. In addition, in an informal discussion with a shelving staff worker at Dollarama, I was told that conically shaped containers conserved shelf space more than did cylindrical containers. My discussion, however, did not involve the specific discussion of ceramic drinking vessels in the store, all of whom had handles; the consideration of handles on these vessels provides a significant challenge to the stacking and space-conservation hypothesis.

Handles pose a weighty problem to the stacking of the vessels; they prevent the vessels from being tightly nested within each other, and prevent them from being stacked to any great height without the tower being dangerously unstable (Figure D). As stacking is a major factor in space conservation in both shelf space and in packaging space, conical shapes can be seen as even less advantageous than cylindrical vessels, which can stack with more stability (Figure B; contrast to Figure D). One conical vessel design (Figures E and F) was specifically shaped for stable stacking, but it was only one out of the many conical designs in Dollarama that would otherwise fail to stack (Figure G). Finally, the aforementioned patents for stackable drinking vessels did all indeed feature conically shaped vessels, but the designs were such that the cumbersome handles were eliminated by either rotating them out of the way (Gottlieb 2001), by folding them against the body of the vessel (Karevaara 1978), or by creating hollow, conical-tipped handles that would themselves stack (Prothe 1993). Because none of the handles in our collection could be removed in some way, they prevent the vessels from being stacked properly; the hypothesis that conically shaped vessels serve to conserve shelf space by stacking is therefore lacking.

We now consider the possibility of arranging conical vessels by alternating their orientations; one vessel is placed upright next to a vessel that is placed upside down (as seen in Figure G). In such an arrangement, the total length of shelf space occupied by a pair of vessels is the sum of the top external diameter of one vessel and the base diameter of another (Table 5). Thus, one can evaluate the space efficiency of arranging conical vessels in an alternating fashion by comparing these sums. This does not seem to be considerably advantageous, however. Even if Dollarama, the collection with the most conically shaped vessels, arranges their vessels in an alternating fashion, the space it conserves is insignificant compared to the other assemblages, which have vessels that are in general less conically shaped ($p=.17$, Value Village vs. Dollarama; $p=0.82$, Non-Dollarama vs. Dollarama; Table 6). Therefore, the hypothesis that conically shaped vessels conserve shelf space, when arranged in an alternating orientation fashion, also falls short.

Admittedly, the above p-values are reflective of the small total sample size of Dollarama vessels ($n=21$) versus the much larger sample size of non-Dollarama vessels ($n=207$). Had Dollarama sample size been greater, a p-value closer to that of Non-Dollarama versus Value Village ($p=0.068$, which is close to significant; Table 6) might be seen. Future studies are encouraged to take larger sample sizes of Dollarama vessels and investigate this issue; it is possible that, by the alternative orientation arrangement method, shelf space occupation can indeed be significantly reduced. For this study, I have endeavored to show that the conical vessel shapes in our sample collections do not stack readily because of the existence of handles, and therefore, that the conical vessel shape is not completely advantageous.

I now propose an alternative explanation: the prevalence of conical vessels in dollar stores may be due to the aesthetic preferences of consumers. If consumers find conical shapes more desirable, and such vessels sell quickly, dollarware ceramic manufacturers would logically respond by producing more conical-shaped vessels. A sufficiently high supply of conical-shaped vessels would then readily fill the dollarware shelves, where they could be readily acquired for our collection.

In contrast, Value Village does not have a constant supplier for their goods; if one product sells well, the store cannot respond by producing more of it, for Value Village takes its stock from donations (Value Village, "About Us"). If conical-shaped vessels are indeed more desired and prized by consumers, they will be less likely to be donated, and therefore will in low quantity in Value Village. In addition, if conical-shaped vessels are more sought after, they will likely be purchased quickly so that acquiring it for our collection would be difficult. There can be indeed a combination of both low supply and high demand; at the end, Value Village would have comparably less conical-shaped vessels than does Dollarama or the non-Dollarama dollar stores.

I conclude that aesthetic preference may indeed be driving the prevalence of conically shaped vessels amongst Dollarama and other dollar stores, but this explanation involves more speculation than empirical evidence. I have no data to demonstrate that conical vessels are more desired than cylindrical vessels, though possible research into this matter may be done in the future. The final explanation for the prevalence of conical vessels in Dollarama, and their prevalence to a lesser degree in non-Dollarama stores, is likely far from simple. Other factors, like the existence of the stackable conical mug, and the small but certainly possible stacks of conical vessels that can be formed, can also favor the production of more conical vessels. In addition, how space efficient conical vessels are when they are arranged in an alternating orientation fashion, and when they all have handles, also has yet to be further documented.

