

Norm Referenced Test (NRT)

NRT Test Design

In 2006, the MSA Mathematics tests included the *TerraNova* Mathematics Survey (TN) Form C at Grades 3, 4, 5, 7, and 8 and Form D at Grade 6. CTB's *TerraNova* is an assessment system designed to measure concepts, processes, and skills taught throughout the nation. *TerraNova* Survey consists of SR items only. The number of items and scale score ranges can be found in Table 5. *TerraNova* Mathematics scale scores based on IRT pattern scoring were reported. Scores on the *TerraNova* English Language Arts Survey were not reported in 2005.

Table 5
The Number of Items and Scale Score Range

Content Grade	SR Items	Scale Score Range
MA3	30	385-740
MA4	32	403-770
MA5	32	430-797
MA6	31	477-820
MA7	32	487-850
MA8	31	502-872

MA: Mathematics

Distributions of NRT Scores

NRT summary statistics for raw score (NCS), scale score (SS), national percentile rank (NP), and performance level are presented in Tables 6-9¹. The NP shows that Maryland students' performance on the NRT was higher (55th through 63rd percentile) than the national average. As can be seen from NCS, SS, and NP in Tables 8 and 9, students' 2006 performance at most grade levels was somewhat higher than in 2005. Note that performance cuts in Table 9 were obtained from the *TerraNova* standard setting, not the Maryland standard setting.

Tables 10 and 11 show the scale score statistics (including the mean, standard deviation, minimum and maximum) for ethnicity and gender subgroups on each form. Overall, White students performed better than the other ethnic groups. There was almost one standard deviation (40 points) difference between the scores of white students and African American students in many grades. Note that *TerraNova* scores are vertically scaled so that scale scores across grades can be compared. On average across grades,

¹ Note that case counts for the NRT are lower than for the CRT because NRT scores were not computed for students who attempted fewer than 5 *TerraNova* items.

standard deviations were larger for White and Hispanic students than for African-American students and were larger for males than for females.

Figure 1 shows the 2006 Mathematics mean scale scores by grade level for each ethnic group. The increases in NRT score means from year to year appear to be similar for African-American and Hispanic groups. The year-to-year score increases for African-American and Hispanic students were similar to those for White students overall, but the African-American and White students showed small score increases between Grade 6 and Grade 7, while the Hispanic students actually showed a slight score drop between Grade 6 and Grade 7.

Tables 12 to 17 show the proportion of students answering each NRT item correctly (i.e., item p-values) in 2005 and 2006 on the *TerraNova* Mathematics items in Grades 3 through 8. For most items in Grades 3 through 7, p-values were higher in 2006 than in 2005, indicating an improvement in student performance. At Grade 8, the 2005 and 2006 average p-values were approximately the same, with some items showing increases and others showing decreases in p-values between the two years.

Table 6
NRT Summary Statistics based on Number-Correct Scores

Grade	N	Mean	SD	Skewness	Kurtosis	KR20	SEM
3	60269	24.17	4.387	-0.951	0.735	0.818	1.874
4	61666	23.65	5.772	-0.575	-0.379	0.862	2.147
5	63369	24.91	5.547	-0.846	0.068	0.860	2.078
6	64355	21.84	6.424	-0.576	-0.613	0.877	2.249
7	65253	21.77	6.943	-0.439	-0.810	0.891	2.292
8	67126	20.88	5.981	-0.276	-0.729	0.855	2.277

Table 7
NRT Summary Statistics based on Scale Scores and National Percentile Rank (NP)

Grade	N	Mean	SD	Skewness	Kurtosis	NP
3	60269	621	47.4	0.451	1.307	61
4	61666	641	45.7	0.505	2.332	58
5	63369	668	53.6	0.399	0.728	63
6	64355	676	51.1	-0.018	1.838	59
7	65253	681	54.3	0.415	2.450	55
8	67126	701	52.5	0.358	1.840	58

Table 8
NRT Summary Statistics: 2005 and 2006 State Means

Grade	2005			2006		
	NCS	SS	NP	NCS	SS	NP
3	23.966	619	61	24.169	621	61
4	23.017	636	57	23.648	641	58
5	24.281	662	61	24.913	668	63
6	21.340	673	58	21.840	676	59
7	21.239	677	53	21.774	681	55
8	20.745	700	58	20.878	701	58

NCS = number-correct score (i.e., raw score)

