ESTIMATING VALUES OF A QUALITY CHARACTERISTIC AFTER PRODUCT CONVERSION

by

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ABSTRACT

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"Estimating Values of a Quality Characteristic After Product Conversion" is a statistical study commissioned by a company in the United States. Due to the proprietary nature of the information contained within this study, all proper names have been changed to a generic form and all references to actual company personnel and documentation have been removed.

At a production facility in Anytown, U.S.A., Company A makes product B on production line C. Product B comes in a variety of colors, custom-converted widths and types. Throughout the production process many of the product's physical attributes are monitored. Characteristic D is one such physical attribute. Characteristic D is measured, in E units, before product conversion and after product conversion. Personnel that work closely with product B had hypothesize that a correlation between pre-converted and post-converted test values exists. The problem of the study is to determine if there is a relationship between characteristic D values of product B created on production line C before and after conversion. If a quantifiable relationship exists, then post-converted test values could be predicted and post-converted testing eliminated, creating greater economies of operator labor and test equipment use.

To solve the problem of the study, background information was gathered on the product and its characteristics and the test equipment and its operation. Data collection was planned for by learning about and utilizing Microsoft™ Excel and Microsoft™ Access and by remedying inaccurate data in the database. Data was collected and organized by creating and running a series of queries. Data was analyzed through the use of scatter plots, histograms, x-bar charts, descriptive statistics and corresponding rules and theorems.

Regression and correlation analysis indicated a loose correlation between pre-converted and post-converted test values, but the correlation was not significant enough to merit further modeling. Instead, the Empirical rule and sample statistics of the average value and standard deviation of the change in characteristic D were used to predict future changes in characteristic D. Based on the analysis of the data, recommendations were made to discontinue post-converted characteristic D testing if pre-converted test values met or exceeded calculated lower specification limits.

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Chapter One: Introduction

Background of the Problem

At a production facility in Anytown, U.S.A., Company A makes product B on production line C. Product B comes in a variety of colors, custom-converted widths and types. Throughout the production process, many of the product's physical attributes are monitored. Characteristic D is one such physical attribute. Currently, characteristic D is measured, in E units, before product conversion and after product conversion. Engineers and technicians that work closely with product B have hypothesized that a correlation between pre-converted and post-converted characteristic D test values exists and believe that the hypothesis should be further investigated in a formal study. The study of the relationship between pre-converted and post-converted test values began on April 27, 1999 and culminated on August 11, 1999.

Statement of the Problem

The problem of the study is to determine if there is a relationship between characteristic D values of product B created on production line C before and after conversion. If a quantifiable relationship exists, then post-converted test values can be predicted and post-converted testing can be eliminated. Characteristics inherent to the product, such as: the tool used to create it, the color, the product width, the type, the length of time between creation and conversion, and the coordinates and the corresponding lower specification limits at which characteristic D is measured, must be taken into consideration when analyzing the relationship.

Purpose and Importance of the Study

If post-converted values of characteristic D can be adequately predicted rather than measured, then final testing of product B can be eliminated, creating greater economies of operator labor and test equipment use.

Limitations of the Study

Due to the proprietary nature of the information contained within this study, all true product and process names have been changed to a generic form and all references to true company personnel and documentation have been removed.

Findings are limited and applicable only to processed and converted product B at Company A's Anytown, U.S.A. facility. Results can not be generalized beyond this scope.

Definition of Terms

Independent variable: a variable that causes, or influences, another variable (Bobrow 1993); D_{Before}.

Dependent variable: a variable that is caused or influenced by another variable (Bobrow); D_{After}.

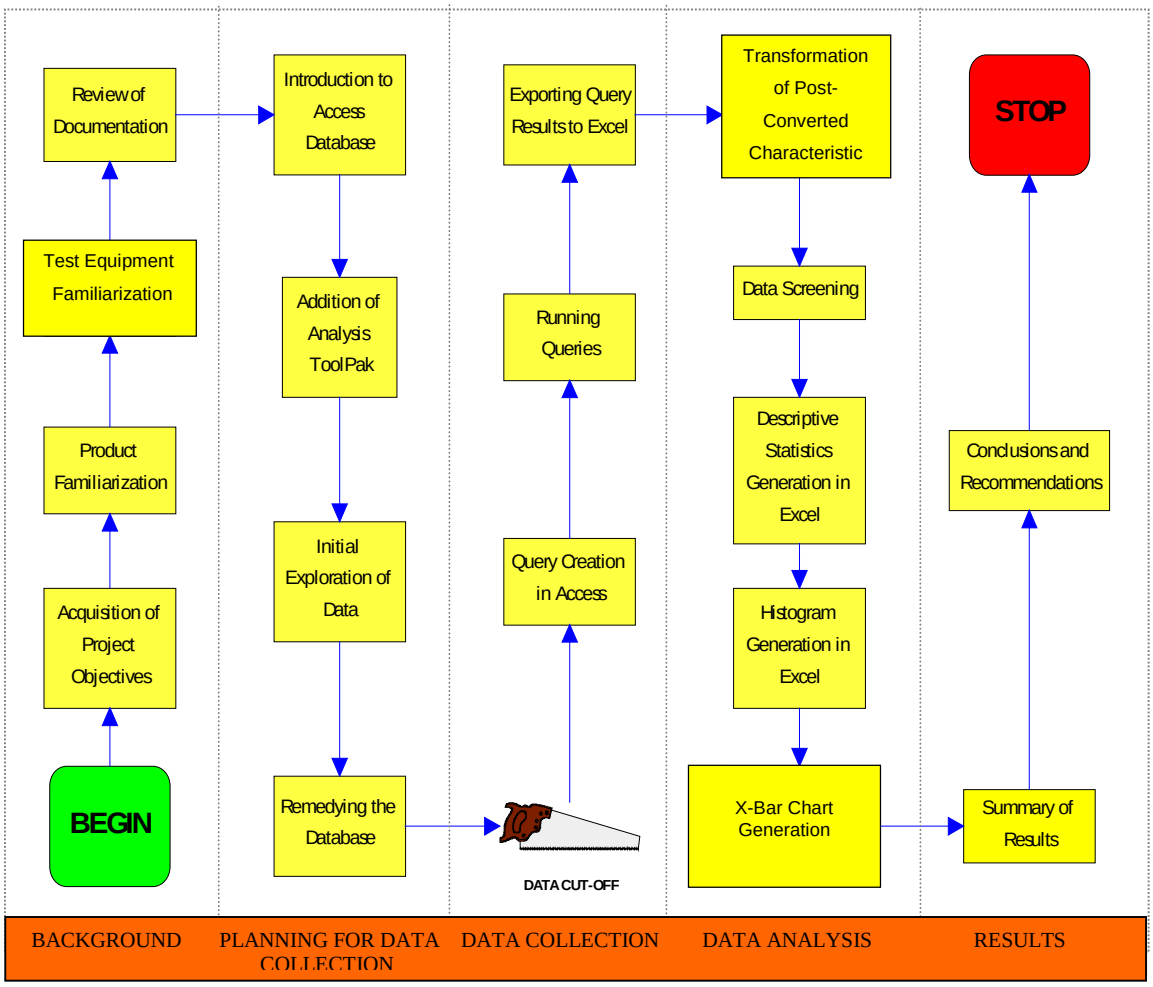
Empirical rule for normal distributions: the interval from one standard deviation below the mean to one standard deviation above the mean contains approximately 68% of the measurements; the interval from two standard deviations below the mean to two standard deviations above the mean contains approximately 95% of the measurements; the interval from three standard deviations below the mean to three standard deviations above the mean contains approximately all of the measurements (Bobrow).

Mean: the sum of the measures in a distribution divided by the number of measures (Bobrow); the average.

Standard deviation: the measure of data variation; the square root of the variance (Bobrow).

Chapter II: Methods and Procedures of the Study

Illustration 1. **Flow Chart of Research Activities**



Collection of Background Information

The study began with the acquisition of project objectives from engineering. Project objectives are summarized in Chapter One's Statement of the Problem. Background information was gathered on the product and its characteristics and the test equipment and its operation.

The product and its characteristics. Company A produces product B of a specific color on a production line that outputs material on rolls. Material colors include: white, orange, green, blue, lime-yellow, yellow and red. After production on line C, the material may either be shipped directly to the

customer or further processed by converting operations. Rolls of product can be finished in a customer-specified width and pattern.

Test equipment and its operation. After product creation and after product conversion, characteristic D is measured is E units on test equipment F. The test equipment operator cuts eight pieces of material from specified areas on the sample roll, calibrates the test equipment and runs each of eight samples through characteristic D tests. Each piece of material is manipulated to color-specific locations and must meet or exceed minimum internal specification limits. After testing is complete, the operator enters required information about the tested material and saves test values and the corresponding product information in a database. The following table summarizes the test coordinates and lower specification limits for each product color.

Illustration 2. Test Coordinates and Corresponding Lower Specification Limits (in E units)

product	first coordinate	second coordinate	LSL
white and lime-yellow			
	1	5	330
	2	5	290
	3	5	180
	4	5	65
	1	6	250
	2	6	200
	3	6	170
	4	6	60
	1	7	25
	2	7	15
	3	7	12
	4	7	10
	1	8	10
	2	8	7
	3	8	5
	4	8	4
orange			
	1	5	200
	4	5	50
	1	6	110
green			
	1	5	150
blue			
	1	5	30
red-orange			
	1	5	60
yellow			
	1	5	200
	4	5	50
	1	6	110

Test values of the first and second coordinates are averages of two measurements.

Planning for Data Collection

The test equipment database. The test equipment database is housed in Microsoft™ Access software. When the test equipment operator saves test results, each position's test value from each of the eight pieces of material tested is stored in a database table. From the eight test values, Access calculates the average value of each position (Information Technology 1999). The average values of each position before and after conversion are the variables under study. Access tables also contain other information about the tested product including its product code, part number, run number, tool number, roll number and test date. Based on the information contained in Access tables, test values before and after conversion can be compared through the creation and use of queries. Queries are commands used to gather and view data in different ways (Microsoft™ Access 1999).

Microsoft™ Excel and the Analysis ToolPak. Microsoft Access has the ability to gather and organize the test values under study, but it can not perform the type of statistical analysis that the study requires. Query results needed to be imported to statistical software for further exploration. Although Excel is commonly thought of as a spreadsheet software, it has an add-in called Analysis ToolPak that contains a wide variety of statistical applications. After Analysis ToolPak activation, Excel proved to be a capable software for the purposes of the study.

Initial exploration of characteristic D data. A review of the data in Access revealed some minor issues that would need to be addressed before analysis could take place. Firstly, the database contained information from tests that needed to stay in the database but needed to be omitted from analysis. For example, the database contained test values from material created on a production line other than the one under study. Data from the other line would need to be omitted from analysis, but it was not readily apparent in the database which material was created on the line under study and which was not. Another example was that Access contained test values from experimental runs that would need to be identified and omitted from analysis. Yet another problem discovered during initial exploration was that Access as it was would not be able to group data by product width. In order to meet the objectives of the study, it would be necessary to group data by product width. The last problem with the database was that many transposistional errors were occurring when test equipment operators entered product information about samples into the database. Entry errors would need to be corrected before data could be gathered by query

Remedying the database. A number of steps were taken to prepare the database for data collection. A copy of the original network drive was moved to a remote drive and a one-way link from the original to the remote drive was created. The one-way link existed so that new test results could be added to the analysis, but old test results that needed to be deleted from analysis could be removed without destroying the integrity of the original database. All factory experiments were identified and deleted from the remote database. All material created on a line other than production line C was identified and deleted. To solve the problem of grouping test values by product width, a new table was created in Access. The table assigned the correct product width to each product code in the database. The new table would be a part of the query for collecting all data and sorting it by product width. The last problem to be fixed was the correction of operator's transposistional errors. A quality technician undertook the task of correcting any transposistional errors she could find. After all problems with the database were remedied, the link to the original database was severed and data collection began.

Data Collection

Query creation in Access. Data collection and organization of the values of pre- and post-converted product was made simple by the creation of a series of queries. An MIT consultant helped to design commands that gathered: all test values from material created on production line C, all test values from material further processed by converting operations, and a pairing of all test values from material that was created on line C and then converted (see Appendix A for an illustration of each query). The pairings include all converted product whose origins could be traced back to production line C from the beginning of product testing on April 16, 1998 to the point of data collection cut-off on June 11, 1999. The pairings became the elements of the study's sample from which all data analysis was conducted.

Running the queries. The execution of the query that compared test values of material produced on line C and then converted by further processing returned 692 unique pairs of data to be analyzed. The query results were then arranged so that data could be analyzed by product type, color, width, tool number, converting interval and test coordinate/lower specification limit. Each sub group of the data was exported to Excel for further statistical analysis. See Appendix B for a compilation of all data sets.

Data Analysis

Once imported into Excel, the data was transformed for easier comprehension and applicability by turning values for post-converted material into percentage change in characteristic D from pre-converted values. For example, if the test value of characteristic D off line C was equal to 10 and the test value of characteristic D after converting was equal to 9, then during the conversion process, material lost ten percent of characteristic D. Changes in the characteristic under study were analyzed with Excel's Analysis ToolPak and charting tools and other statistical software. Data was screened and the test values of two materials were removed from analysis. The first, blue material created on line C on March 23, 1999 and converted several months later, was removed from analysis due to an excessive time gap between creation on C and testing of characteristic D off line C. The second, a white material also created on March 23, 1999 was removed because post-converted test values appeared to be technically flawed (Process Engineering 1999). After data screening, data was analyzed as a whole and in the above-mentioned subsets through the use of scatter plots, histograms, x-bar charts, descriptive statistics and corresponding rules and theorems.

Chapter Three: Findings

1. In the sample of 692 values off line C, Company A has never created product that has failed to exceed minimum specifications by at least 26 percent. On average, line C test results exceed minimum specification limits by more than 210 percent. Illustration 4. provides a summary of descriptive statistics on test results off line C in relation to lower specification limits for all sample data. Furthermore, of the matching 692 sample values after conversion, the company has never converted product that has failed to exceed minimum specifications by at least 23 percent. On average, converted test results exceed minimum specification limits by almost 187 percent.

Illustration 3.

