Sit-Stand Storage Solutions

Proposal for Sit-Stand Storage Station

November 7, 2017

Prepared by:
Chad Goldberg
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Prepared for:
James Intriligator, PhD
Professor of the Practice - Human Factors and Design
Tufts University

Sit-Stand Storage Solutions
574 Boston Ave
Medford, MA 02155

November 7, 2017

James Intriligator
200 College Ave
Medford, MA 02155

Dear Professor Intriligator,

Thank you for considering Sit-Stand Storage Solutions for the design of your classroom-of-the-future! With our background in product design, we believe that we can design you a highly functional sit-stand storage desk for your classroom.

In this proposal, you will find an executive summary, an introduction, our plan for collecting user group information, our design plan (including requirements and process), our schedule for each deliverable, and a conclusion, followed by a list of references and appendices.

If you have any questions, please feel free to contact our project manager, Lexie Kirsch, at akirsc01@tufts.edu.

We look forward to starting this project.

Sincerely,
Chad and Lexie
Sit-Stand Storage Solutions

EXECUTIVE SUMMARY

SIT STAND STORAGE SOLUTIONS

This proposal summarizes the steps that Sit-Stand Storage Solutions will take in order to design a desk with sit-stand and storage functionality. Our goal for this desk is that it promotes collaboration in classroom settings, particularly for college students. Our deliverables will include a User Research Report (completed 11/17), an Interim Report (completed 12/8), a Usability Assessment (completed 2/2), a list of Design Specifications (completed 2/16), and a Final Report (completed 5/4). We look forward to working with you!

INTRODUCTION

SIT STAND STORAGE SOLUTIONS

Purpose

The purpose of this project is to design a desk with sit-stand and storage functionality. Our goal for this desk is that it promotes collaboration in classroom settings.

Scope

We are designing this desk with college students in mind, because college students are more likely to collaborate on large projects with others and need an appropriate space to do so. However, any user who works at a desk and would prefer a sit-stand desk with storage functionality would also benefit from this design.

Our Team

Lexie Kirsch is a senior majoring in Human Factors Engineering at Tufts University. She is the project manager of this team, so she will provide weekly updates on the progress of this project. Lexie is excited to use her design expertise from her product design class, sponsored by the Massachusetts Bay Transportation Authority (MBTA), and her experience participating in make-a-thons, sponsored by IDEO and SONOS, to create a physical product.

Chad Goldberg is also a senior studying Human Factors Engineering at Tufts University. He is the design and manufacturing manager of the team and has consulted on projects sponsored by Adobe, the MBTA, and the US Army Soldier Systems Center. His experience as a Human Factors research assistant at the Natick Soldier Research and Development Center makes him a qualified professional. He looks forward to using his CAD and prototyping experience to develop a high-end sit-stand storage solution.

BACKGROUND

SIT STAND STORAGE SOLUTIONS

User Group

Our user group consists of college students, ages 17 to 25. We will conduct user research to identify user needs by using literature reviews and by asking users directly through questionnaires.

Themes to Explore

We will explore themes relating to work environments, desk settings, breaks, storage, and collaboration.

Here are examples of some questions we might initially ask users:

- Where do you go to do your work?
- How often do you work at a desk? For how long?
- Do you have a sit-stand desk? Are you familiar with the concept of one?
- How often do you take breaks? What do you do? For how long?
- What supplies do you use most often? Where do you store those supplies?
- Where do you go to do work with others? Why?

DESIGN

SIT
SOLUTIONS
STAND
STORAGE

Design Requirements

In order to identify design requirements, we will take the following four steps:

1. We will identify specific user needs by conducting interviews with and distributing questionnaires to our target users. We will ask them questions such as:
    a. How much space do you need on your desk?
    b. How much legroom do you need?
    c. What are your thoughts on overhead storage?
2. We will conduct a task analysis for the following three spaces:
    a. Sitting desk
    b. Standing desk
    c. Storage space
3. We will create a Bill Of Materials based on research of related designs.
4. We will identify design specifications by studying published anthropometric data tables (see Appendices A-G).

Design Process

SIT STAND STORAGE SOLUTIONS

Step 1: Research

First, we will identify the user needs for the User Research Report, which will be completed by November 17. We will gather this information through literature reviews and questionnaires.

For the literature review, we will use Google and the Tisch library database to research articles about work environments and similar available sit-stand products.