Internal Volume, Displacement Volume, and Mass- Thinner Walls and Smaller Handles?

Dollarama vessels hold more fluid than the other two groups; the differences are nearly significant. (p= 0.050, Value Village vs. Dollarama; p= 0.045, Non-Dollarama vs. Dollarama; Table 2). This is most striking when considering that the Value Village and non-Dollarama stores have identical mean internal volumes (p=.99, Table 2). Admittedly, there are many more outliers in the non-Dollarama collection than there are in the Value Village collection; however, the boxplots of the two distributions are far more similar to each other in terms of interquartile values and 95% confidence intervals, than when compared to the Dollarama distribution (Figure 8, Appendix A).

This observation may reflect Dollarama vessel producers belief that consumers prefer vessels of larger internal volume due to consumer drinking habits, and therefore, that vessels of larger internal volume are more marketable. However, only future research can provide well supported hypotheses as to why non-Dollarama dollar store and Value Village manufacturers did not seem to follow suit. For this study, it should be noted that Dollarama vessel manufacturers such as Gryphonware have produced these vessels of larger internal capacity without sacrificing more materials into forming the mug; the Dollarama vessel displacement volume is the least out of the three assemblages (though not significantly so; p= .95, Value Village vs. Dollarama; p=.15, Non-Dollarama vs. Dollarama; Tables 1 and 2) and its overall mass is not significantly greater than any of the other assemblages (p=.76, Value Village vs. Dollarama, p=.88, Non-Dollarama vs. Dollarama; Tables 1 and 2). From an economic standpoint, this is indeed advantageous, for one would not want to invest more money into purchasing extra raw material, especially when each vessel is destined to be sold for one dollar.

How can Dollarama offer vessels with larger internal volume, and yet of comparable mass and even of comparable height (p=0.41, Value Village vs. Dollarama; p=0.73, Non-Dollarama vs. Dollarama; Table 2)? The answer lies not in a lowered density, for Dollarama vessels are actually the most dense out of the three collections (though close to significantly so only when compared to Non-Dollarama vessels, p=0.06; Tables 1 and 2). One possible explanation is that the thickness of the vessel walls tapers and decreases below the rim; such a vessel wall measurement was not taken during this study but may be done in a subsequent one. It is also possible that Dollarama vessel handles are significantly smaller, so that, in comparison to the other assemblages, the allocation of raw material is proportionally greater for the body of the mug than for the handle. A smaller handle size can also account for why the displacement volume of Dollarama is the least out of the three collections, while its internal volume capacity is the greatest. I am aware that handle size data was taken by others, and what is left to be done is a comparison of Dollarama vessel handles alone to the handles of other collections. Certainly, a combination of both thinner vessel walls and smaller handle sizes is possible.

The thickness of the vessel walls may be of some concern to the consumer, for thinner walls, even of comparable density, will shatter more easily upon dropping. In addition, users who grasp smaller handles upon drinking have a higher probability of burning the back of their fingers against the walls of the vessel. Handle size, however, is certainly of individual preference and some may prefer smaller handles for personal reasons. It is therefore the thickness of the vessel walls that is more critical in evaluating the quality of Dollarama vessels, and not the handle size. I leave the evaluation of these characteristics to future studies.

Density, Heat Retention, and Durability

Density was significantly different between non-Dollarama dollar stores and Value village (p= 0.019, Table 2), and close to significantly different between Non-Dollarama and Dollarama stores (p=0.060, Table 2). Value Village and Dollarama, however, have comparably similar densities (p=0.83, Table 2).

As significant density differences do exist, one can also logically expect the existence of a significant difference in heat retention amongst the vessel assemblages; however, none were observed. In fact, one of the most remarkable similarities amongst the three assemblages is the ability to retain heat (p=0.90, Value Village vs. Dollarama; p=0.95, Non-Dollarama vs. Dollarama; p=0.93, Non-Dollarama vs. Value Village; Table 2). Manufacturers of all assemblages were perhaps wary of the fact that, if their vessels lost heat noticeably faster than the vessels of competing companies, sales will go down. Alternatively, the similarity in heat retention may not be a conscious effort by the manufacturers, but rather the result of similar, cost-efficient ceramic manufacturing processes. A subsequent visit to a ceramic drinking vessel manufacturing plant will provide more details into this explanation. To summarize, density may vary between the assemblages, but it is clear that these differences did not affect, or were not great enough to significantly affect, heat retention.