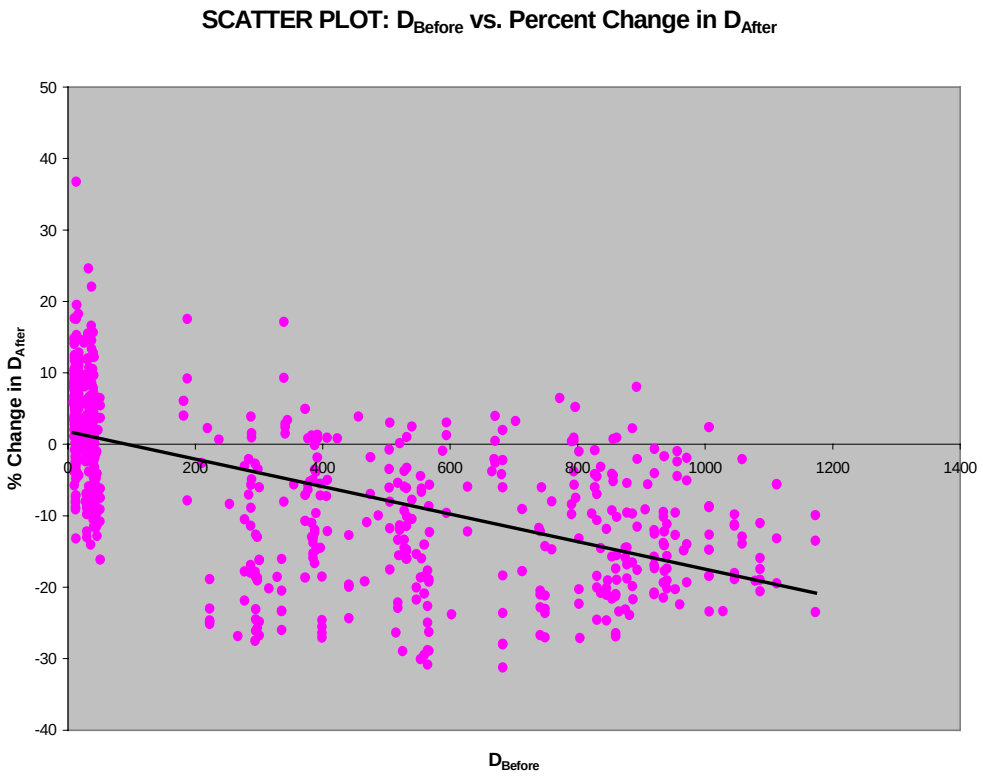
D_{Before} % Above LSL	
Mean	210.607609
Standard Error	5.844223634
Median	166.0102076
Mode	325.1458295
Standard Deviation	153.7375209
Sample Variance	23635.22532
Range	903.308011
Minimum	26.61499768
Maximum	929.9230087
Sum	145740.4655
Count	692

Illustration 4.

D_{After} % Above LSL	
Mean	186.8243062
Standard Error	4.524626296
Median	160.9536265
Standard Deviation	119.0243346
Sample Variance	14166.79224
Range	727.3055315
Minimum	23.8859992
Maximum	751.1915307
Sum	129282.4199
Count	692

2. A visual representation of all pre-converted test values plotted against the percent change in post-converted values indicates a loose correlation between the two; as pre-converted test values become larger, post-converted material loses more characteristic D. The correlation, however, is not significant enough to merit linear regression modeling. The average value of the change in characteristic D will be a better predictor of change in characteristic D than will pre-converted test values.

Illustration 5.



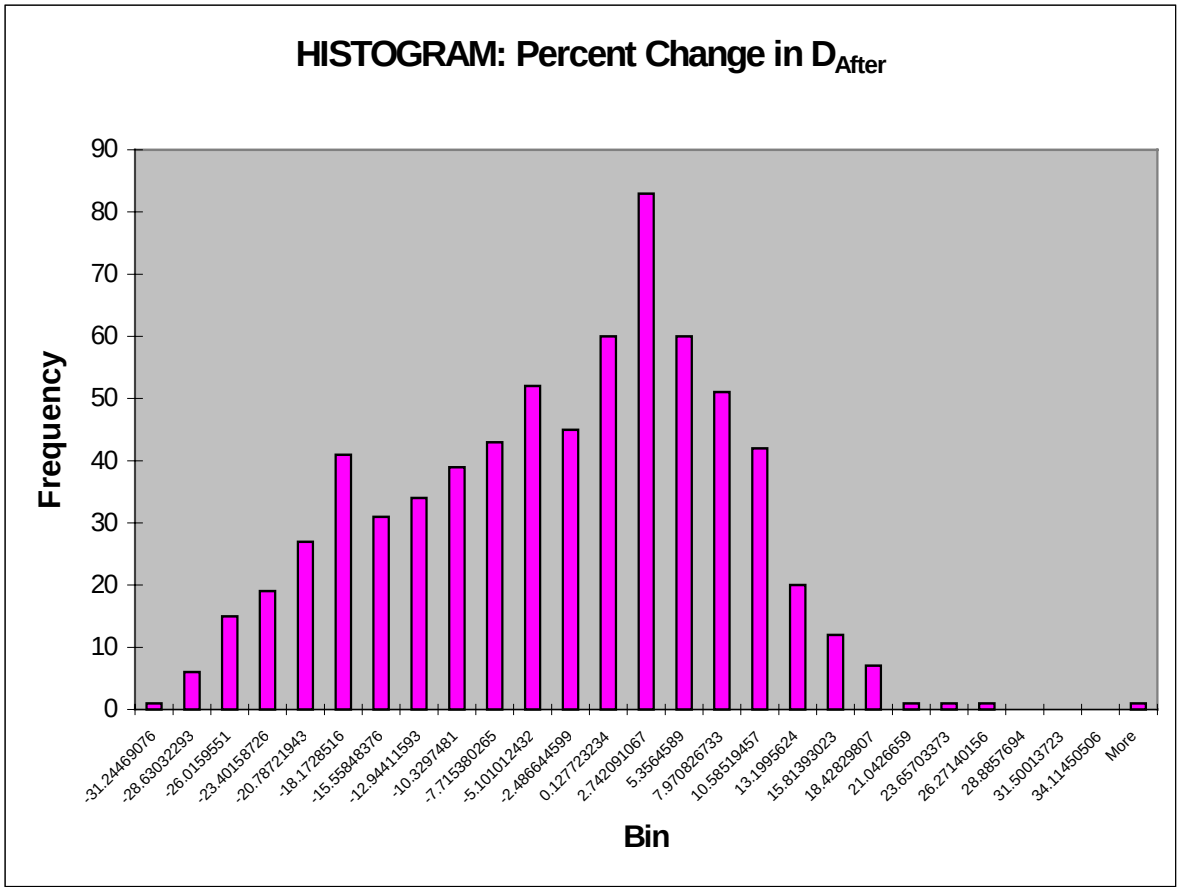
3. Average percent change in characteristic D during conversion and corresponding standard deviations for all sample data and each available sub group of sample data are listed in Illustration 6.

Illustration 6. Sample Means and Standard Deviations

DATA GROUP	MEAN % CHANGE IN CHARACTERISTIC D DURING CONVERSION	STANDARD DEVIATION
conversion interval		
7 or less units	0.346527182	7.124859884
8-14 units	-3.737613409	11.41608871
15-21 units	-5.636702977	10.46674165
22-28 units	-6.162111842	11.84126282
29-35 units	-9.818613436	11.99277881
36-42 units	-3.305233147	12.6149009
43-49 units	-3.184723232	9.889159161
50 or more units	1.106578201	6.965508721
tool number		
1	1.456908836	7.696284178
2	-12.83107556	10.60373268
3	-4.913519342	10.93969126
4	-3.801780127	11.0564754
converted width		
1 units	0.439268842	8.325947847
2 units	-1.169958737	8.682255764
3 units	-7.613395944	12.31004807
4 units	-0.903387192	6.608732859
5 units	-7.88134849	12.8769309
6 units	-4.449661901	10.49178632
7 units	-4.472753629	11.08512265
8 units	-8.288440427	12.16295798
9 units	-5.388009812	11.2455226
10 units	-4.348237071	11.2378727
series		
a	-5.859692343	11.54108267
b	-0.343681902	8.427412467
color		
white	-4.900097218	11.11291518
lime-yellow	-3.958350769	11.04393679
yellow	-13.65585206	12.8242667
LSL		
4	2.195751314	6.541577382
5	5.363118148	5.384962626
7	3.833744731	3.756480274
10	4.893242381	7.838810752
12	-4.323158337	5.721949646
15	3.421113246	7.369934868
25	3.474119065	6.298481154
60	-13.31268737	11.4050804
65	-15.49447183	11.85458771
170	-8.927838374	7.949300468
180	-14.49439337	9.607365049
200	-9.322733048	7.107884744
250	-12.1241326	8.215480054
290	-11.39979349	8.378677562
330	-11.60423873	7.927381712
all data	-4.625225579	11.21351496

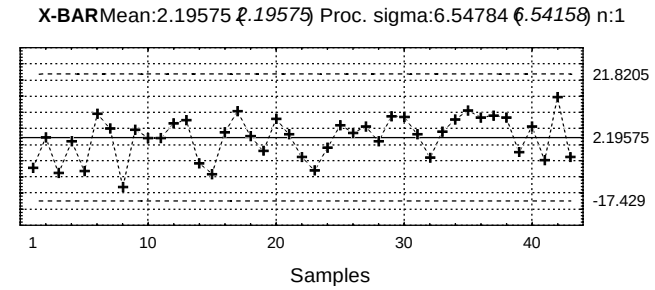
4. The distribution of the percent change in D_{After} all sample data (as well as the distributions of all sub groups) is approximately normal; therefor, the Empirical rule can be applied to predict change in D during conversion.

Illustration 7.



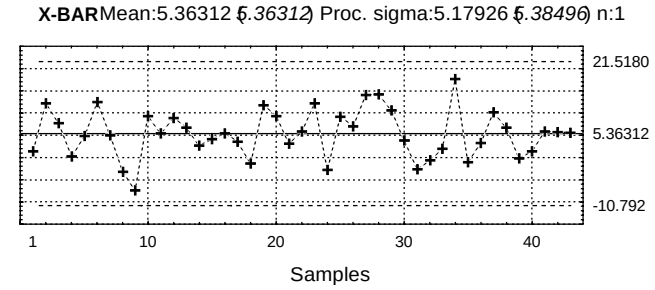
5. The best predictors of post-converted test values are the sample means (with their respective standard deviations) of the lower specification limits sub group because their descriptive statistics reflect the loose correlation that D_{Before} values have with D_{After} values. Using the Empirical rule of normal distributions, it can be said that approximately 68.26 percent of all D_{After} values will fall within one standard deviation from the mean, that approximately 95.46 percent of all D_{After} values will fall within two standard deviations from the mean and that approximately 99.73 percent of all D_{After} values will fall within three standard deviations of the mean. Applying the Empirical rule to the sub group sample of test values grouped by lower specification limits produces the results in Illustrations 8. through 22.

Illustration 8. LSL=4



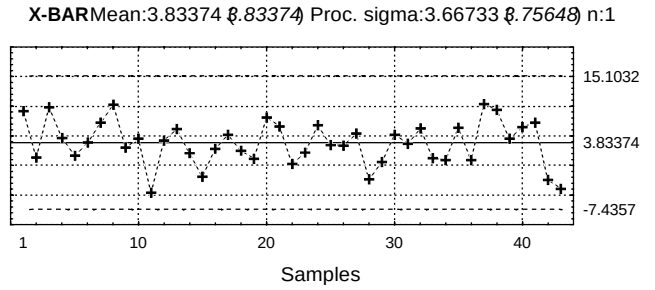
When the test coordinate's lower specification limit is equal to four, 99.74% of material will lose 17.429% or less of characteristic D during conversion.

Illustration 9. LSL=5



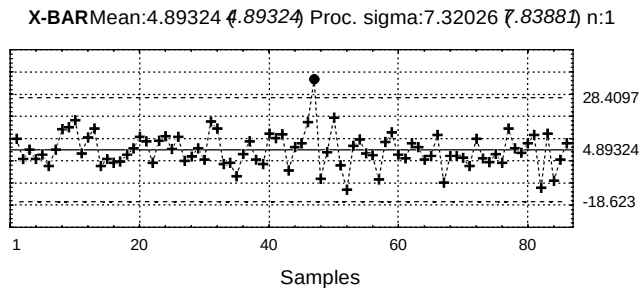
When the test coordinate's lower specification limit is equal to five, 99.74% of material will lose 10.792% or less of characteristic D during conversion.

Illustration 10. LSL=7



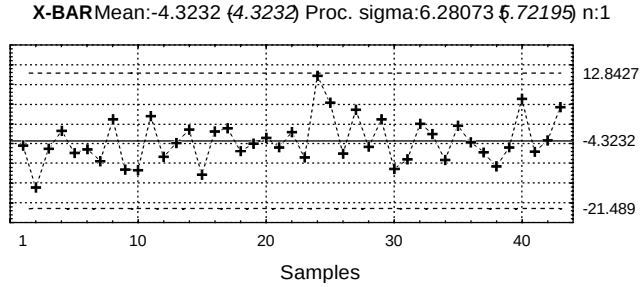
When the test coordinate's lower specification limit is equal to seven, 99.74% of material will lose 7.436% or less of characteristic D during conversion.

Illustration 11. LSL=10



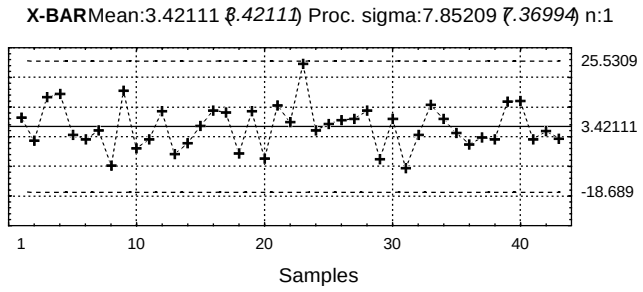
When the test coordinate's lower specification limit is equal to ten, 99.74% of material will lose 18.623% or less of characteristic D during conversion.

Illustration 12. LSL=12



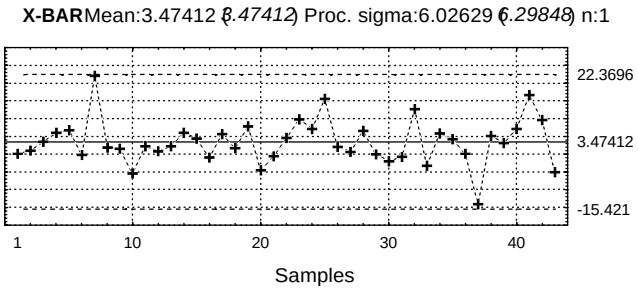
When the test coordinate's lower specification limit is equal to twelve, 99.74% of material will lose 21.489% or less of characteristic D during conversion.

Illustration 13. LSL=15



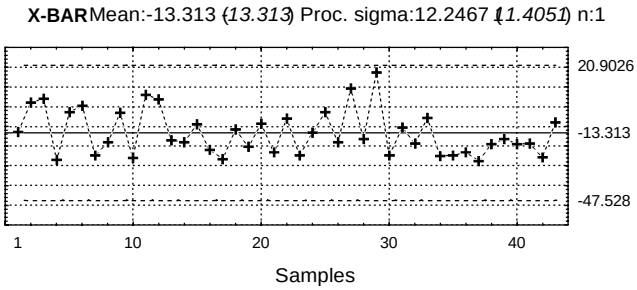
When the test coordinate's lower specification limit is equal to fifteen, 99.74% of material will lose 18.689% or less of characteristic D during conversion.