For the questionnaire, we will use Google Forms to ask users about their preferences regarding work environments, desk settings, work breaks, storage, and collaboration. We will administer this questionnaire via computer, and responses will be anonymous.

Step 2: Concept Development

Second, we will use our user needs research to develop three initial design concepts for the Interim Report, which will be delivered on December 8.

Each design concept will differ significantly, so we can incorporate all user needs and collect a variety of feedback.

Step 3: User Testing

Third, we will show these three design concepts to our users and collect their feedback through user interviews and focus groups. We will ask them subjective and objective questions about each concept so we have both a quantitative and qualitative measure of each concept. This data will allow us to directly compare each design concept.

We will compile the feedback in the Usability Assessment deliverable, which will be completed by February 2.

Step 4: Concept Refining and Testing

Fourth, we will use the feedback to select one of the three designs to refine and prototype for our final design. If possible and necessary, we will create a fourth design that incorporates the best qualities of each initial design concept.

This process will be iterative, as we will require repeated user input for each step in refining the design and for each prototype we develop based on that refined design.

We will document these design requirements in the Design Specifications deliverable, which will be completed by February 16.

Step 5: Final Design

Fifth, and finally, our design process will culminate with a refined physical product, presentation, and Final Report, which will be delivered on May 4.

The report and presentation will document our progress through each stage of the design process. We will summarize our user research, concept development, user testing results, and concept and prototype refinements. In the presentation, we will also present our final prototype.

SCHEDULE

SIT STAND SOLUTIONS STORAGE

Expenses

First, we will spend one week conducting user research for the User Research Report, which will be completed by November 17. Second, we will dedicate three weeks to developing our design concepts for the Interim Report, which will be completed by December 8. Third, we will collect feedback on our concepts and complete the Usability Assessment, which will be completed by February 2. Fourth, we will identify design requirements necessary for our prototype and the Design Specifications deliverable, which will be completed by February 16. Finally, we will spend the subsequent months creating and testing prototypes, and we will submit our Final Report on May 4.

Gantt Chart

Task Name
Oct
Nov
Dec
Jan
Feb
Mar
Apr
Oct 1
Oct 8
Oct 15
Oct 22
Oct 29
Nov 5
Nov 12
Nov 19
Nov 26
Dec 3
Dec 10
Dec 17
Dec 24
Dec 31
Jan 7
Jan 14
Jan 21
Jan 28
Feb 4
Feb 11
Feb 18
Feb 25
Mar 4
Mar 11
Mar 18
Mar 25
Apr 1
Apr 8
Apr 15
Apr 22
Apr 29
1 Finish Project Proposal
2 Conduct User Research/White
3 Develop Design Concepts
4 Prepare Interim Report
5 Test Concepts With Users
6 Complete Usability Assessmen
7 Develop Final Design and Desi
8 Final Prototyping & Testing
9 Prepare Final Report

CONCLUSION

SIT STAND STORAGE SOLUTIONS

From November 3 to May 4, we will deliver a User Research Report that identifies user needs based on literature reviews and questionnaires, an Interim Report that includes our three initial design concepts, a Usability Assessment that contains feedback on our three design concepts plus the chosen concept for our final design, a list of Design Specifications for the prototype of our final design, and a Final Report that documents our progress and presents our final design.

REFERENCES

SIT STAND SOLUTIONS STORAGE

https://multisite.eos.ncsu.edu/www-ergocenter-ncsu-edu/wp-content/uploads/sites/18/2016/06/Anthropometric-Detailed-Data-Tables.pdf

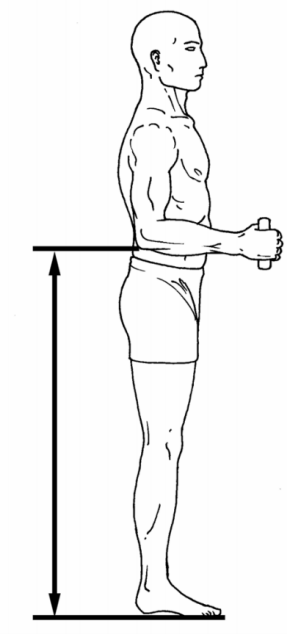
https://www.smartsheet.com/s/smartsheet?s=55&c=21&m=5500&a=223602164358&k=smartsheet&mtp=e&adp=1t2&net=g&dev=c&devm=&plc=&gclid=Cj0KCQiA84rQBRDCARIsAPO8RFx0PKIrXEy_xMVeiodcPcQ0nLoOpjPsc3fIO2c5jNpvuWIVfaVK5IMaAicgEALw_wcB