Density and durability have a positive correlation when it comes to ceramic flooring tiles (Laminate Flooring Answers, "The Basics"; World Floor Covering Association, "Glossary"), so that ceramic tiles with the fewest and smallest amounts of pockets are also the strongest, and it is likely that a similar trend exists for ceramic drinking vessels. I am aware that a study has been done in which our collected vessels were shattered and their shards counted and massed; however, to better understand the correlation between density and durability of ceramic vessels, I propose a method by which vessels are dropped from greater and greater heights, with height distances recorded at the first sign of chipping. This is a general outline, and refinements to this method will certainly be required should it ever be adopted.

Conclusion

I conclude this paper with a discussion of how these results can possibly be applied by the consumer, and possibly even the ceramic vessel producer and marketer. Aside from aesthetic considerations of decoration and shape, the quality of a ceramic drinking can be quantitatively defined by its ability to retain heat, and by the maximum falling height it can survive. The consumer should consider that there does not seem to be an overall difference in the heat retention capabilities of the vessels, no matter where one purchases them, though variations among the vessels in each assemblage is certainly to be expected. Though the comparative durability of the vessels have yet to be established, heat retention data suggests that vessels from dollar stores are not as terrible as they may be commonly perceived. .

Finally, to the producers who supply discount stores with ceramic vessels, I propose the possibility of manufacturing more ceramic drinking vessels of space efficient design, in which more designs lack a handle or do not hinder as much the stacking of the vessels (an example would be Figure F). Such designs may be of considerable value to the marketer, especially those who are constrained to sell vessels for less than one dollar; they may even appeal to consumers who are searching for vessels that take up less space in their own homes.

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Appendix A: Statistical Data on Ceramic Vessel Attributes and Boxplots

(see separately attached pdf file)

Appendix B: Photographs

The web page sources of the images are given, and when possible, an exact image URL.

Figure A
Image URL : http://www.dollarware.org/F-01-big.JPG
Artifact F-01 has a ratio of top to bottom diameter of 1.308. The conical nature of the shape is just becoming apparent by visual inspection.

Figure B
Image URL: http://www.dollarware.org/siteb-02.JPG
Shelves from Site B: Le Même Prix Plus. Very crowded, and stacking of cylindrical black vessels can be seen in towards the left.

Figure C
Image URL : http://www.steinland.com/images/Images2/GoodInside7copy.jpg
Shelves from Steinland Gifts and Collectibles. Notice that the ceramic vessels are spaciously displayed in the back.

Figure D
Image URL: http://www.dollarware.org/sitec-07.JPG
Shelves from Site C: Luxe du Dollar. Notice the precarious nature of the stacking of conical vessels.

Figure E
A photo of shelves taken upon the revisit to Dollarama, displaying a vessel design especially made for stacking. This vessel design is embodied by F-06 in our Dollarama sample collection (see Figure F).

Figure F
Image URL: http://www.dollarware.org/F-06-big.JPG
Artifact F-06.
A closer look at the vessel shape designed to stack. Notice that it is conical in the lower half but cylindrical in the top half, which adds to the stability of the vessel upon stacking. Also notice that the handle has been greatly reduced as to not obstruct stacking too much.

Figure G
Image URL: http://www.dollarware.org/sitef-06.JPG
Shelves of Dollarama (Site F).
Towards the lower right one sees brown, white, blue and orange conical vessels being placed in alternating orientations.

Appendix C: Raw Data

Raw data for top external/base diameter ratios, and density.