Illustration 14. LSL=25



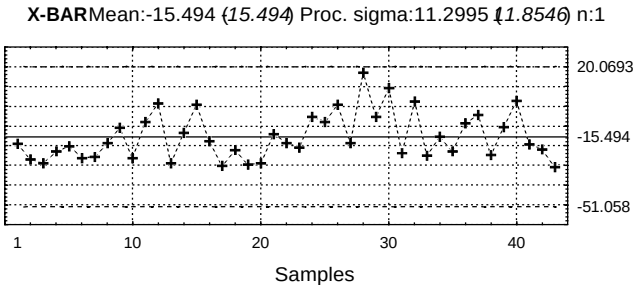
When the test coordinate's lower specification limit is equal to 25, 99.74% of material will lose 15.421% or less of characteristic D during conversion.

Illustration 15. LSL=60



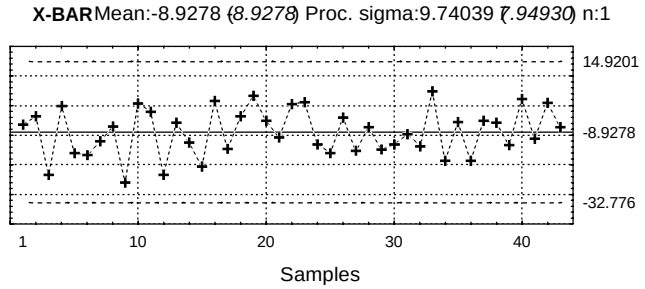
When the test coordinate's lower specification limit is equal to 60, 99.74% of material will lose 47.528% or less of characteristic D during conversion.

Illustration 16. LSL=65



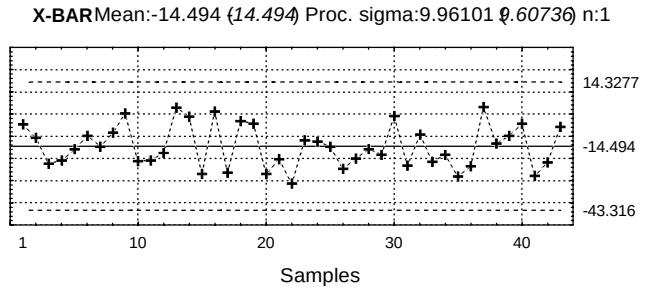
When the test coordinate's lower specification limit is equal to 65, 99.74% of material will lose 51.058% or less of characteristic D during conversion.

Illustration 17. LSL=170



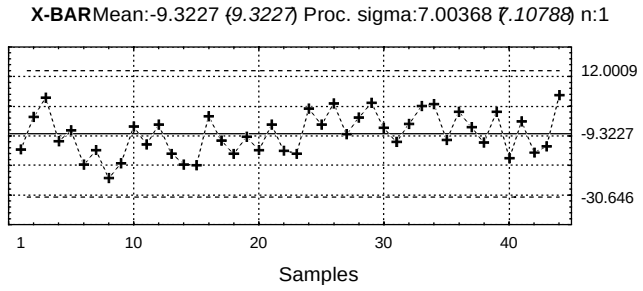
When the test coordinate's lower specification limit is equal to 170, 99.74% of material will lose 32.776% or less of characteristic D during conversion.

Illustration 18. LSL=180



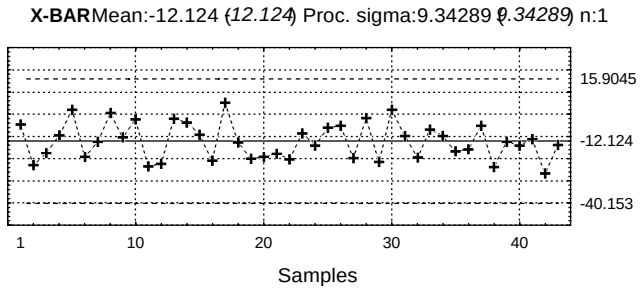
When the test coordinate's lower specification limit is equal to 180, 99.74% of material will lose 43.316% or less of characteristic D during conversion.

Illustration 19. LSL=200



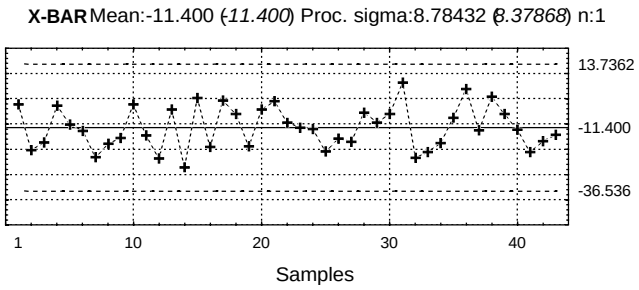
When the test coordinate's lower specification limit is equal to 200, 99.74% of material will lose 30.646% or less of characteristic D during conversion.

Illustration 20. LSL=250



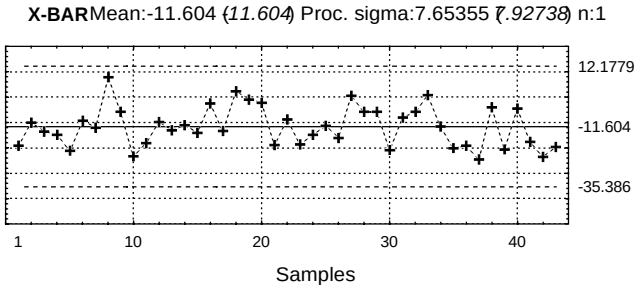
When the test coordinate's lower specification limit is equal to 250, 99.74% of material will lose 40.153% or less of characteristic D during conversion.

Illustration 21. LSL=290



When the test coordinate's lower specification limit is equal to 290, 99.74% of material will lose 36.536% or less of characteristic D during conversion.

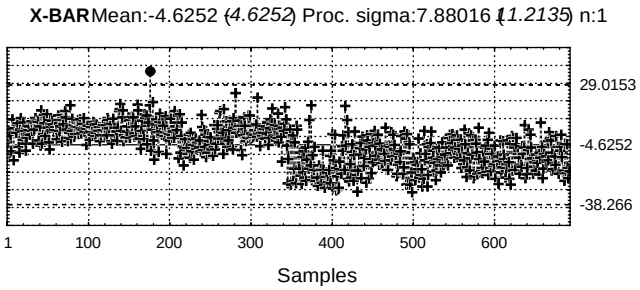
Illustration 22. LSL=330



When the test coordinate's lower specification limit is equal to 330, 99.74% of material will lose 35.386% or less of characteristic D during conversion.

6. Some lower specification limits did not have enough sample data to calculate means and standard deviations. Loss of characteristic D during conversion for test coordinates with a lower specification limit of 50, 110 and 150 will be estimated using the mean and standard deviation for all data.

Illustration 23. All Data



When the test coordinate's lower specification limit is equal to 50, 110 or 150, 99.74% of material will lose 38.266% or less of characteristic D during conversion.

Chapter Four: Conclusions

Summary

Based on the study findings, it is determined that loss of characteristic D during the conversion process can be estimated by using sample statistics generated during the study. By calculating the mean and standard deviation of characteristic D change during conversion at each lower specification limit, it can be predicted that more than 99 percent of all observations of changes in characteristic D during the conversion process will fall within three standard deviations of the mean. The following table summarizes what D_{Before} test values must be achieved so that more than 99 percent of all D_{After} test values would meet or exceed lower specification limits.

Illustration 24.

Table of Required Pre-Converted Characteristic D Test Values by LSL

LSL	mean % change in D_{After}	-3σ	$1 - \lvert -3\sigma \rvert (.01)$	D_{Before} must be at least
4	2.196	-17.429	.82571	4.8443
5	5.363	-10.792	.89208	5.6049
7	3.834	-7.436	.92564	7.5623
10	4.893	-18.623	.82377	12.1393
12	-4.323	-21.489	.78511	15.2845
15	3.421	-18.689	.81311	18.4477
25	3.474	-15.421	.84579	29.5582
50	-4.625 (estimated)	-38.266	.61734	80.9926
60	-13.312	-47.528	.52472	114.3467
65	-15.494	-51.058	.48242	134.7374
110	-4.625 (estimated)	-38.266	.61734	178.1838
150	-4.625 (estimated)	-38.266	.61734	242.9449
170	-8.928	-32.776	.67224	252.8859
180	-14.494	-43.316	.56684	317.54992
200	-9.323	-30.646	.69354	288.3756
250	-12.124	-40.153	.59847	417.7319
290	-11.400	-36.536	.63464	456.9520
330	-11.604	-35.386	.64614	510.7252

Recommendations

For immediate action:

1. Place Illustration 24. in the test equipment room for operator reference.
2. Train all test equipment operators on how to use the table.

3. Discontinue the procedure of testing all converted material for characteristic D. Instead, compare the pre-converted test values at each lower specification limit against the values in the last column of Illustration 24.
    a. If all D_{Before} tests meet or exceed the values in the last column, the product can be converted and shipped to the customer without any further characteristic D testing.
    b. If one or more of the D_{Before} tests fail to meet the values in the last column, the product should be identified as potentially non-conforming and marked for further characteristic D testing after conversion.

For future action:

4. Contact Information Technology about the possibility of adding columns in the test equipment's software that would, based on the minimum D_{Before} test values, identify pre-converted product as "good to ship" or "in need of further testing".
5. Investigate the sources of variation in characteristic D test values.

Appendix A. Queries

Query "CompareAllBeforesandAfters"

```
SELECT QryGetAllBefores.Expr2, QryGetAllAfters.ToolNumber, QryGetAllBefores.ProductNumber,
QryGetAllBefores.ToolNumber, QryGetAllAfters.ProductNumber, QryGetAllAfters.Coordinate1,
QryGetAllAfters.Coordinate2, First(QryGetAllBefores.AvgOfTestValue) AS BeforeAverage,
First(QryGetAllAfters.AvgOfTestValue) AS AfterAverage, QryGetAllBefores.LowerSpecification,
QryGetAllAfters.[Product Width], ([BeforeAverage]-[AfterAverage])/[BeforeAverage]*-100 AS
[%Change], First([AfterDate]-[BeforeDate]) AS DateDifference, First([AfterDate]-[DatefromRunNo]) AS
DifferencefromJulian, QryGetAllAfters.ProductCode
FROM (QryGetAllBefores INNER JOIN QryGetAllAfters ON (QryGetAllBefores.LowerSpecification =
QryGetAllAfters.LowerSpecification) AND (QryGetAllBefores.Coordinate2 =
QryGetAllAfters.Coordinate2) AND (QryGetAllBefores.Coordinate1 = QryGetAllAfters.Coordinate1)
AND (QryGetAllBefores.ToolNumber = QryGetAllAfters.ToolNumber) AND (QryGetAllBefores.Expr2 =
QryGetAllAfters.Expr2)) INNER JOIN (QryGetBeforesDates INNER JOIN QryGetAftersDates ON
(QryGetBeforesDates.Coordinate2 = QryGetAftersDates.Coordinate2) AND
(QryGetBeforesDates.Coordinate1 = QryGetAftersDates.Coordinate1) AND
(QryGetBeforesDates.ToolNumber = QryGetAftersDates.ToolNumber) AND (QryGetBeforesDates.Expr2
= QryGetAftersDates.Expr2)) ON (QryGetAllAfters.Coordinate2 = QryGetBeforesDates.Coordinate2)
AND (QryGetAllAfters.Coordinate1 = QryGetBeforesDates.Coordinate1) AND
(QryGetAllAfters.ToolNumber = QryGetBeforesDates.ToolNumber) AND (QryGetAllAfters.Expr2 =
QryGetBeforesDates.Expr2)
GROUP BY QryGetAllBefores.Expr2, QryGetAllAfters.ToolNumber, QryGetAllBefores.ProductNumber,
QryGetAllBefores.ToolNumber, QryGetAllAfters.ProductNumber, QryGetAllAfters.Coordinate1,
QryGetAllAfters.Coordinate2, QryGetAllBefores.LowerSpecification, QryGetAllAfters.[Product Width],
QryGetAllAfters.ProductCode;
```

Query "GetAllBefores"

```
SELECT After([runnumber]) AS Expr2, TestInformationTable.ProductNumber,
TestInformationTable.ToolNumber, TestConfigurationTable.Coordinate1,
TestConfigurationTable.Coordinate2, Avg(TestValuesTable.TestValue) AS AvgOfTestValue,
TestConfigurationTable.LowerSpecification, TestInformationTable.ProductCode,
ProductMasterTable.[Product Width]
FROM (ProductMasterTable INNER JOIN TestInformationTable ON ProductMasterTable.[Product
Number] = TestInformationTable.ProductNumber) INNER JOIN (TestConfigurationTable INNER JOIN
TestValuesTable ON TestConfigurationTable.TestConfigurationKey =
TestValuesTable.TestConfigurationKey) ON TestInformationTable.TestInformationKey =
TestConfigurationTable.TestInformationIndex
WHERE (((Left$([ProductCode],2))="a" Or (Left$([ProductCode],2))="b") AND
((Left$([ProductNumber],2))="c"))
GROUP BY After([runnumber]), TestInformationTable.ProductNumber,
TestInformationTable.ToolNumber, TestConfigurationTable.Coordinate1,
TestConfigurationTable.Coordinate2, TestConfigurationTable.LowerSpecification,
TestInformationTable.ProductCode, ProductMasterTable.[Product Width];
```

Query “GetAllAfters”

```
SELECT Right(After([RunNumber]),6) AS Expr2, TestInformationTable.ProductNumber,
TestInformationTable.ToolNumber, TestConfigurationTable.Coordinate1,
TestConfigurationTable.Coordinate2, Avg(TestValuesTable.TestValue) AS AvgOfTestValue,
TestConfigurationTable.LowerSpecification, TestInformationTable.ProductCode,
ProductMasterTable.[Product Width]
FROM (ProductMasterTable INNER JOIN TestInformationTable ON ProductMasterTable.[Product
Number] = TestInformationTable.ProductNumber) INNER JOIN (TestConfigurationTable INNER JOIN
TestValuesTable ON TestConfigurationTable.TestConfigurationKey =
TestValuesTable.TestConfigurationKey) ON TestInformationTable.TestInformationKey =
TestConfigurationTable.TestInformationIndex
WHERE (((Left$([ProductNumber],2))="d") AND ((Left$([ProductCode],2))="a" Or
(Left$([ProductCode],2))="b"))
GROUP BY Right(After([RunNumber]),6), TestInformationTable.ProductNumber,
TestInformationTable.ToolNumber, TestConfigurationTable.Coordinate1,
TestConfigurationTable.Coordinate2, TestConfigurationTable.LowerSpecification,
TestInformationTable.ProductCode, ProductMasterTable.[Product Width];
```