APPENDIX A

SIT STAND SOLUTIONS STORAGE

Elbow Rest Height, Standing

FEMALE N = 2208			MALE N = 1774		
Centimeters		**Inches**	**Centimeters**		**Inches**
99.79	**Mean**	39.29	107.25	**Mean**	42.22
4.48	**Std Dev**	1.76	4.81	**Std Dev**	1.89
118.50	**Maximum**	46.65	126.10	**Maximum**	49.65
85.60	**Minimum**	33.70	88.80	**Minimum**	34.96
	Percentiles			**Percentiles**	
89.51	1st	35.24	96.18	1st	37.87
90.80	2nd	35.75	97.56	2nd	38.41
91.58	3rd	36.06	98.40	3rd	38.74
92.63	5th	36.47	99.52	5th	39.18
94.20	10th	37.09	101.21	10th	39.85
95.24	15th	37.50	102.34	15th	40.29
96.06	20th	37.82	103.23	20th	40.64
96.77	25th	38.10	104.00	25th	40.95
97.41	30th	38.35	104.70	30th	41.22
98.00	35th	38.58	105.35	35th	41.48
98.57	40th	38.87	105.97	40th	41.72
99.12	45th	39.02	106.57	45th	41.96
99.67	50th	39.24	107.18	50th	42.20
100.23	55th	39.46	107.78	55th	42.43
100.79	60th	39.68	108.40	60th	42.68
101.38	65th	39.92	109.05	65th	42.93
102.02	70th	40.16	109.73	70th	43.20
102.71	75th	40.44	110.47	75th	43.49
103.49	80th	40.74	111.31	80th	43.82
104.41	85th	41.11	112.28	85th	44.20
105.60	90th	41.57	113.50	90th	44.68
107.40	95th	42.28	115.28	95th	45.39
108.59	97th	42.75	116.41	97th	45.83
109.47	98th	43.10	117.21	98th	46.15
110.87	99th	43.65	118.41	99th	46.62

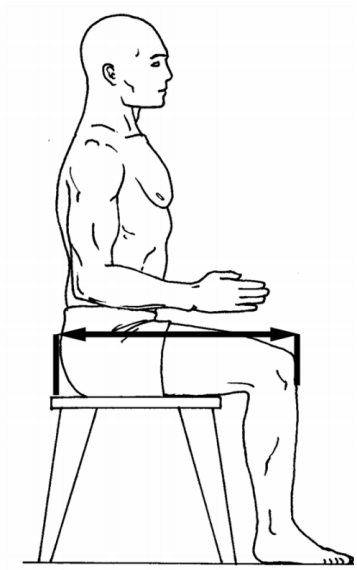


APPENDIX B

SIT STAND SOLUTIONS STORAGE

Buttock-Knee Length

FEMALE N = 2208			MALE N = 1774		
Centimeters		**Inches**	**Centimeters**		**Inches**
58.89	**Mean**	23.19	61.64	**Mean**	24.27
2.96	**Std Dev**	1.17	2.99	**Std Dev**	1.18
69.10	**Maximum**	27.20	72.30	**Maximum**	28.46
49.10	**Minimum**	19.33	50.60	**Minimum**	19.92
	Percentiles			**Percentiles**	
52.18	1st	20.54	55.07	1st	21.68
53.03	2nd	20.88	55.81	2nd	21.97
53.54	3rd	21.08	56.28	3rd	22.16
54.21	5th	21.34	56.90	5th	22.40
55.20	10th	21.73	57.87	10th	22.78
55.87	15th	22.00	58.54	15th	23.05
56.39	20th	22.20	59.08	20th	23.26
56.85	25th	22.38	59.55	25th	23.45
57.27	30th	22.55	59.98	30th	23.62
27.66	35th	22.70	60.39	35th	23.77
58.04	40th	22.85	60.78	40th	23.93
58.41	45th	23.00	61.16	45th	24.08
58.78	50th	23.14	61.54	50th	24.23
59.15	55th	23.29	61.93	55th	24.38
59.54	60th	23.44	62.32	60th	24.54
59.95	65th	23.60	62.73	65th	24.70
60.38	70th	23.77	63.17	70th	24.87
60.85	75th	23.96	63.65	75th	25.06
61.39	80th	24.17	64.19	80th	25.27
62.01	85th	24.41	64.81	85th	25.52
62.81	90th	24.73	65.60	90th	25.83
63.98	95th	25.19	66.74	95th	26.28
64.72	97th	25.48	67.45	97th	26.56
65.24	98th	25.69	67.95	98th	26.75
66.02	99th	25.99	68.69	99th	27.04