Specimen	Density g/mL	Top External /Base diameter Ratio	Sum of Top External Diameter and Base Diameters
A-01	1.147977	1.015130845	162.5
A-02	1.206732	1.016169905	167.1
A-03	1.203983	1.025900901	161.9
A-04	1.110449	1.012851309	167.6
A-05	1.130408	1.012534128	162.2
A-06	1.131072	1.027562983	162.6
A-07	0.603303	1.011410082	118.1
A-08	0.639017	1.489825581	102.8
A-09	1.003282	1.765986133	143.6
A-10	1.08259	1.001362893	220.3
A-11	1.056122	1.474490602	156.7
A-12	0.881127	1.726148039	130.0
A-13	1.104678	1.05358348	152.2
A-14	1.092648	1.051918124	151.4
A-15	1.052447	1.441368078	149.9
A-16	1.065066	1.505732879	161.7
A-17	0.778795	1.539932508	135.5
A-18	1.061207	1.494453249	157.4
A-19	0.765893	1.459366278	149.8
A-20	0.926739	1.070422535	147.0
A-21	0.841865	1.854613936	151.6
B-01	0.949224	1.078389831	147.2
B-02	1.052519	1	162.2
B-03	1.103354	1.01375	161.1
B-04	0.879491	1.746987952	182.4
B-05	0.889423	1.310107198	150.9
B-06	1.19164	1	158.7
B-07	0.92352	1.460693153	145.6
B-08	0.876481	1.56510186	144.8
B-09	0.74216	1.407582938	152.4
B-10	1.15017	1.01875	161.5
B-11	1.002425	1.453528399	142.6
B-12	1.132696	1.625	147.0
B-13	0.891297	1.075842697	147.8
B-14	0.99824	1.444162437	144.5
B-15	1.186545	1.645454545	145.5
B-16	0.850257	1.439418417	151.0
B-17	1.322148	1.19650655	150.9
B-18	1.00302	1.542778919	185.8
B-19	1.202471	0.995151515	164.6
B-20	1.047461	1.147368421	163.2
C-01	0.813337	1.530357143	141.7
C-02	0.761179	1.78422782	127.1
C-03	0.965995	1.065860215	153.7
C-04	1.004018	1.757692308	143.4
C-05	1.22476	1.04494382	145.6

C-06	1.164898	1.414596273	155.5
C-07	0.598191	1.473710819	146.8
C-08	0.867144	1.573214286	144.1
C-09	1.002099	1.193092622	139.7
C-10	0.853401	1.071428571	147.9
C-11	0.84501	1.047819972	145.6
C-12	0.78669	1.126428571	148.9
C-13	1.175869	1.576086957	118.5
C-14	0.842264	1.053097345	162.4
C-15	0.9375	1.479474548	151.0
C-16	1.189732	1.209276018	97.7
C-17	1.31931	1.151430565	154.2
C-18	1.147429	1.266716196	152.6
C-19	0.732681	1.364655172	137.2
C-20	0.854222	1.450847458	144.6
D-01	1.0771	1.026335404	163.1
D-02	0.978607	1.061772152	162.9
D-03	1.099198	1.328828829	155.1
D-04	0.98736	0.998158379	162.8
D-05	0.906926	1.491197183	141.5
D-06	1.045363	1.017234966	162.7
D-07	0.8135	1.295861462	156.4
D-08	0.749789	1.439869281	149.3
D-09	1.105804	1.030188679	161.4
D-10	1.241561	1.030886076	160.4
D-11	0.675952	2.6812159	141.7
D-12	1.074777	1.022857143	162.8
D-13	1.034744	1.092627058	146.2
D-14	0.938177	1.02556962	160.0
D-15	1.092383	1.901124339	175.5
D-16	0.930663	1.955178268	174.1
D-17	0.806274	1.307679739	141.2
D-18	0.974034	1.512614679	131.5
D-19	0.943691	1.507518797	133.4
D-20	1.639483	1.399339934	145.4
E-01	0.943223	1.073081608	170.2
E-02	1.244893	1.42926045	151.1
E-03	1.032099	1.006142506	163.3
E-04	0.781145	1.239598278	156.1
E-05	0.811217	1.437646272	145.8
E-06	1.177849	1.011278195	160.5
E-07	1.029595	1.007334963	164.2
E-08	1.117269	1.448780488	150.6
E-09	1.104904	1.018867925	160.5
E-10	0.891338	1.33419257	153.9
E-11	1.002348	1.038895859	162.5
E-12	1.006895	1.420454545	159.8
E-13	1.257162	1.396825397	151.0
E-14	1.106844	1.027707809	161.0
E-15	1.083895	1.007453416	161.6