Query “GetBeforesDates”

```
SELECT After([runnumber]) AS Expr2, TestInformationTable.ProductNumber,
TestInformationTable.ToolNumber, TestConfigurationTable.Coordinate1,
TestConfigurationTable.Coordinate2, TestInformationTable.DateProcessed AS BeforeDate,
Avg(TestValuesTable.TestValue) AS AvgOfTestValue,
CDate(Month(Val(Right(After([RunNumber]),3))+1) & "/" & Day(Val(Right(After([RunNumber]),3))+1)
& "/99") AS DatefromRunNo
FROM TestInformationTable INNER JOIN (TestConfigurationTable INNER JOIN TestValuesTable ON
TestConfigurationTable.TestConfigurationKey = TestValuesTable.TestConfigurationKey) ON
TestInformationTable.TestInformationKey = TestConfigurationTable.TestInformationIndex
WHERE (((TestInformationTable.StamperNumber)<>"linenotunderstudy") AND
((Left$([ProductCode],2))="a" Or (Left$([ProductCode],2))="b") AND ((Left$([ProductNumber],2))="c")
AND ((Val(Right(After([RunNumber]),4)))>9000))
GROUP BY After([runnumber]), TestInformationTable.ProductNumber,
TestInformationTable.ToolNumber, TestConfigurationTable.Coordinate1,
TestConfigurationTable.Coordinate2, TestInformationTable.DateProcessed;
```

Query “Get AftersDates”

```
SELECT Right(After([RunNumber]),6) AS Expr2, TestInformationTable.ProductNumber,
TestInformationTable.ToolNumber, TestConfigurationTable.Coordinate1,
TestConfigurationTable.Coordinate2, Avg(TestValuesTable.TestValue) AS AvgOfTestValue,
TestConfigurationTable.LowerSpecification, TestInformationTable.ProductCode,
ProductMasterTable.[Product Width]
FROM (ProductMasterTable INNER JOIN TestInformationTable ON ProductMasterTable.[Product
Number] = TestInformationTable.ProductNumber) INNER JOIN (TestConfigurationTable INNER JOIN
TestValuesTable ON TestConfigurationTable.TestConfigurationKey =
TestValuesTable.TestConfigurationKey) ON TestInformationTable.TestInformationKey =
TestConfigurationTable.TestInformationIndex
WHERE (((Left$([ProductNumber],2))="d") AND ((Left$([ProductCode],2))="a" Or
(Left$([ProductCode],2))="b"))
GROUP BY Right(After([RunNumber]),6), TestInformationTable.ProductNumber,
TestInformationTable.ToolNumber, TestConfigurationTable.Coordinate1,
TestConfigurationTable.Coordinate2, TestConfigurationTable.LowerSpecification,
TestInformationTable.ProductCode, ProductMasterTable.[Product Width];
```

Appendix B. Sample Data

Julian Date	Tool #	Before #	After #	1st Coord	2nd Coord	D_{Before}	D_{After}	% Change	LSL	Width	Conversion Interval	Series
9056	3	6508-6	1142-0	3	7	51.02	47.19	-7.509	12	10	13.01	a
9056	3	6508-6	2160-1	3	6	387.2	386.9	-0.092	170	2	13.01	a
9056	3	6508-6	1039-8	4	7	29.69	29.27	-1.414	10	5	13.01	a
9056	3	6508-6	1039-8	4	8	12.82	11.91	-7.129	4	5	13.01	a
9056	3	6508-6	1142-0	1	5	1046	857.3	-18.04	330	10	13.01	a
9056	3	6508-6	1142-0	1	6	934.8	753.6	-19.38	250	10	13.01	a
9056	3	6508-6	1142-0	1	7	40.05	42.7	6.5998	25	10	13.01	a
9056	3	6508-6	1142-0	1	8	13.99	15.42	10.281	10	10	13.01	a
9056	3	6508-6	1142-0	2	5	877.4	729.8	-16.83	290	10	13.01	a
9056	3	6508-6	1142-0	2	6	527.8	457.2	-13.38	200	10	13.01	a
9056	3	6508-6	1142-0	2	7	37.56	40.79	8.5806	15	10	13.01	a
9056	3	6508-6	1142-0	2	8	13.46	13.96	3.7162	7	10	13.01	a
9056	3	6508-6	1039-8	4	5	566.7	417.8	-26.27	65	5	13.01	a
9056	3	6508-6	1142-0	3	6	387.2	341.1	-11.91	170	10	13.01	a
9056	3	6508-6	1039-8	3	8	11.85	12.49	5.4073	5	5	13.01	a
9056	3	6508-6	1142-0	4	5	566.7	459.8	-18.85	65	10	13.01	a
9056	3	6508-6	1142-0	4	7	29.69	29.91	0.7266	10	10	13.01	a
9056	3	6508-6	1142-0	4	8	12.82	12.34	-3.769	4	10	13.01	a
9056	3	6508-6	2160-1	1	5	1046	943.5	-9.8	330	2	13.01	a
9056	3	6508-6	2160-1	1	6	934.8	846	-9.498	250	2	13.01	a
9056	3	6508-6	2160-1	1	7	40.05	40	-0.131	25	2	13.01	a
9056	3	6508-6	2160-1	1	8	13.99	14.38	2.8242	10	2	13.01	a
9056	3	6508-6	2160-1	2	5	877.4	829.8	-5.427	290	2	13.01	a
9056	3	6508-6	2160-1	2	6	527.8	508.2	-3.728	200	2	13.01	a
9056	3	6508-6	2160-1	2	7	37.56	43.02	14.528	15	2	13.01	a
9056	3	6508-6	2160-1	2	8	13.46	14.33	6.5091	7	2	13.01	a
9056	3	6508-6	1038-0	1	5	1046	848.5	-18.88	330	8	13.01	a
9056	3	6508-6	1142-0	3	5	830.5	677.6	-18.41	180	10	13.01	a
9056	3	6508-6	1038-0	4	7	29.69	30.27	1.9264	10	8	13.01	a
9056	3	6508-6	1038-0	1	6	934.8	734	-21.48	250	8	13.01	a
9056	3	6508-6	1038-0	1	7	40.05	40.4	0.8626	25	8	13.01	a
9056	3	6508-6	1038-0	1	8	13.99	15.73	12.437	10	8	13.01	a
9056	3	6508-6	1038-0	2	5	877.4	712.4	-18.81	290	8	13.01	a
9056	3	6508-6	1038-0	2	6	527.8	451.4	-14.48	200	8	13.01	a
9056	3	6508-6	1038-0	2	7	37.56	37.27	-0.788	15	8	13.01	a
9056	3	6508-6	1038-0	2	8	13.46	14.09	4.6627	7	8	13.01	a
9056	3	6508-6	1038-0	3	5	830.5	626.5	-24.57	180	8	13.01	a
9056	3	6508-6	1038-0	3	6	387.2	322.8	-16.64	170	8	13.01	a
9056	3	6508-6	1038-0	3	7	51.02	42.79	-16.12	12	8	13.01	a
9056	3	6508-6	1038-0	3	8	11.85	12.17	2.748	5	8	13.01	a
9056	3	6508-6	1039-8	4	6	300.3	225.7	-24.84	60	5	13.01	a
9056	3	6508-6	1038-0	4	6	300.3	220	-26.75	60	8	13.01	a
9056	3	6508-6	2160-1	3	7	51.02	52.9	3.6899	12	2	13.01	a
9056	3	6508-6	1038-0	4	8	12.82	11.13	-13.2	4	8	13.01	a
9056	3	6508-6	1039-8	1	5	1046	928.5	-11.24	330	5	13.01	a
9056	3	6508-6	1039-8	1	6	934.8	805.6	-13.83	250	5	13.01	a
9056	3	6508-6	1039-8	1	7	40.05	41.9	4.6025	25	5	13.01	a

9056	3	6508-6	1039-8	1	8	13.99	15.52	10.939	10	5	13.01	a
9056	3	6508-6	1039-8	2	5	877.4	750.7	-14.44	290	5	13.01	a
9056	3	6508-6	1039-8	2	6	527.8	478.7	-9.307	200	5	13.01	a
9056	3	6508-6	1039-8	2	7	37.56	39.8	5.9524	15	5	13.01	a
9056	3	6508-6	1039-8	2	8	13.46	14.17	5.2682	7	5	13.01	a
9056	3	6508-6	1039-8	3	5	830.5	664.1	-20.04	180	5	13.01	a
9056	3	6508-6	1039-8	3	6	387.2	339.2	-12.41	170	5	13.01	a
9056	3	6508-6	1039-8	3	7	51.02	47.84	-6.23	12	5	13.01	a
9056	3	6508-6	1038-0	4	5	566.7	402.8	-28.92	65	8	13.01	a
9101	4	6508-6	1142-0	2	5	796.9	737.1	-7.501	290	10	51.99	a
9056	3	6508-6	2160-1	3	5	830.5	793.3	-4.487	180	2	13.01	a
9078	4	6508-6	1142-0	3	5	567.8	497.8	-12.32	180	10	12.93	a
9078	4	6508-6	1142-0	3	6	283.9	263.8	-7.056	170	10	12.93	a
9078	4	6508-6	1142-0	3	7	44.41	42.3	-4.754	12	10	12.93	a
9078	4	6508-6	1142-0	3	8	11.54	12.2	5.732	5	10	12.93	a
9078	4	6508-6	1142-0	4	5	341	346.1	1.5039	65	10	12.93	a
9078	4	6508-6	1142-0	4	6	181.9	192.9	6.0562	60	10	12.93	a
9078	4	6508-6	1142-0	4	7	28.9	29.1	0.7094	10	10	12.93	a
9078	4	6508-6	1142-0	4	8	10.21	11.14	9.1025	4	10	12.93	a
9101	4	6508-6	1142-0	1	5	910.1	859	-5.609	330	10	51.99	a
9101	4	6508-6	1142-0	1	6	822.1	742.5	-9.684	250	10	51.99	a
9078	4	6508-6	1142-0	2	7	33.51	37.11	10.736	15	10	12.93	a
9101	4	6508-6	1142-0	1	8	16.91	19.99	18.228	10	10	51.99	a
9078	4	6508-6	1142-0	2	6	407.5	358	-12.16	200	10	12.93	a
9101	4	6508-6	1142-0	2	6	474.7	441.7	-6.963	200	10	51.99	a
9101	4	6508-6	1142-0	2	7	35.27	38.33	8.6775	15	10	51.99	a
9101	4	6508-6	1142-0	2	8	15.54	15.58	0.2558	7	10	51.99	a
9101	4	6508-6	1142-0	3	5	739.6	653	-11.71	180	10	51.99	a
9101	4	6508-6	1142-0	3	6	354.7	334.7	-5.632	170	10	51.99	a
9101	4	6508-6	1142-0	3	7	44.14	43.55	-1.341	12	10	51.99	a
9101	4	6508-6	1142-0	3	8	12.63	13.05	3.3409	5	10	51.99	a
9101	4	6508-6	1142-0	4	5	469.1	417.9	-10.92	65	10	51.99	a
9101	4	6508-6	1142-0	4	6	253.5	232.3	-8.364	60	10	51.99	a
9101	4	6508-6	1142-0	4	7	29.63	30.84	4.0772	10	10	51.99	a
9101	4	6508-6	1142-0	4	8	11.92	12.05	1.0538	4	10	51.99	a
9008	2	6508-6	0975-4	1	5	845.4	637.1	-24.64	330	3	33.19	a
9101	4	6508-6	1142-0	1	7	39.84	44.95	12.818	25	10	51.99	a
9078	4	6508-6	1038-0	3	5	567.8	535.5	-5.68	180	8	12.93	a
9056	3	6508-6	2160-1	3	8	11.85	12.63	6.6653	5	2	13.01	a
9056	3	6508-6	2160-1	4	5	566.7	517.6	-8.659	65	2	13.01	a
9056	3	6508-6	2160-1	4	6	300.3	282.3	-6.006	60	2	13.01	a
9056	3	6508-6	2160-1	4	7	29.69	29.44	-0.839	10	2	13.01	a
9056	3	6508-6	2160-1	4	8	12.82	13.56	5.7488	4	2	13.01	a
9078	4	6508-6	1038-0	1	5	759.5	698.8	-7.99	330	8	12.93	a
9078	4	6508-6	1038-0	1	6	712.8	648.2	-9.066	250	8	12.93	a
9078	4	6508-6	1038-0	1	7	36.76	40.37	9.822	25	8	12.93	a
9078	4	6508-6	1038-0	1	8	13.03	15.32	17.539	10	8	12.93	a
9078	4	6508-6	1038-0	2	5	627.4	590.2	-5.928	290	8	12.93	a
9078	4	6508-6	1038-0	2	6	407.5	387.1	-5.006	200	8	12.93	a
9078	4	6508-6	1142-0	2	8	13.37	13.84	3.5262	7	10	12.93	a