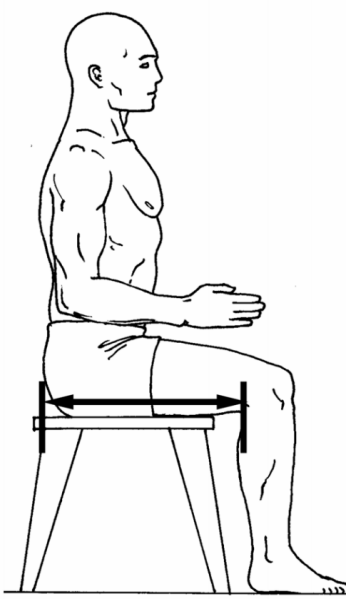


APPENDIX C

SIT SOLUTIONS STAND STORAGE

Buttock-Popliteal Length

FEMALE N = 2208			MALE N = 1774		
Centimeters		**Inches**	**Centimeters**		**Inches**
48.17	**Mean**	18.96	50.04	**Mean**	1970
2.66	**Std Dev**	1.05	2.66	**Std Dev**	1.05
57.80	**Maximum**	22.76	59.70	**Maximum**	23.50
39.40	**Minimum**	15.51	40.10	**Minimum**	15.79
	Percentiles			**Percentiles**	
42.10	1st	16.57	44.13	1st	17.37
42.91	2nd	16.89	44.81	2nd	17.64
43.39	3rd	17.08	45.24	3rd	17.81
44.00	5th	17.32	45.81	5th	18.04
44.89	10th	17.67	46.70	10th	18.39
45.47	15th	17.90	47.30	15th	18.62
45.93	20th	18.08	47.79	20th	18.81
46.34	25th	18.24	48.21	25th	18.98
46.71	30th	18.39	48.59	30th	19.13
47.05	35th	18.52	48.95	35th	19.27
47.39	40th	18.66	49.29	40th	19.41
47.72	45th	18.79	49.63	45th	19.54
48.05	50th	18.92	49.96	50th	19.67
48.39	55th	19.05	50.30	55th	19.80
48.73	60th	19.19	50.65	60th	19.94
49.10	65th	19.33	51.01	65th	20.08
49.49	70th	19.49	51.39	70th	20.23
49.93	75th	19.66	51.81	75th	20.40
50.42	80th	19.85	52.28	80th	20.58
50.99	85th	20.07	52.83	85th	20.80
51.72	90th	20.36	53.53	90th	21.07
52.77	95th	20.78	54.55	95th	21.48
53.43	97th	21.03	55.21	97th	21.74
53.88	98th	21.21	55.68	98th	21.92
54.54	99th	21.47	56.40	99th	22.21