E-16	1.005309	1	154.4
E-17	0.817908	1.288690476	153.8
E-18	1.069428	1.014814815	163.2
E-19	0.971938	1.072163433	141.0
E-20	1.188247	1.437240498	152.6
F-01	0.818856	1.308333333	138.5
F-02	1.455488	1.01010101	119.4
F-03	1.015769	1.404958678	145.5
F-04	0.863996	1.636022514	140.5
F-05	0.938844	1.556291391	154.4
F-06	0.802022	1.483420593	142.3
F-07	1.024112	1.645056726	163.2
F-08	0.984065	1.65625	153.0
F-09	0.962093	1.467226891	146.8
F-10	0.967652	1.702439024	166.2
F-11	0.590897	1.668209877	172.9
F-12	0.622936	1.045845272	142.8
F-13	0.89307	1.612389381	147.6
F-14	1.081214	1.593043478	149.1
F-15	0.927377	1.561604585	178.8
F-16	1.071942	1.001242236	161.1
F-17	1.026331	1.02244389	162.2
F-18	1.270907	1.402777778	138.4
F-19	0.845645	1.445578231	143.8
F-20	0.959115	1.014102564	157.1
F-21	0.65009	1.111764706	143.6
G-01	0.914854	1.566914498	138.1
G-02	0.948536	1.636007828	134.7
G-03	0.959964	1.611577965	139.9
G-04	0.983607	1.02894356	140.2
H-01	0.928105	1.013998783	165.5
H-02	0.954572	1.013406459	165.2
H-03	0.966318	1.033974359	158.7
H-04	0.995711	1.008181246	159.6
H-05	0.972222	1.016843419	161.7
H-06	0.946057	1.011677935	163.7
I-01	1.134921	1.01375	161.1
I-02	1.015906	1.009339975	161.4
I-03	0.914547	1.083451202	147.3
I-04	1.572638	1.719495091	97.0
I-05	0.98703	2.018957346	159.3
I-06	1.087113	1.001877347	160.0
I-07	1.140677	1.007490637	160.8
I-08	0.913278	1.488410596	150.3
I-09	0.695845	1.414115646	142.0
I-10	0.928547	1.077087794	145.5
I-11	0.883074	1.077683616	147.1
I-12	1.070245	1.055393586	211.5
I-13	1.135135	1.011278195	160.5
I-14	0.875742	1.041441441	170.0

I-15	1.143158	1.024193548	163.2
I-16	0.892807	1.602811951	148.1
I-17	0.691601	1.620817844	141.0
I-18	1.076352	1.021437579	160.3
I-19	1.095853	1.01181592	161.8
I-20	1.099448	1.097848716	151.2
J-01	1.018396	1.511164274	157.5
J-02	0.939478	1.141045959	135.1
J-03	1.071564	0.993670886	157.5
J-04	0.982881	1.100303951	138.2
J-05	0.865554	1.690189329	156.3
J-06	1.066745	1.010989011	164.7
J-07	1.074194	1.011860175	161.2
J-08	1.116076	1.51459854	137.8
J-09	0.911919	1.557768924	128.4
J-10	0.913192	1.666518847	120.3
J-11	0.81053	1.294756554	122.5
J-12	1.04604	1.457726958	141.9
J-13	1.099809	0.999006458	161.0
J-14	0.918175	1.44011976	163.0
J-15	1.088147	1.49154665	159.2
J-16	0.707379	1.56097561	138.6
J-17	0.516181	1.190225344	149.7
J-18	1.007643	1.017844564	171.9
J-19	1.006743	1.089778587	137.8
J-20	1.015733	1.500373692	133.8
K-01	1.173749	0.99030303	164.2
K-02	1.104693	0.996323529	162.9
K-03	0.937798	1.006203474	161.7
K-04	1.19806	1.00244798	163.6
K-05	1.592642	1.444852941	133.0
K-06	1.2357	1.056062581	157.7
K-07	1.126363	1.444794953	155.0
K-08	1.150767	1.046557377	156.1
K-09	1.040584	1.080174927	142.7
K-10	1.102317	1.213639527	159.1
K-11	1.301646	1.014814815	163.2
K-12	1.351729	1.678719008	129.7
K-13	1.145999	1.008641975	162.7
K-14	1.079735	1.065789474	157.0
K-15	1.46938	1.721627409	127.1
K-16	0.963338	1.466898955	141.6
K-17	0.883897	1.335901387	151.6
K-18	1.751763	1.785100287	97.2
K-19	0.814616	1.576628352	134.5
K-20	0.862703	2.026455026	171.6
L-01	1.106089	1.013597033	162.9
L-02	1.046831	1.022871665	159.2
L-03	1.347488	1.117839607	129.4
L-04	1.340568	1.111111111	131.1