9078	4	6508-6	1038-0	2	8	13.37	13.78	3.0605	7	8	12.93	a
9056	3	6508-6	1142-0	3	8	11.85	12.43	4.9282	5	10	13.01	a
9078	4	6508-6	1038-0	3	6	283.9	278	-2.078	170	8	12.93	a
9078	4	6508-6	1038-0	3	7	44.41	41.35	-6.905	12	8	12.93	a
9078	4	6508-6	1038-0	3	8	11.54	11.99	3.8543	5	8	12.93	a
9078	4	6508-6	1038-0	4	5	341	350.8	2.874	65	8	12.93	a
9078	4	6508-6	1038-0	4	6	181.9	189.2	4.0276	60	8	12.93	a
9078	4	6508-6	1038-0	4	7	28.9	28.44	-1.575	10	8	12.93	a
9078	4	6508-6	1038-0	4	8	10.21	10.79	5.7374	4	8	12.93	a
9078	4	6508-6	1142-0	1	5	759.5	647.7	-14.71	330	10	12.93	a
9078	4	6508-6	1142-0	1	6	712.8	586.2	-17.77	250	10	12.93	a
9078	4	6508-6	1142-0	1	7	36.76	42.87	16.619	25	10	12.93	a
9078	4	6508-6	1142-0	1	8	13.03	17.82	36.729	10	10	12.93	a
9078	4	6508-6	1142-0	2	5	627.4	550.8	-12.22	290	10	12.93	a
9078	4	6508-6	1038-0	2	7	33.51	36.47	8.8496	15	8	12.93	a
9008	2	6508-6	1038-0	3	8	12.92	12.51	-3.17	5	8	33.19	a
9008	2	6508-6	0977-0	4	7	29.78	27.26	-8.445	10	7	33.19	a
9008	2	6508-6	0977-0	4	8	12.5	11.5	-7.961	4	7	33.19	a
9008	2	6508-6	1038-0	1	5	845.4	667.2	-21.08	330	8	33.19	a
9008	2	6508-6	1038-0	1	6	741.4	572.2	-22.82	250	8	33.19	a
9008	2	6508-6	1038-0	1	7	40.46	41.18	1.7967	25	8	33.19	a
9008	2	6508-6	1038-0	1	8	17.88	18.38	2.7986	10	8	33.19	a
9008	2	6508-6	1038-0	2	5	748.9	576.6	-23.01	290	8	33.19	a
9008	2	6508-6	1038-0	2	6	440.9	354.3	-19.65	200	8	33.19	a
9008	2	6508-6	1038-0	2	7	39.89	35.69	-10.53	15	8	33.19	a
9008	2	6508-6	1038-0	2	8	14.87	14.28	-3.965	7	8	33.19	a
9008	2	6508-6	1038-0	3	5	682.7	492.1	-27.91	180	8	33.19	a
9008	2	6508-6	1039-8	3	5	682.7	491.4	-28.01	180	5	33.19	a
9008	2	6508-6	1038-0	3	7	45.97	40.76	-11.34	12	8	33.19	a
9008	2	6508-6	0977-0	3	8	12.92	12.58	-2.666	5	7	33.19	a
9008	2	6508-6	1038-0	4	5	399.1	293.7	-26.42	65	8	33.19	a
9008	2	6508-6	1038-0	4	6	222.7	167.3	-24.86	60	8	33.19	a
9008	2	6508-6	1038-0	4	7	29.78	26.87	-9.777	10	8	33.19	a
9008	2	6508-6	1038-0	4	8	12.5	11.48	-8.14	4	8	33.19	a
9008	2	6508-6	1039-8	1	5	845.4	668.9	-20.88	330	5	33.19	a
9008	2	6508-6	1039-8	1	6	741.4	585.5	-21.03	250	5	33.19	a
9008	2	6508-6	1039-8	1	7	40.46	43.35	7.1642	25	5	33.19	a
9008	2	6508-6	1039-8	1	8	17.88	18.3	2.3513	10	5	33.19	a
9008	2	6508-6	1039-8	2	5	748.9	572	-23.62	290	5	33.19	a
9008	2	6508-6	1039-8	2	6	440.9	353.9	-19.75	200	5	33.19	a
9008	2	6508-6	1039-8	2	7	39.89	39.01	-2.23	15	5	33.19	a
9008	2	6508-6	1039-8	2	8	14.87	15.01	0.8959	7	5	33.19	a
9008	2	6508-6	1038-0	3	6	335.8	257.6	-23.28	170	8	33.19	a
9008	2	6508-6	0975-4	4	8	12.5	11.39	-8.838	4	3	33.19	a
9008	2	6508-6	0975-4	1	6	741.4	543.1	-26.74	250	3	33.19	a
9008	2	6508-6	0975-4	1	7	40.46	41.32	2.1366	25	3	33.19	a
9008	2	6508-6	0975-4	1	8	17.88	17.73	-0.846	10	3	33.19	a
9008	2	6508-6	0975-4	2	5	748.9	546.5	-27.02	290	3	33.19	a
9008	2	6508-6	0975-4	2	6	440.9	333.6	-24.33	200	3	33.19	a
9008	2	6508-6	0975-4	2	7	39.89	37.62	-5.692	15	3	33.19	a

9008	2	6508-6	0975-4	2	8	14.87	14.59	-1.913	7	3	33.19	a
9008	2	6508-6	0975-4	3	5	682.7	469.4	-31.24	180	3	33.19	a
9008	2	6508-6	0975-4	3	6	335.8	248.5	-26	170	3	33.19	a
9008	2	6508-6	0975-4	3	7	45.97	40.07	-12.85	12	3	33.19	a
9008	2	6508-6	0975-4	3	8	12.92	12.79	-1.044	5	3	33.19	a
9056	3	6508-6	1142-0	4	6	300.3	251.7	-16.2	60	10	13.01	a
9008	2	6508-6	0977-0	4	6	222.7	180.6	-18.88	60	7	33.19	a
9055	3	6508-6	2782-2	4	8	12.83	12.21	-4.868	4	9	5.019	a
9008	2	6508-6	0977-0	4	5	399.1	325.1	-18.54	65	7	33.19	a
9008	2	6508-6	0977-0	1	5	845.4	745	-11.87	330	7	33.19	a
9008	2	6508-6	0977-0	1	6	741.4	651.2	-12.17	250	7	33.19	a
9008	2	6508-6	0977-0	1	7	40.46	40.85	0.9612	25	7	33.19	a
9008	2	6508-6	0977-0	1	8	17.88	17.97	0.5032	10	7	33.19	a
9008	2	6508-6	0977-0	2	5	748.9	642.1	-14.26	290	7	33.19	a
9008	2	6508-6	0977-0	2	6	440.9	384.8	-12.73	200	7	33.19	a
9008	2	6508-6	0977-0	2	7	39.89	36.91	-7.482	15	7	33.19	a
9008	2	6508-6	0977-0	2	8	14.87	14.52	-2.397	7	7	33.19	a
9008	2	6508-6	0977-0	3	5	682.7	557.4	-18.35	180	7	33.19	a
9008	2	6508-6	0977-0	3	6	335.8	282	-16.04	170	7	33.19	a
9008	2	6508-6	0977-0	3	7	45.97	43.24	-5.94	12	7	33.19	a
9008	2	6508-6	0975-4	4	7	29.78	26.14	-12.22	10	3	33.19	a
9008	2	6508-6	0975-4	4	6	222.7	167.8	-24.66	60	3	33.19	a
9055	3	6508-6	2782-2	1	7	37.88	40.07	5.7719	25	9	5.019	a
9055	3	6508-6	1142-0	2	6	504.4	473.7	-6.086	200	10	5.019	a
9055	3	6508-6	1142-0	2	7	39.15	38.77	-0.959	15	10	5.019	a
9055	3	6508-6	1142-0	2	8	13.62	14.07	3.3391	7	10	5.019	a
9055	3	6508-6	1142-0	3	5	790.8	724.4	-8.389	180	10	5.019	a
9055	3	6508-6	1142-0	3	6	376.8	352.7	-6.373	170	10	5.019	a
9055	3	6508-6	1142-0	3	7	50.55	45.96	-9.087	12	10	5.019	a
9055	3	6508-6	1142-0	3	8	12.02	12.19	1.4501	5	10	5.019	a
9055	3	6508-6	1142-0	4	5	539.9	483.3	-10.48	65	10	5.019	a
9055	3	6508-6	1142-0	4	6	287.5	261.9	-8.881	60	10	5.019	a
9055	3	6508-6	1142-0	4	7	29.07	28.87	-0.679	10	10	5.019	a
9055	3	6508-6	1142-0	4	8	12.83	12.31	-4.053	4	10	5.019	a
9055	3	6508-6	1142-0	2	5	826.9	777	-6.028	290	10	5.019	a
9055	3	6508-6	2782-2	1	6	856.1	811.8	-5.176	250	9	5.019	a
9055	3	6508-6	2782-2	2	8	13.62	13.92	2.2267	7	9	5.019	a
9055	3	6508-6	2782-2	1	8	13.65	15.74	15.306	10	9	5.019	a
9055	3	6508-6	2782-2	2	5	826.9	792.1	-4.202	290	9	5.019	a
9055	3	6508-6	2782-2	2	6	504.4	487	-3.457	200	9	5.019	a
9055	3	6508-6	2782-2	2	7	39.15	39.97	2.1041	15	9	5.019	a
9055	3	6508-6	2782-2	3	5	790.8	713.3	-9.791	180	9	5.019	a
9055	3	6508-6	2782-2	3	7	50.55	45.09	-10.8	12	9	5.019	a
9055	3	6508-6	2782-2	3	8	12.02	12.04	0.1935	5	9	5.019	a
9055	3	6508-6	2782-2	4	5	539.9	497.9	-7.778	65	9	5.019	a
9055	3	6508-6	2782-2	4	6	287.5	271.2	-5.658	60	9	5.019	a
9008	2	6508-6	1039-8	3	6	335.8	257.3	-23.37	170	5	33.19	a
9008	2	6508-6	0975-4	4	5	399.1	291.1	-27.07	65	3	33.19	a
9055	3	6508-6	2782-2	4	7	29.07	30.85	6.1352	10	9	5.019	a
9055	3	6508-6	2782-2	1	5	956.2	933.1	-2.423	330	9	5.019	a

9008	2	6508-6	1142-0	1	5	845.4	675.2	-20.13	330	10	33.19	a
9008	2	6508-6	1039-8	3	8	12.92	12.75	-1.317	5	5	33.19	a
9008	2	6508-6	1039-8	4	5	399.1	297.2	-25.55	65	5	33.19	a
9055	3	6508-6	2782-2	3	6	376.8	355.4	-5.68	170	9	5.019	a
9008	2	6508-6	1039-8	3	7	45.97	41.59	-9.533	12	5	33.19	a
9055	3	6508-6	1142-0	1	8	13.65	15.25	11.681	10	10	5.019	a
9008	2	6508-6	1039-8	4	6	222.7	166.7	-25.15	60	5	33.19	a
9008	2	6508-6	1039-8	4	8	12.5	11.36	-9.12	4	5	33.19	a
9008	2	6508-6	1142-0	1	6	741.4	589.5	-20.49	250	10	33.19	a
9008	2	6508-6	1142-0	1	7	40.46	41.9	3.5752	25	10	33.19	a
9008	2	6508-6	1142-0	1	8	17.88	18.91	5.7593	10	10	33.19	a
9008	2	6508-6	1142-0	2	5	748.9	590.6	-21.14	290	10	33.19	a
9008	2	6508-6	1142-0	2	6	440.9	352.9	-19.97	200	10	33.19	a
9008	2	6508-6	1142-0	4	5	399.1	300.8	-24.63	65	10	33.19	a
9008	2	6508-6	1142-0	4	8	12.5	12.21	-2.289	4	10	33.19	a
9008	2	6508-6	1142-0	4	7	29.78	25.9	-13.01	10	10	33.19	a
9008	2	6508-6	1039-8	4	7	29.78	27.12	-8.925	10	5	33.19	a
9008	2	6508-6	1142-0	2	7	39.89	38.83	-2.662	15	10	33.19	a
9055	3	6508-6	1142-0	1	5	956.2	913.6	-4.458	330	10	5.019	a
9008	2	6508-6	1142-0	4	6	222.7	171.5	-22.99	60	10	33.19	a
9055	3	6508-6	1142-0	1	6	856.1	818.5	-4.384	250	10	5.019	a
9008	2	6508-6	1142-0	2	8	14.87	15.13	1.7061	7	10	33.19	a
9055	3	6508-6	1142-0	1	7	37.88	38.76	2.3072	25	10	5.019	a
9008	2	6508-6	1142-0	3	7	45.97	44.09	-4.11	12	10	33.19	a
9008	2	6508-6	1142-0	3	6	335.8	267	-20.5	170	10	33.19	a
9008	2	6508-6	1142-0	3	8	12.92	13.79	6.6952	5	10	33.19	a
9008	2	6508-6	1142-0	3	5	682.7	521.5	-23.61	180	10	33.19	a
9064	5	9376-5	2603-0	-4	5	487.1	438.6	-9.96	150	7	0.873	a
9066	1	2434-2	0980-4	4	6	187.5	204.8	9.2052	60	7	0.73	a
9066	1	2434-2	1042-2	1	6	682.3	641.2	-6.018	250	5	0.73	a
9066	1	2434-2	0980-4	3	7	41.41	40	-3.389	12	7	0.73	a
9066	1	2434-2	0980-4	3	8	12.55	12.73	1.4423	5	7	0.73	a
9066	1	2434-2	0980-4	4	7	25.72	27.2	5.7631	10	7	0.73	a
9066	1	2434-2	0980-4	4	5	339.2	370.8	9.3058	65	7	0.73	a
9066	1	2434-2	0980-4	1	8	15.19	17.43	14.722	10	7	0.73	a
9066	1	2434-2	0980-4	4	8	10.69	11.23	5.0421	4	7	0.73	a
9066	1	2434-2	1042-2	1	5	794.1	764.1	-3.787	330	5	0.73	a
9066	1	2434-2	0980-4	3	5	594.2	612.3	3.0395	180	7	0.73	a
9066	1	2434-2	0980-4	2	7	32.58	34.69	6.4754	15	7	0.73	a
9066	1	2434-2	0980-4	2	5	670.5	697.1	3.9742	290	7	0.73	a
9066	1	2434-2	0980-4	1	7	37.24	38.9	4.4641	25	7	0.73	a
9066	1	2434-2	0980-4	1	6	682.3	695.7	1.973	250	7	0.73	a
9066	1	2434-2	1042-2	1	7	37.24	37.97	1.9706	25	5	0.73	a
9066	1	2434-2	1042-2	4	8	10.69	10.61	-0.79	4	5	0.73	a
9066	1	2434-2	0980-4	1	5	794.1	798.1	0.4966	330	7	0.73	a
9066	1	2434-2	0978-8	4	8	10.69	11.34	6.0524	4	3	0.73	a
9066	1	2434-2	0978-8	4	7	25.72	29.37	14.229	10	3	0.73	a
9066	1	2434-2	0978-8	4	6	187.5	172.8	-7.857	60	3	0.73	a
9066	1	2434-2	0980-4	2	6	391.5	396.7	1.3194	200	7	0.73	a
9066	1	2434-2	1042-2	4	7	25.72	26.6	3.4279	10	5	0.73	a