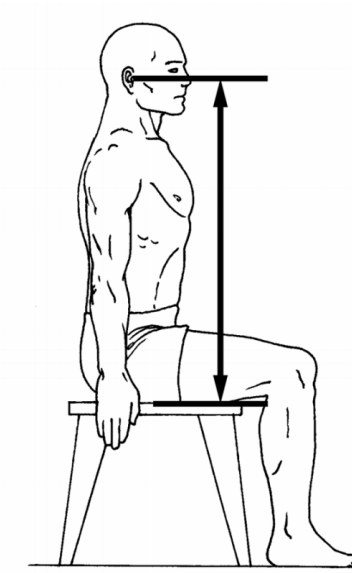


APPENDIX D

SIT SOLUTIONS STAND STORAGE

Eye Height Approximation, Sitting

FEMALE N = 2208			MALE N = 1774		
Centimeters		**Inches**	**Centimeters**		**Inches**
72.85	**Mean**	28.68	78.30	**Mean**	30.83
3.31	**Std Dev**	1.30	3.38	**Std Dev**	1.33
84.00	**Maximum**	33.07	89.30	**Maximum**	35.16
63.00	**Minimum**	24.80	67.70	**Minimum**	26.65
	Percentiles			**Percentiles**	
65.48	1st	25.78	70.14	1st	27.61
66.27	2nd	26.09	71.17	2nd	28.02
66.78	3rd	26.29	71.81	3rd	28.27
67.48	5th	26.57	72.66	5th	28.60
68.59	10th	27.01	73.93	10th	29.10
69.37	15th	27.31	74.77	15th	29.44
69.99	20th	27.55	75.43	20th	29.70
70.54	25th	27.77	76.01	25th	29.92
71.03	30th	27.96	76.52	30th	30.13
71.49	35th	28.15	77.00	35th	30.31
74.93	40th	28.32	77.45	40th	30.49
72.36	45th	28.49	77.89	45th	30.66
72.79	50th	28.66	78.32	50th	30.83
73.22	55th	28.83	78.75	55th	31.01
73.66	60th	29.00	79.19	60th	31.18
74.11	65th	29.18	79.65	65th	31.36
74.59	70th	29.37	80.13	70th	31.55
75.11	75th	29.57	80.64	75th	31.75
75.69	80th	29.80	81.22	80th	31.97
76.36	85th	30.06	81.87	85th	32.23
77.19	90th	30.39	82.68	90th	32.55
78.41	95th	30.87	83.83	95th	33.01
79.17	97th	31.17	84.53	97th	33.28
79.71	98th	31.38	85.02	98th	33.47
80.52	99th	31.70	85.71	99th	33.74

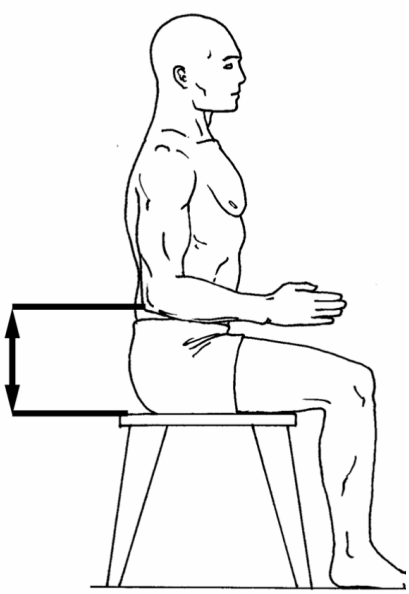


APPENDIX E

SIT STAND SOLUTIONS STORAGE

Elbow Rest Height, Sitting

FEMALE N = 2208			MALE N = 1774		
Centimeters		**Inches**	**Centimeters**		**Inches**
22.05	**Mean**	8.68	23.06	**Mean**	9.08
2.68	**Std Dev**	1.05	2.72	**Std Dev**	1.07
30.20	**Maximum**	11.89	31.10	**Maximum**	12.24
12.40	**Minimum**	4.88	14.00	**Minimum**	5.51
	Percentiles			**Percentiles**	
15.80	1st	6.22	16.75	1st	6.60
16.49	2nd	6.49	17.35	2nd	6.83
16.94	3rd	6.67	17.78	3rd	7.00
17.57	5th	6.92	18.41	5th	7.25
18.56	10th	7.31	19.44	10th	7.65
19.24	15th	7.57	20.17	15th	7.94
19.77	20th	7.87	20.74	20th	8.17
20.24	25th	7.97	21.24	25th	8.36
20.65	30th	8.13	21.69	30th	8.54
21.03	35th	8.28	22.09	35th	8.70
21.39	40th	8.42	22.47	40th	8.85
21.74	45th	8.56	22.83	45th	8.99
22.08	50th	8.69	23.19	50th	9.13
22.42	55th	8.83	23.53	55th	9.27
22.77	60th	8.96	23.88	60th	9.40
23.12	65th	9.10	24.23	65th	9.54
23.49	70th	8.25	24.59	70th	9.68
23.89	75th	9.41	24.98	75th	9.83
24.33	80th	9.58	25.40	80th	10.00
24.84	85th	9.78	25.88	85th	10.19
25.49	90th	10.03	26.48	90th	10.43
26.44	95th	10.41	27.37	95th	10.78
27.06	97th	10.65	27.96	97th	11.01
27.52	98th	10.83	28.41	98th	11.19
28.24	99th	11.12	29.16	99th	11.48