L-05	1.301985	1.099358974	131.0
L-06	1.313969	1.02676399	166.6
L-07	1.12199	0.985185185	160.8
L-08	1.098769	1.016548463	170.6
L-09	0.998134	1.513409962	131.2
L-10	1.135968	1.461937716	142.3
L-11	1.22178	1.033412888	170.4
L-12	0.936538	1.064327485	141.2
L-13	0.925787	1.161527166	147.2
L-14	0.973854	1.017832647	147.1
L-15	1.020933	1.029288703	145.5
L-16	0.93479	1.011004127	146.2
M-01	0.96905	1.493381038	139.4
M-02	1.185682	1.007634543	160.4
M-03	1.013632	1.020289855	153.3
M-04	0.78772	1.680916031	140.5
M-05	1.11374	0.998283753	174.7
M-06	1.185077	0.994578313	165.6
M-07	0.886103	1.029749632	137.8
M-08	1.076688	1.050422195	170.0
M-09	1.043695	1.013567251	172.2
M-10	0.961661	1.50819398	150.0
M-11	1.01342	1.027656477	139.3
M-12	1.113475	1.007309942	137.3
M-13	1.038549	1.00723589	138.7
M-14	1.123544	1.02764977	176.0
M-15	1.011972	1.078286558	140.7
M-16	0.938124	1.095577746	146.9
M-17	0.98448	1.01056338	171.3
M-18	1.213757	1.02679659	166.4
M-19	0.961118	1.034749035	105.4
M-20	1.189926	1.008894536	158.1
N-01	0.924405	0.995157385	164.8
N-02	1.100346	0.995221027	167.0
N-03	1.020436	0.997487437	159.0
N-04	1.256831	1.117221418	146.3
N-05	0.581752	1.054568528	161.9
N-06	0.857	1.305993691	146.2
N-07	0.934018	1.01212938	149.3
N-08	1.141583	1.049118388	162.7
N-09	1.145894	1.400907716	158.7
N-10	0.866725	1.042394015	163.8
N-11	0.760841	1.481283422	139.2
N-12	0.8	1.436305732	153.0
N-13	1.056129	1.035943517	158.6
N-14	0.934322	1.038926174	151.9
N-15	1.078601	1.01656051	158.3
N-16	1.181425	1.035612536	142.9
N-17	0.938608	1.010335917	155.6
N-18	0.471125	1.785571142	139.0

N-19	1.165169	1.447042641	177.9
N-20	1.204973	1.006203474	161.7
N-21	1.107281	0.998628258	145.7
N-22	1.098325	2.132022472	111.5
N-23	1.199166	1.011083744	163.3
N-24	1.180891	1.272197962	156.1
N-25	0.960545	1.07057257	155.5
N-26	1.355539	1.639468691	139.1
N-27	0.998429	1.001242236	161.1
N-28	0.835679	1.175097276	167.7
N-29	1.198461	1.007352941	163.8
N-30	0.912945	1.4375	144.3
N-31	0.999374	1.40765391	144.7
N-32	0.771971	1.299401198	153.6
N-33	1.022374	1.001242236	161.1
N-34	1.154161	1.009815951	163.8
N-35	1.14891	1.711111111	146.4
N-36	0.951763	1.096296296	141.5
N-37	0.970243	1.072592593	139.9
N-38	1.066856	1.031210986	162.7
N-39	0.898983	1.084569733	140.5
N-40	1.108403	1.031818182	223.5
N-41	1.098027	1.01375	161.1
N-42	1.096351	1.104387292	139.1
N-43	0.99789	1.019083969	158.7
N-44	0.784557	2.008992806	167.3
N-45	1.141173	1.137748344	161.4
N-46	1.196728	1.159500693	155.7
N-47	1.085501	1.220551378	177.2
N-48	1.038366	1.008484848	165.7
N-49	1.005551	1.060294118	140.1
N-50	0.79548	1.167400881	147.6
N-51	0.931363	1.106901218	155.7
N-52	1.104473	1.026315789	169.4
N-53	1.029924	1.057352941	139.9
N-54	1.034021	0.99881376	168.5
N-55	1.155906	1.043701799	159.0
N-56	1.090745	0.997455471	157.0
N-57	0.928032	1.092888244	144.2
N-58	1.067297	1.004813478	166.6
N-59	0.599815	1.163294798	149.7
N-60	0.93978	0.99137931	161.7
N-61	1.062814	1.092741935	155.7