9103	4	6509-4	0980-4	2	7	33.19	31.92	-3.821	15	7	19.58	a
9103	4	6509-4	0980-4	2	8	14	14.73	5.2361	7	7	19.58	a
9028	3	6509-4	0980-4	4	8	11.19	11.72	4.7174	4	7	18.98	a
9066	1	2434-2	0978-8	4	5	339.2	312	-8.027	65	3	0.73	a
9103	4	6509-4	0980-4	2	6	521	461.9	-11.34	200	7	19.58	a
9103	4	6509-4	0980-4	2	5	893.3	790.2	-11.54	290	7	19.58	a
9103	4	6509-4	0980-4	1	8	17.45	18.32	4.9877	10	7	19.58	a
9103	4	6509-4	0980-4	1	7	41.85	39.69	-5.155	25	7	19.58	a
9066	1	2434-2	1042-2	4	6	187.5	220.4	17.521	60	5	0.73	a
9103	4	6509-4	0980-4	1	5	1058	921.3	-12.92	330	7	19.58	a
9066	1	2434-2	1042-2	1	8	15.19	15.98	5.1795	10	5	0.73	a
9066	1	2434-2	1042-2	4	5	339.2	397.3	17.124	65	5	0.73	a
9066	1	2434-2	1042-2	3	8	12.55	11.63	-7.327	5	5	0.73	a
9066	1	2434-2	1042-2	3	7	41.41	37.71	-8.92	12	5	0.73	a
9066	1	2434-2	1042-2	3	6	288.4	291.2	0.9625	170	5	0.73	a
9066	1	2434-2	1042-2	3	5	594.2	601.8	1.2753	180	5	0.73	a
9066	1	2434-2	1042-2	2	8	14.16	13.82	-2.374	7	5	0.73	a
9066	1	2434-2	1042-2	2	7	32.58	33.81	3.7805	15	5	0.73	a
9066	1	2434-2	1042-2	2	6	391.5	384.2	-1.853	200	5	0.73	a
9066	1	2434-2	1042-2	2	5	670.5	673.6	0.4688	290	5	0.73	a
9103	4	6509-4	0980-4	1	6	936	803.8	-14.12	250	7	19.58	a
9028	3	6509-4	0980-4	2	8	12.68	13.99	10.32	7	7	18.98	a
9065	1	2434-2	0979-6	1	8	15.65	17.39	11.122	10	6	5.963	a
9065	1	2434-2	0979-6	1	7	41.14	38.92	-5.416	25	6	5.963	a
9065	1	2434-2	0979-6	1	5	794.7	749.7	-5.659	330	6	5.963	a
9028	3	6509-4	0980-4	4	7	27.14	27.12	-0.085	10	7	18.98	a
9028	3	6509-4	0980-4	4	6	315.8	252.1	-20.18	60	7	18.98	a
9028	3	6509-4	0980-4	4	5	602.5	459.2	-23.79	65	7	18.98	a
9028	3	6509-4	0980-4	3	8	10.69	11.83	10.628	5	7	18.98	a
9028	3	6509-4	0980-4	3	7	42.76	40.66	-4.909	12	7	18.98	a
9065	1	2434-2	0979-6	1	6	665.6	640.3	-3.792	250	6	5.963	a
9028	3	6509-4	0980-4	3	5	887	694.6	-21.7	180	7	18.98	a
9065	1	2434-2	0979-6	2	7	38.07	34.41	-9.629	15	6	5.963	a
9028	3	6509-4	0980-4	2	7	33.83	35.84	5.9657	15	7	18.98	a
9028	3	6509-4	0980-4	2	6	519.5	438.8	-15.54	200	7	18.98	a
9028	3	6509-4	0980-4	2	5	936.2	770.1	-17.74	290	7	18.98	a
9028	3	6509-4	0980-4	1	8	13.67	16.12	17.859	10	7	18.98	a
9028	3	6509-4	0980-4	1	7	34.54	36.87	6.7423	25	7	18.98	a
9028	3	6509-4	0980-4	1	6	960.3	745.2	-22.4	250	7	18.98	a
9028	3	6509-4	0980-4	1	5	1079	872.9	-19.1	330	7	18.98	a
9066	1	2434-2	0980-4	3	6	288.4	293	1.5711	170	7	0.73	a
9103	4	6509-4	0980-4	3	5	836.4	714.7	-14.54	180	7	19.58	a
9028	3	6509-4	0980-4	3	6	385.1	332.1	-13.76	170	7	18.98	a
9065	1	2434-2	0979-6	4	8	11.61	11.41	-1.761	4	6	5.963	a
9066	1	2434-2	0978-8	3	7	41.41	46.47	12.227	12	3	0.73	a
9066	1	2434-2	0978-8	3	6	288.4	274.2	-4.922	170	3	0.73	a
9066	1	2434-2	0978-8	3	5	594.2	537.1	-9.616	180	3	0.73	a
9066	1	2434-2	0978-8	2	8	14.16	14.24	0.5737	7	3	0.73	a
9066	1	2434-2	0978-8	2	7	32.58	40.59	24.587	15	3	0.73	a
9066	1	2434-2	0978-8	2	6	391.5	394.6	0.7856	200	3	0.73	a

9066	1	2434-2	0978-8	2	5	670.5	653.1	-2.593	290	3	0.73	a
9066	1	2434-2	0978-8	1	8	15.19	16.71	9.9788	10	3	0.73	a
9066	1	2434-2	0978-8	1	7	37.24	45.44	22.045	25	3	0.73	a
9065	1	2434-2	0979-6	2	5	669.2	655.3	-2.074	290	6	5.963	a
9066	1	2434-2	0978-8	1	5	794.1	801.5	0.9236	330	3	0.73	a
9065	1	2434-2	0979-6	2	6	405.8	376.4	-7.249	200	6	5.963	a
9065	1	2434-2	0979-6	4	7	28.83	26.83	-6.931	10	6	5.963	a
9065	1	2434-2	0979-6	4	6	210.3	204.8	-2.627	60	6	5.963	a
9065	1	2434-2	0979-6	4	5	380.1	360.4	-5.198	65	6	5.963	a
9065	1	2434-2	0979-6	3	8	12.91	12.83	-0.612	5	6	5.963	a
9065	1	2434-2	0979-6	3	7	43.58	38.48	-11.71	12	6	5.963	a
9065	1	2434-2	0979-6	3	6	298.1	287.7	-3.486	170	6	5.963	a
9065	1	2434-2	0979-6	3	5	588	582.8	-0.893	180	6	5.963	a
9065	1	2434-2	0979-6	2	8	14.58	14.7	0.854	7	6	5.963	a
9066	1	2434-2	0978-8	3	8	12.55	12.53	-0.116	5	3	0.73	a
9066	1	2434-2	0978-8	1	6	682.3	667.1	-2.219	250	3	0.73	a
9115	4	6509-4	2758-2	3	6	384.7	334.6	-13.03	170	7	32.11	a
9115	4	6509-4	2783-0	1	6	940.3	750.5	-20.18	250	9	32.11	a
9115	4	6509-4	2783-0	1	5	1086	862.6	-20.6	330	9	32.11	a
9115	4	6509-4	2758-2	4	8	9.789	10.61	8.3577	4	7	32.11	a
9115	4	6509-4	2758-2	4	7	26.73	26.85	0.4685	10	7	32.11	a
9115	4	6509-4	2758-2	4	6	294.7	239.8	-18.63	60	7	32.11	a
9115	4	6509-4	2758-2	4	5	564.6	436.8	-22.64	65	7	32.11	a
9115	4	6509-4	2758-2	1	6	940.3	776.7	-17.4	250	7	32.11	a
9115	4	6509-4	2758-2	3	7	39.72	36.84	-7.232	12	7	32.11	a
9115	4	6509-4	2783-0	2	5	920.1	726.9	-21	290	9	32.11	a
9115	4	6509-4	2758-2	3	5	860	677	-21.28	180	7	32.11	a
9115	4	6509-4	2758-2	2	8	13.76	14.7	6.8332	7	7	32.11	a
9115	4	6509-4	2758-2	2	7	33.83	33.41	-1.232	15	7	32.11	a
9115	4	6509-4	2758-2	2	6	531.1	451.7	-14.96	200	7	32.11	a
9115	4	6509-4	2758-2	2	5	920.1	764.6	-16.91	290	7	32.11	a
9115	4	6509-4	2758-2	1	8	17.39	19.62	12.827	10	7	32.11	a
9115	4	6509-4	0978-8	4	6	294.7	226.6	-23.09	60	3	32.11	a
9115	4	6509-4	2758-2	3	8	10.82	11.83	9.2521	5	7	32.11	a
9115	4	6509-4	2783-0	3	8	10.82	11.79	8.9056	5	9	32.11	a
9116	4	6509-4	0978-8	2	5	920.5	805.2	-12.53	290	3	43.14	a
9116	4	6509-4	0978-8	1	8	17.69	18.23	3.0438	10	3	43.14	a
9116	4	6509-4	0978-8	1	7	40.56	40.63	0.1827	25	3	43.14	a
9116	4	6509-4	0978-8	1	6	971.5	835.5	-14	250	3	43.14	a
9116	4	6509-4	0978-8	1	5	1112	965.7	-13.17	330	3	43.14	a
9115	4	6509-4	2783-0	4	8	9.789	10.54	7.6937	4	9	32.11	a
9115	4	6509-4	2783-0	4	7	26.73	27.71	3.6862	10	9	32.11	a
9115	4	6509-4	2783-0	1	7	40.67	40.96	0.7141	25	9	32.11	a
9115	4	6509-4	2783-0	4	5	564.6	401.9	-28.83	65	9	32.11	a
9115	4	6509-4	2783-0	1	8	17.39	18.61	6.9842	10	9	32.11	a
9115	4	6509-4	2783-0	3	7	39.72	37.39	-5.871	12	9	32.11	a
9115	4	6509-4	2783-0	3	6	384.7	326	-15.27	170	9	32.11	a
9115	4	6509-4	2783-0	3	5	860	632.3	-26.47	180	9	32.11	a
9115	4	6509-4	2783-0	2	8	13.76	14.3	3.9753	7	9	32.11	a
9115	4	6509-4	2783-0	2	7	33.83	34.25	1.2496	15	9	32.11	a

9115	4	6509-4	2783-0	2	6	531.1	452.7	-14.75	200	9	32.11	a
9115	4	6509-4	2758-2	1	5	1086	896.4	-17.48	330	7	32.11	a
9115	4	6509-4	2783-0	4	6	294.7	222.3	-24.55	60	9	32.11	a
9115	4	6509-4	0980-4	2	6	531.1	498.6	-6.122	200	7	32.11	a
9115	4	6509-4	0980-4	4	6	294.7	257.4	-12.65	60	7	32.11	a
9115	4	6509-4	0980-4	4	5	564.6	464.9	-17.67	65	7	32.11	a
9115	4	6509-4	0980-4	3	8	10.82	12.14	12.198	5	7	32.11	a
9115	4	6509-4	0980-4	3	7	39.72	39.59	-0.326	12	7	32.11	a
9115	4	6509-4	0980-4	3	6	384.7	365.6	-4.975	170	7	32.11	a
9115	4	6509-4	0980-4	3	5	860	710.2	-17.42	180	7	32.11	a
9115	4	6509-4	2758-2	1	7	40.67	40.27	-0.979	25	7	32.11	a
9115	4	6509-4	0980-4	2	7	33.83	35.54	5.0516	15	7	32.11	a
9115	4	6509-4	1042-2	1	5	1086	880.2	-18.98	330	5	32.11	a
9115	4	6509-4	0980-4	2	5	920.1	809.5	-12.03	290	7	32.11	a
9115	4	6509-4	0980-4	1	8	17.39	19.3	10.946	10	7	32.11	a
9115	4	6509-4	0980-4	1	7	40.67	42.79	5.2181	25	7	32.11	a
9115	4	6509-4	0980-4	1	6	940.3	835.2	-11.17	250	7	32.11	a
9115	4	6509-4	0980-4	1	5	1086	966.5	-11.03	330	7	32.11	a
9115	4	6509-4	0978-8	4	8	9.789	10.12	3.3842	4	3	32.11	a
9115	4	6509-4	0978-8	4	7	26.73	26.66	-0.249	10	3	32.11	a
9115	4	6509-4	0980-4	2	8	13.76	15.03	9.2541	7	7	32.11	a
9115	4	6509-4	1042-2	2	8	13.76	14.51	5.4497	7	5	32.11	a
9115	4	6509-4	1042-2	4	8	9.789	10.65	8.8142	4	5	32.11	a
9115	4	6509-4	1042-2	4	7	26.73	27.37	2.4024	10	5	32.11	a
9115	4	6509-4	1042-2	4	6	294.7	217.7	-26.11	60	5	32.11	a
9066	1	2434-2	0980-4	2	8	14.16	15.04	6.2053	7	7	0.73	a
9115	4	6509-4	1042-2	4	5	564.6	390.5	-30.83	65	5	32.11	a
9103	4	6509-4	0980-4	3	6	382.9	340.7	-11.01	170	7	19.58	a
9115	4	6509-4	1042-2	3	7	39.72	38.71	-2.539	12	5	32.11	a
9115	4	6509-4	0980-4	4	7	26.73	29.32	9.7168	10	7	32.11	a
9115	4	6509-4	1042-2	3	5	860	628.5	-26.92	180	5	32.11	a
9115	4	6509-4	0980-4	4	8	9.789	10.57	7.9951	4	7	32.11	a
9115	4	6509-4	1042-2	2	7	33.83	35.69	5.514	15	5	32.11	a
9115	4	6509-4	1042-2	2	6	531.1	446	-16.03	200	5	32.11	a
9115	4	6509-4	1042-2	2	5	920.1	729.3	-20.74	290	5	32.11	a
9115	4	6509-4	1042-2	1	8	17.39	19.16	10.143	10	5	32.11	a
9115	4	6509-4	1042-2	1	7	40.67	42.39	4.2185	25	5	32.11	a
9115	4	6509-4	1042-2	1	6	940.3	760.9	-19.08	250	5	32.11	a
9116	4	6509-4	0978-8	2	8	13.92	14.07	1.1399	7	3	43.14	a
9115	4	6509-4	1042-2	3	6	384.7	323.4	-15.93	170	5	32.11	a
9118	4	6509-4	0979-6	2	5	953.2	832.3	-12.69	290	6	42.85	a
9118	4	6509-4	0979-6	4	5	547	462.9	-15.37	65	6	42.85	a
9118	4	6509-4	0979-6	3	8	10.44	11.93	14.27	5	6	42.85	a
9118	4	6509-4	0979-6	3	7	42.05	42.11	0.1352	12	6	42.85	a
9118	4	6509-4	0979-6	3	6	396.8	374.9	-5.503	170	6	42.85	a
9118	4	6509-4	0979-6	3	5	874.9	736	-15.88	180	6	42.85	a
9118	4	6509-4	0979-6	2	8	13.31	14.28	7.2374	7	6	42.85	a
9116	4	6509-4	0978-8	2	6	532.1	478.3	-10.11	200	3	43.14	a
9118	4	6509-4	0979-6	2	6	554.9	520.5	-6.211	200	6	42.85	a
9118	4	6509-4	0979-6	4	8	9.753	10.7	9.7026	4	6	42.85	a