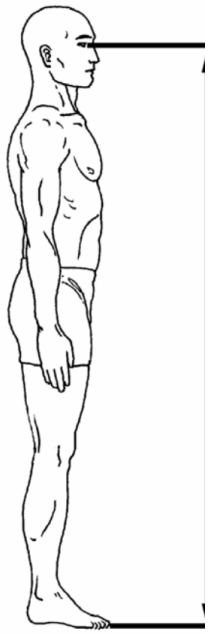


APPENDIX F

SIT SOLUTIONS STAND STORAGE

Eye Height, Standing

FEMALE N = 2208			MALE N = 1774		
Centimeters		**Inches**	**Centimeters**		**Inches**
151.61	**Mean**	59.69	163.39	**Mean**	64.32
6.25	**Std Dev**	2.46	6.57	**Std Dev**	2.59
175.30	**Maximum**	69.02	191.20	**Maximum**	75.28
132.50	**Minimum**	52.17	138.10	**Minimum**	54.37
	Percentiles			**Percentiles**	
137.39	1st	54.09	148.40	1st	58.43
139.07	2nd	54.75	150.22	2nd	59.14
140.11	3rd	55.16	151.33	3rd	59.14
141.52	5th	55.72	152.82	5th	59.58
143.67	10th	56.56	155.08	10th	60.17
145.13	15th	57.14	156.60	15th	61.05
146.29	20th	57.59	157.82	20th	61.65
147.30	25th	57.99	158.88	25th	62.13
148.21	30th	58.35	159.84	30th	62.55
149.06	35th	58.68	160.73	35th	62.93
149.87	40th	59.00	161.59	40th	63.62
150.66	45th	59.32	162.42	45th	63.95
151.45	50th	59.63	163.26	50th	64.28
152.24	55th	59.94	164.10	55th	64.61
153.05	60th	60.26	164.96	60th	64.94
153.90	65th	60.59	165.85	65th	65.30
154.79	70th	60.94	166.79	70th	65.67
155.77	75th	61.33	167.82	75th	66.07
156.86	80th	61.76	168.97	80th	66.52
158.14	85th	62.26	170.29	85th	67.04
159.75	90th	62.90	171.29	90th	67.69
162.13	95th	63.83	174.29	95th	68.62
163.35	97th	64.43	175.73	97th	69.18
164.75	98th	64.86	176.72	98th	69.57
166.43	99th	65.52	178.15	99th	70.14



APPENDIX G

SIT STAND SOLUTIONS STORAGE

Forearm-Forearm Breadth

FEMALE N = 2208			MALE N = 1774		
Centimeters		**Inches**	**Centimeters**		**Inches**
46.85	**Mean**	18.44	54.61	**Mean**	21.50
3.47	**Std Dev**	1.36	4.36	**Std Dev**	1.72
60.90	**Maximum**	23.98	72.52	**Maximum**	28.54
37.30	**Minimum**	14.69	39.90	**Minimum**	15.71
	Percentiles			**Percentiles**	
39.42	1st	15.52	45.12	1st	17.76
40.24	2nd	15.84	46.17	2nd	18.18
40.76	3rd	16.05	46.84	3rd	18.44
41.47	5th	16.33	47.74	5th	18.80
42.58	10th	16.76	49.16	10th	19.35
43.33	15th	17.06	50.13	15th	19.74
43.94	20th	17.30	50.91	20th	20.04
44.47	25th	17.51	51.59	25th	20.31
44.94	30th	17.69	52.21	30th	20.56
45.39	35th	17.87	52.79	35th	20.79
45.82	40th	18.04	53.35	40th	21.00
46.24	45th	18.20	53.90	45th	21.22
46.66	50th	18.37	54.45	50th	21.44
47.08	55th	18.54	55.00	55th	21.65
47.52	60th	18.71	55.56	60th	21.88
47.98	65th	18.89	56.16	65th	22.11
48.47	70th	19.08	56.79	70th	22.36
49.01	75th	19.30	57.47	75th	22.63
49.63	80th	19.54	58.25	80th	22.93
50.37	85th	19.83	59.16	85th	23.29
51.33	90th	20.21	60.32	90th	23.75
52.84	95th	20.80	62.06	95th	24.43
53.87	97th	21.21	63.18	97th	24.87
54.66	98th	21.52	64.00	98th	25.20
55.95	99th	22.03	65.27	99th	25.70