9118	4	6509-4	0979-6	1	8	16.85	18.22	8.0911	10	6	42.85	a
9118	4	6509-4	0979-6	1	7	39.59	42.7	7.8686	25	6	42.85	a
9118	4	6509-4	0979-6	1	6	1006	879.1	-12.65	250	6	42.85	a
9118	4	6509-4	0979-6	1	5	1173	1015	-13.49	330	6	42.85	a
9118	4	6509-4	0978-8	4	8	9.753	10.76	10.356	4	3	42.85	a
9118	4	6509-4	0978-8	4	7	26.38	27.3	3.4682	10	3	42.85	a
9118	4	6509-4	0978-8	4	6	287	235.3	-17.99	60	3	42.85	a
9118	4	6509-4	0979-6	2	7	33.58	35.63	6.1013	15	6	42.85	a
9118	4	6509-4	0980-4	2	7	33.58	36.54	8.8282	15	7	42.85	a
9118	4	6509-4	0980-4	4	8	9.753	11.2	14.791	4	7	42.85	a
9118	4	6509-4	0980-4	4	7	26.38	28.51	8.0712	10	7	42.85	a
9118	4	6509-4	0980-4	4	6	287	238.5	-16.9	60	7	42.85	a
9118	4	6509-4	0980-4	4	5	547	437.4	-20.04	65	7	42.85	a
9118	4	6509-4	0980-4	3	8	10.44	12.28	17.617	5	7	42.85	a
9118	4	6509-4	0980-4	3	7	42.05	41.27	-1.865	12	7	42.85	a
9118	4	6509-4	0980-4	3	6	396.8	368.3	-7.174	170	7	42.85	a
9118	4	6509-4	0979-6	4	6	287	254.2	-11.42	60	6	42.85	a
9118	4	6509-4	0980-4	2	8	13.31	14.63	9.8567	7	7	42.85	a
9118	4	6509-4	0979-6	4	7	26.38	30.22	14.565	10	6	42.85	a
9118	4	6509-4	0980-4	2	6	554.9	518	-6.661	200	7	42.85	a
9118	4	6509-4	0980-4	2	5	953.2	862.3	-9.532	290	7	42.85	a
9118	4	6509-4	0980-4	1	8	16.85	18.95	12.444	10	7	42.85	a
9118	4	6509-4	0980-4	1	7	39.59	41.96	5.9994	25	7	42.85	a
9118	4	6509-4	0980-4	1	6	1006	919.2	-8.666	250	7	42.85	a
9118	4	6509-4	0980-4	1	5	1173	1057	-9.945	330	7	42.85	a
9118	4	6509-4	0978-8	3	7	42.05	38.51	-8.414	12	3	42.85	a
9118	4	6509-4	0980-4	3	5	874.9	748.3	-14.46	180	7	42.85	a
9116	4	6509-4	0978-8	4	7	27.1	26.49	-2.279	10	3	43.14	a
9118	4	6509-4	0978-8	4	5	547	428.1	-21.75	65	3	42.85	a
9116	4	6509-4	0980-4	2	7	34.47	34.16	-0.897	15	7	43.14	a
9116	4	6509-4	0980-4	2	6	532.1	446.9	-16.02	200	7	43.14	a
9116	4	6509-4	0980-4	2	5	920.5	760.9	-17.35	290	7	43.14	a
9116	4	6509-4	0980-4	1	8	17.69	19.09	7.9261	10	7	43.14	a
9116	4	6509-4	0980-4	1	7	40.56	40.63	0.1823	25	7	43.14	a
9116	4	6509-4	0980-4	1	6	971.5	783.9	-19.31	250	7	43.14	a
9116	4	6509-4	0980-4	3	5	854	669.3	-21.62	180	7	43.14	a
9116	4	6509-4	0978-8	4	8	10.38	10.59	2.0657	4	3	43.14	a
9116	4	6509-4	0980-4	3	6	389.5	331.9	-14.8	170	7	43.14	a
9116	4	6509-4	0978-8	4	6	297.4	240.8	-19.04	60	3	43.14	a
9116	4	6509-4	0978-8	4	5	559.3	455.8	-18.51	65	3	43.14	a
9116	4	6509-4	0978-8	3	8	10.77	11.36	5.4474	5	3	43.14	a
9116	4	6509-4	0978-8	3	7	41.62	38.54	-7.398	12	3	43.14	a
9116	4	6509-4	0978-8	3	6	389.5	352	-9.629	170	3	43.14	a
9116	4	6509-4	0978-8	3	5	854	719.8	-15.71	180	3	43.14	a
9115	4	6509-4	1042-2	3	8	10.82	12.09	11.715	5	5	32.11	a
9116	4	6509-4	0980-4	1	5	1112	895.9	-19.45	330	7	43.14	a
9118	4	6509-4	0978-8	1	6	1006	771	-23.39	250	3	42.85	a
9116	4	6509-4	0978-8	2	7	34.47	34.38	-0.258	15	3	43.14	a
9118	4	6509-4	0978-8	3	6	396.8	339.2	-14.5	170	3	42.85	a
9118	4	6509-4	0978-8	3	5	874.9	672.6	-23.12	180	3	42.85	a

9118	4	6509-4	0978-8	2	8	13.31	14.16	6.3408	7	3	42.85	a
9118	4	6509-4	0978-8	2	7	33.58	35.04	4.3516	15	3	42.85	a
9118	4	6509-4	0978-8	2	6	554.9	466.2	-16	200	3	42.85	a
9118	4	6509-4	0978-8	2	5	953.2	759.8	-20.29	290	3	42.85	a
9116	4	6509-4	0980-4	2	8	13.92	15.23	9.4315	7	7	43.14	a
9118	4	6509-4	0978-8	1	7	39.59	42.03	6.1715	25	3	42.85	a
9118	4	6509-4	0978-8	3	8	10.44	11.9	14.054	5	3	42.85	a
9118	4	6509-4	0978-8	1	5	1173	897.4	-23.51	330	3	42.85	a
9116	4	6509-4	0980-4	4	8	10.38	10.78	3.8137	4	7	43.14	a
9116	4	6509-4	0980-4	4	7	27.1	27.46	1.3213	10	7	43.14	a
9116	4	6509-4	0980-4	4	6	297.4	220.9	-25.73	60	7	43.14	a
9116	4	6509-4	0980-4	4	5	559.3	394.2	-29.51	65	7	43.14	a
9116	4	6509-4	0980-4	3	8	10.77	12.08	12.146	5	7	43.14	a
9116	4	6509-4	0980-4	3	7	41.62	38.97	-6.372	12	7	43.14	a
9118	4	6509-4	0978-8	1	8	16.85	18.28	8.4545	10	3	42.85	a
9104	4	6509-4	0979-6	2	5	861.4	727.6	-15.53	290	6	24.97	a
9104	4	6509-4	0979-6	4	5	518.2	403.4	-22.15	65	6	24.97	a
9104	4	6509-4	0979-6	3	8	11.49	12.16	5.8412	5	6	24.97	a
9104	4	6509-4	0979-6	3	7	40.84	38.51	-5.698	12	6	24.97	a
9104	4	6509-4	0979-6	3	6	372.6	332.6	-10.74	170	6	24.97	a
9104	4	6509-4	0979-6	3	5	802.2	639.4	-20.29	180	6	24.97	a
9104	4	6509-4	0979-6	2	8	14.12	14.72	4.2128	7	6	24.97	a
9104	4	6509-4	0978-8	4	6	277.4	216.8	-21.85	60	3	24.97	a
9104	4	6509-4	0979-6	2	6	505.3	446	-11.74	200	6	24.97	a
9103	4	6509-4	2147-8	2	8	14	14.64	4.5825	7	4	19.58	a
9104	4	6509-4	0979-6	1	8	17.04	19.55	14.725	10	6	24.97	a
9104	4	6509-4	0979-6	1	7	40.19	41.46	3.1771	25	6	24.97	a
9104	4	6509-4	0979-6	1	6	885.8	739.3	-16.54	250	6	24.97	a
9104	4	6509-4	0979-6	1	5	1006	857.7	-14.75	330	6	24.97	a
9104	4	6509-4	0978-8	4	8	10.02	10.14	1.12	4	3	24.97	a
9104	4	6509-4	0980-4	4	8	10.02	10.81	7.864	4	7	24.97	a
9104	4	6509-4	0979-6	2	7	31.51	35.3	12.021	15	6	24.97	a
9104	4	6509-4	0980-4	2	7	31.51	35.25	11.854	15	7	24.97	a
9104	4	6509-4	0980-4	4	7	27.82	27.59	-0.827	10	7	24.97	a
9104	4	6509-4	0980-4	4	6	277.4	248.3	-10.5	60	7	24.97	a
9104	4	6509-4	0980-4	4	5	518.2	448.9	-13.37	65	7	24.97	a
9104	4	6509-4	0980-4	3	8	11.49	11.96	4.1304	5	7	24.97	a
9104	4	6509-4	0980-4	3	7	40.84	38.99	-4.532	12	7	24.97	a
9104	4	6509-4	0980-4	3	6	372.6	346.1	-7.116	170	7	24.97	a
9104	4	6509-4	0979-6	4	6	277.4	228	-17.81	60	6	24.97	a
9104	4	6509-4	0980-4	2	8	14.12	14.53	2.8717	7	7	24.97	a
9104	4	6509-4	0979-6	4	7	27.82	27.95	0.4745	10	6	24.97	a
9104	4	6509-4	0980-4	2	6	505.3	464.7	-8.021	200	7	24.97	a
9104	4	6509-4	0980-4	2	5	861.4	773.8	-10.17	290	7	24.97	a
9104	4	6509-4	0980-4	1	8	17.04	19.09	12.04	10	7	24.97	a
9104	4	6509-4	0980-4	1	7	40.19	41.11	2.2922	25	7	24.97	a
9104	4	6509-4	0978-8	3	6	372.6	303.2	-18.64	170	3	24.97	a
9104	4	6509-4	0980-4	1	5	1006	917.6	-8.802	330	7	24.97	a
9104	4	6509-4	0978-8	4	5	518.2	399.5	-22.9	65	3	24.97	a
9104	4	6509-4	0980-4	3	5	802.2	696.4	-13.19	180	7	24.97	a

9103	4	6509-4	2147-8	4	7	27.45	29.98	9.2196	10	4	19.58	a
9104	4	6509-4	0978-8	2	7	31.51	32.12	1.9421	15	3	24.97	a
9104	4	6509-4	0978-8	2	6	505.3	416.8	-17.52	200	3	24.97	a
9104	4	6509-4	0978-8	2	5	861.4	698.2	-18.95	290	3	24.97	a
9104	4	6509-4	0978-8	1	8	17.04	17.98	5.5348	10	3	24.97	a
9104	4	6509-4	0978-8	1	7	40.19	38.34	-4.584	25	3	24.97	a
9104	4	6509-4	0978-8	1	6	885.8	709.9	-19.86	250	3	24.97	a
9104	4	6509-4	0978-8	4	7	27.82	25.6	-7.985	10	3	24.97	a
9103	4	6509-4	2147-8	4	8	10.21	10.42	2.0654	4	4	19.58	a
9103	4	6509-4	2147-8	2	7	33.19	32.95	-0.721	15	4	19.58	a
9103	4	6509-4	2147-8	4	6	294.3	286.3	-2.729	60	4	19.58	a
9103	4	6509-4	2147-8	4	5	553.3	528.7	-4.446	65	4	19.58	a
9103	4	6509-4	2147-8	3	8	11.01	11.78	6.9694	5	4	19.58	a
9103	4	6509-4	2147-8	3	7	41.28	41.79	1.2404	12	4	19.58	a
9103	4	6509-4	2147-8	3	6	382.9	387.6	1.2346	170	4	19.58	a
9103	4	6509-4	2147-8	3	5	836.4	809.8	-3.173	180	4	19.58	a
9104	4	6509-4	0978-8	1	5	1006	821	-18.41	330	3	24.97	a
9103	4	6509-4	0980-4	4	8	10.21	10.49	2.7414	4	7	19.58	a
9104	4	6509-4	0978-8	3	8	11.49	11.18	-2.729	5	3	24.97	a
9104	4	6509-4	0978-8	3	7	40.84	36.15	-11.5	12	3	24.97	a
9115	4	6509-4	0978-8	4	5	564.6	423.5	-24.99	65	3	32.11	a
9103	4	6509-4	0980-4	3	7	41.28	39.04	-5.417	12	7	19.58	a
9103	4	6509-4	0980-4	3	8	11.01	11.86	7.6775	5	7	19.58	a
9103	4	6509-4	0980-4	4	5	553.3	450.1	-18.65	65	7	19.58	a
9104	4	6509-4	0978-8	2	8	14.12	13.47	-4.577	7	3	24.97	a
9103	4	6509-4	0980-4	4	7	27.45	27.68	0.852	10	7	19.58	a
9104	4	6509-4	0978-8	3	5	802.2	623	-22.34	180	3	24.97	a
9103	4	6509-4	2147-8	1	5	1058	1036	-2.101	330	4	19.58	a
9103	4	6509-4	2147-8	1	6	936	920.4	-1.669	250	4	19.58	a
9103	4	6509-4	2147-8	1	7	41.85	41	-2.036	25	4	19.58	a
9103	4	6509-4	2147-8	1	8	17.45	17.54	0.4928	10	4	19.58	a
9103	4	6509-4	2147-8	2	5	893.3	875	-2.052	290	4	19.58	a
9103	4	6509-4	2147-8	2	6	521	521.8	0.1548	200	4	19.58	a
9104	4	6509-4	0980-4	1	6	885.8	800.1	-9.679	250	7	24.97	a
9103	4	6509-4	0980-4	4	6	294.3	241.7	-17.86	60	7	19.58	a
9115	4	6509-4	0978-8	2	6	531.1	470.3	-11.45	200	3	32.11	a
9115	4	6509-4	0978-8	1	5	1086	913.5	-15.92	330	3	32.11	a
9115	4	6509-4	0978-8	1	6	940.3	793.3	-15.63	250	3	32.11	a
9115	4	6509-4	0978-8	2	5	920.1	775.3	-15.74	290	3	32.11	a
9115	4	6509-4	0978-8	2	7	33.83	34.02	0.5642	15	3	32.11	a
9115	4	6509-4	0978-8	2	8	13.76	14.1	2.485	7	3	32.11	a
9115	4	6509-4	0978-8	3	5	860	679.7	-20.97	180	3	32.11	a
9104	4	6509-4	0979-6	4	8	10.02	10.87	8.4346	4	6	24.97	a
9115	4	6509-4	0978-8	1	8	17.39	18.96	9.0002	10	3	32.11	a
9115	4	6509-4	0978-8	3	8	10.82	11.82	9.2116	5	3	32.11	a
9115	4	6509-4	0978-8	3	6	384.7	334	-13.19	170	3	32.11	a
9115	4	6509-4	0978-8	1	7	40.67	40.42	-0.609	25	3	32.11	a
9115	4	6509-4	0978-8	3	7	39.72	36.93	-7.018	12	3	32.11	a
9026	3	9379-9	3206-1	3	8	8.529	9.03	5.8679	5	5	22.03	a
9026	3	9379-9	3206-1	1	5	1028	788.1	-23.34	330	5	22.03	a

9026	3	9379-9	3206-1	3	6	328.4	267.4	-18.58	170	5	22.03	a
9026	3	9379-9	3206-1	1	6	881.4	670.8	-23.89	250	5	22.03	a
9099	4	9379-9	2838-2	-4	5	966.5	823	-14.84	200	6	25.89	a
9026	3	9379-9	3206-1	4	8	9.569	9.208	-3.778	4	5	22.03	a
9026	3	9379-9	3206-1	4	7	19.01	21.26	11.841	10	5	22.03	a
9026	3	9379-9	3206-1	4	6	266.7	195.1	-26.86	60	5	22.03	a
9026	3	9379-9	3206-1	4	5	525.7	373.5	-28.96	65	5	22.03	a
9026	3	9379-9	3206-1	3	7	36.26	33.27	-8.247	12	5	22.03	a
9099	4	9379-9	2838-2	1	6	847.3	685.9	-19.05	110	6	25.89	a
9026	3	9379-9	3206-1	2	7	31.13	28.86	-7.302	15	5	22.03	a
9026	3	9379-9	3206-1	1	8	12.66	12.8	1.1294	10	5	22.03	a
9026	3	9379-9	3206-1	2	5	864.9	662.4	-23.41	290	5	22.03	a
9026	3	9379-9	3206-1	1	7	36.03	30.97	-14.05	25	5	22.03	a
9026	3	9379-9	3206-1	2	6	466.1	376.7	-19.18	200	5	22.03	a
9026	3	9379-9	3206-1	2	8	10.08	10.75	6.667	7	5	22.03	a
9026	3	9379-9	3206-1	3	5	803.5	585.7	-27.11	180	5	22.03	a
9099	4	9379-9	2838-2	4	5	515	379.2	-26.37	50	6	25.89	a
9055	3	6508-6	2159-3	1	6	856.1	862.5	0.751	250	1	5.019	b
9055	3	6508-6	2159-3	1	5	956.2	947	-0.965	330	1	5.019	b
9082	4	6508-6	2159-3	1	6	830	772.3	-6.952	250	1	48.64	b
9055	3	6508-6	2159-3	1	7	37.88	37.89	0.0264	25	1	5.019	b
9055	3	6508-6	2159-3	1	8	13.65	13.34	-2.283	10	1	5.019	b
9082	4	6508-6	2159-3	4	8	10.77	11.2	4.0573	4	1	48.64	b
9056	3	6508-6	2160-1	4	5	566.7	457.8	-19.22	65	2	13.01	b
9082	4	6508-6	2159-3	4	7	30.38	32.09	5.5987	10	1	48.64	b
9056	3	6508-6	2160-1	4	6	300.3	251.7	-16.18	60	2	13.01	b
9082	4	6508-6	2159-3	4	6	219.2	224.2	2.2544	60	1	48.64	b
9056	3	6508-6	2160-1	3	8	11.85	13.06	10.249	5	2	13.01	b
9082	4	6508-6	2159-3	1	8	14.12	16.87	19.507	10	1	48.64	b
9082	4	6508-6	2159-3	2	7	37.69	40.8	8.2477	15	1	48.64	b
9082	4	6508-6	2159-3	2	8	14.39	15.05	4.605	7	1	48.64	b
9055	3	6508-6	2159-3	3	5	790.8	794.1	0.4246	180	1	5.019	b
9055	3	6508-6	2159-3	2	5	826.9	819.9	-0.848	290	1	5.019	b
9082	4	6508-6	2159-3	3	6	341.2	349.3	2.3813	170	1	48.64	b
9082	4	6508-6	2159-3	1	5	905.9	823.1	-9.138	330	1	48.64	b
9082	4	6508-6	2159-3	2	5	743.1	698.2	-6.048	290	1	48.64	b
9056	3	6508-6	2160-1	4	7	29.69	29.41	-0.951	10	2	13.01	b
9082	4	6508-6	2159-3	3	8	11.69	12.34	5.5265	5	1	48.64	b
9082	4	6508-6	2159-3	1	7	39.67	45.89	15.668	25	1	48.64	b
9056	3	6508-6	2160-1	4	8	12.82	13.68	6.7317	4	2	13.01	b
9082	4	6508-6	2159-3	2	6	475.1	466.4	-1.837	200	1	48.64	b
9082	4	6508-6	2159-3	4	5	407	410.8	0.923	65	1	48.64	b
9082	4	6508-6	2159-3	3	5	680.4	651.8	-4.202	180	1	48.64	b
9082	4	6508-6	2159-3	3	7	47.58	48.53	1.9927	12	1	48.64	b
9056	3	6508-6	2160-1	3	6	387.2	373.4	-3.587	170	2	13.01	b
9102	4	6508-6	2159-3	2	6	456.2	473.9	3.8819	200	1	56	b
9102	4	6508-6	2159-3	2	5	771.9	821.9	6.4804	290	1	56	b
9102	4	6508-6	2159-3	1	8	18.98	20.52	8.0822	10	1	56	b
9102	4	6508-6	2159-3	1	7	40.91	44.85	9.6303	25	1	56	b
9102	4	6508-6	2159-3	1	6	796.3	837.7	5.1985	250	1	56	b

9055	3	6508-6	2159-3	2	6	504.4	500.7	-0.739	200	1	5.019	b
9056	3	6508-6	2160-1	1	5	1046	926.7	-11.41	330	2	13.01	b
9055	3	6508-6	2159-3	2	7	39.15	43.28	10.549	15	1	5.019	b
9102	4	6508-6	2159-3	3	5	702.6	725.4	3.2434	180	1	56	b
9056	3	6508-6	2160-1	3	5	830.5	742.3	-10.62	180	2	13.01	b
9056	3	6508-6	2160-1	2	8	13.46	14.33	6.4534	7	2	13.01	b
9056	3	6508-6	2160-1	2	6	527.8	496.5	-5.937	200	2	13.01	b
9056	3	6508-6	2160-1	2	5	877.4	793.7	-9.549	290	2	13.01	b
9056	3	6508-6	2160-1	1	8	13.99	15.48	10.667	10	2	13.01	b
9056	3	6508-6	2160-1	1	7	40.05	42.44	5.9657	25	2	13.01	b
9056	3	6508-6	2160-1	1	6	934.8	840	-10.14	250	2	13.01	b
9102	4	6508-6	2159-3	1	5	892.5	964.3	8.0367	330	1	56	b
9056	3	6508-6	2160-1	2	7	37.56	42.59	13.37	15	2	13.01	b
9055	3	6508-6	2159-3	2	8	13.62	13.8	1.3382	7	1	5.019	b
9102	4	6508-6	2159-3	4	6	237.4	239	0.6567	60	1	56	b
9055	3	6508-6	2159-3	3	6	376.8	380	0.8555	170	1	5.019	b
9055	3	6508-6	2159-3	3	7	50.55	53.83	6.477	12	1	5.019	b
9055	3	6508-6	2159-3	3	8	12.02	12.61	4.9495	5	1	5.019	b
9055	3	6508-6	2159-3	4	5	539.9	553.3	2.4864	65	1	5.019	b
9055	3	6508-6	2159-3	4	6	287.5	298.6	3.8726	60	1	5.019	b
9102	4	6508-6	2159-3	2	7	37.13	37.91	2.083	15	1	56	b
9055	3	6508-6	2159-3	4	8	12.83	14.19	10.563	4	1	5.019	b
9102	4	6508-6	2159-3	2	8	16.22	16.55	2.0461	7	1	56	b
9102	4	6508-6	2159-3	4	7	29.97	29.35	-2.075	10	1	56	b
9102	4	6508-6	2159-3	4	8	12.35	12.62	2.2539	4	1	56	b
9102	4	6508-6	2159-3	4	5	422.8	426.3	0.8135	65	1	56	b
9102	4	6508-6	2159-3	3	8	13.26	13.52	2.0092	5	1	56	b
9102	4	6508-6	2159-3	3	7	45.59	45.12	-1.041	12	1	56	b
9102	4	6508-6	2159-3	3	6	344.4	356	3.3748	170	1	56	b
9056	3	6508-6	2160-1	3	7	51.02	53.78	5.4168	12	2	13.01	b
9055	3	6508-6	2159-3	4	7	29.07	28.37	-2.41	10	1	5.019	b
9103	4	6509-4	2145-2	2	8	14	14.16	1.1787	7	1	19.58	b
9103	4	6509-4	2145-2	1	5	1058	910.8	-13.91	330	1	19.58	b
9103	4	6509-4	2145-2	1	6	936	821.6	-12.22	250	1	19.58	b
9103	4	6509-4	2145-2	1	7	41.85	40.5	-3.212	25	1	19.58	b
9103	4	6509-4	2145-2	1	8	17.45	16.69	-4.355	10	1	19.58	b
9103	4	6509-4	2145-2	2	5	893.3	736.2	-17.59	290	1	19.58	b
9103	4	6509-4	2145-2	4	8	10.21	9.621	-5.742	4	1	19.58	b
9103	4	6509-4	2145-2	2	7	33.19	31.23	-5.886	15	1	19.58	b
9103	4	6509-4	2145-2	4	7	27.45	28.31	3.1566	10	1	19.58	b
9103	4	6509-4	2145-2	3	5	836.4	662.5	-20.78	180	1	19.58	b
9103	4	6509-4	2145-2	3	6	382.9	333.3	-12.95	170	1	19.58	b
9103	4	6509-4	2145-2	3	7	41.28	40.62	-1.605	12	1	19.58	b
9103	4	6509-4	2145-2	3	8	11.01	11.41	3.5513	5	1	19.58	b
9103	4	6509-4	2145-2	4	5	553.3	386.9	-30.07	65	1	19.58	b
9103	4	6509-4	2145-2	4	6	294.3	213.3	-27.52	60	1	19.58	b
9103	4	6509-4	2145-2	2	6	521	458.6	-11.98	200	1	19.58	b
9104	4	6509-4	2145-2	2	6	505.3	520.5	3.007	200	1	24.97	b
9116	4	6509-4	2147-8	1	6	971.5	922.2	-5.073	250	4	43.14	b
9116	4	6509-4	2147-8	2	6	532.1	514.6	-3.292	200	4	43.14	b

9116	4	6509-4	2147-8	2	5	920.5	883.3	-4.049	290	4	43.14	b
9116	4	6509-4	2147-8	1	8	17.69	17.9	1.2068	10	4	43.14	b
9116	4	6509-4	2147-8	1	7	40.56	40.25	-0.761	25	4	43.14	b
9116	4	6509-4	2147-8	1	5	1112	1050	-5.572	330	4	43.14	b
9104	4	6509-4	2145-2	1	5	1006	1030	2.3857	330	1	24.97	b
9104	4	6509-4	2145-2	1	6	885.8	905.6	2.2357	250	1	24.97	b
9104	4	6509-4	2145-2	1	7	40.19	43.09	7.2224	25	1	24.97	b
9116	4	6509-4	2147-8	2	8	13.92	14.92	7.2532	7	4	43.14	b
9104	4	6509-4	2145-2	2	5	861.4	869.3	0.9131	290	1	24.97	b
9116	4	6509-4	2147-8	3	5	854	774.9	-9.256	180	4	43.14	b
9104	4	6509-4	2145-2	2	7	31.51	36.39	15.47	15	1	24.97	b
9104	4	6509-4	2145-2	2	8	14.12	15.27	8.1299	7	1	24.97	b
9104	4	6509-4	2145-2	3	5	802.2	794.1	-1.01	180	1	24.97	b
9104	4	6509-4	2145-2	3	6	372.6	391.1	4.9386	170	1	24.97	b
9104	4	6509-4	2145-2	3	7	40.84	42.62	4.3714	12	1	24.97	b
9104	4	6509-4	2145-2	3	8	11.49	11.85	3.105	5	1	24.97	b
9104	4	6509-4	2145-2	4	5	518.2	490.3	-5.391	65	1	24.97	b
9104	4	6509-4	2145-2	4	6	277.4	269	-3.058	60	1	24.97	b
9104	4	6509-4	2145-2	4	7	27.82	28.62	2.8896	10	1	24.97	b
9104	4	6509-4	2145-2	4	8	10.02	10.88	8.5717	4	1	24.97	b
9104	4	6509-4	2145-2	1	8	17.04	18.57	8.9839	10	1	24.97	b
9116	4	6509-4	2956-2	1	8	17.69	18.1	2.3302	10	4	43.14	b
9116	4	6509-4	2956-2	4	7	27.1	28.77	6.1382	10	4	43.14	b
9116	4	6509-4	2956-2	4	6	297.4	258.8	-12.98	60	4	43.14	b
9116	4	6509-4	2956-2	4	5	559.3	480.7	-14.05	65	4	43.14	b
9116	4	6509-4	2956-2	3	8	10.77	12.12	12.47	5	4	43.14	b
9116	4	6509-4	2956-2	3	7	41.62	42.11	1.1681	12	4	43.14	b
9116	4	6509-4	2956-2	3	6	389.5	391.5	0.5192	170	4	43.14	b
9116	4	6509-4	2956-2	3	5	854	818.5	-4.15	180	4	43.14	b
9116	4	6509-4	2956-2	2	8	13.92	15.36	10.379	7	4	43.14	b
9116	4	6509-4	2956-2	2	7	34.47	34.69	0.6605	15	4	43.14	b
9116	4	6509-4	2147-8	2	7	34.47	34.16	-0.895	15	4	43.14	b
9116	4	6509-4	2956-2	2	5	920.5	914.5	-0.654	290	4	43.14	b
9116	4	6509-4	2956-2	4	8	10.38	10.76	3.6993	4	4	43.14	b
9116	4	6509-4	2956-2	1	7	40.56	41.18	1.5245	25	4	43.14	b
9116	4	6509-4	2956-2	1	6	971.5	953	-1.904	250	4	43.14	b
9116	4	6509-4	2956-2	1	5	1112	1050	-5.624	330	4	43.14	b
9116	4	6509-4	2147-8	4	8	10.38	10.72	3.326	4	4	43.14	b
9116	4	6509-4	2147-8	4	7	27.1	27.74	2.3358	10	4	43.14	b
9116	4	6509-4	2147-8	4	6	297.4	241.9	-18.66	60	4	43.14	b
9116	4	6509-4	2147-8	4	5	559.3	442.5	-20.87	65	4	43.14	b
9116	4	6509-4	2147-8	3	8	10.77	11.78	9.3438	5	4	43.14	b
9116	4	6509-4	2147-8	3	7	41.62	40.75	-2.086	12	4	43.14	b
9116	4	6509-4	2147-8	3	6	389.5	374.4	-3.868	170	4	43.14	b
9116	4	6509-4	2956-2	2	6	532.1	537.4	0.9978	200	4	43.14	b

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