SS = scale score

NP = national percentile rank

Table 9
Percentages of Students in Each NRT Performance Level in 2005 and 2006

Grade	2005 Performance Level					2006 Performance Level				
	1	2	3	4	5	1	2	3	4	5
3	31.9	35.3	22.4	4.9	5.5	30.8	34.1	23.3	5.4	6.4
4	16.6	33.6	30.9	11.9	7.0	14.0	32.4	32.3	12.9	8.5
5	9.7	20.3	27.1	22.1	20.9	7.9	18.0	26.7	23.4	24.0
6	28.3	24.2	27.3	14.0	6.1	26.0	23.4	28.3	15.2	7.2
7	27.8	22.7	26.1	16.0	7.4	25.2	22.4	26.8	17.2	8.4
8	13.7	17.2	27.7	24.6	16.7	13.9	17.4	26.3	24.4	18.0

Table 10
NRT Scale Score Descriptive Statistics by Ethnicity

Grade Content	Test Form	White					African American					Hispanic				
		N	Mean	SD	Min	Max	N	Mean	SD	Min	Max	N	Mean	SD	Min	Max
MA3	A	5911	633.44	47.61	385	740	4615	600.99	41.36	385	740	1089	605.50	41.21	385	740
	B	5800	636.20	46.38	385	740	4610	603.87	41.23	385	740	1041	608.84	42.59	385	740
	C	5761	636.16	47.04	385	740	4538	604.54	41.25	385	740	992	610.77	41.99	385	740
	D	5717	635.84	47.24	385	740	4456	604.02	41.92	385	740	1025	608.98	38.94	458	740
	E	5650	635.56	46.50	385	740	4419	602.59	41.86	385	740	956	605.91	40.26	437	740
	Total	28839	635.43	46.97	385	740	22638	603.20	41.54	385	740	5103	607.98	41.06	385	740
MA4	A	6123	651.45	45.22	403	770	4674	620.75	38.98	403	770	1079	625.40	40.27	403	770
	B	6036	653.80	45.04	403	770	4711	622.97	37.60	403	770	1041	628.93	40.90	403	770
	C	6038	654.19	43.78	403	770	4543	624.20	38.29	403	770	1014	629.71	39.56	403	770
	D	5929	654.51	45.21	403	770	4536	623.42	38.59	403	770	1022	627.89	43.17	403	770
	E	5861	654.78	45.70	403	770	4518	622.70	37.84	403	770	972	628.30	41.53	403	770
	Total	29987	653.73	45.00	403	770	22982	622.80	38.28	403	770	5128	628.02	41.10	403	770
MA5	A	6268	680.57	53.66	430	797	4893	643.76	46.16	430	797	1058	650.60	50.71	430	797
	B	6219	684.68	52.05	430	797	4972	646.44	46.40	430	797	937	654.35	50.98	430	797
	C	6175	684.91	51.88	430	797	4789	646.29	44.95	430	797	990	653.26	47.18	486	797
	D	6077	684.41	51.38	430	797	4760	646.36	45.22	430	797	946	656.81	49.95	430	797
	E	6027	685.49	51.56	519	797	4674	645.18	46.33	430	797	987	655.07	49.61	430	797
	Total	30766	684.00	52.15	430	797	24088	645.61	45.83	430	797	4918	653.94	49.73	430	797
MA6	A	6248	689.51	49.22	477	820	5178	652.70	46.58	477	820	1020	659.99	50.27	477	820
	B	6239	693.12	48.03	477	820	5049	656.75	45.55	477	820	987	664.77	46.18	477	820
	C	6143	693.09	47.31	477	820	5058	655.63	46.32	477	820	906	664.85	46.98	477	820
	D	6075	693.42	46.76	477	820	5053	655.98	46.18	477	820	912	664.27	51.33	477	820
	E	5990	693.68	47.20	477	820	4994	655.00	46.03	477	820	950	662.78	49.74	477	820
	Total	30695	692.55	47.74	477	820	25332	655.20	46.15	477	820	4775	663.27	48.95	477	820

Table 10 (cont.)
NRT Scale Score Descriptive Statistics by Ethnicity

Grade Content	Test Form	White					African American					Hispanic				
		N	Mean	SD	Min	Max	N	Mean	SD	Min	Max	N	Mean	SD	Min	Max
MA7	A	6428	695.88	52.90	487	850	5259	657.00	46.82	487	850	953	658.79	47.88	487	850
	B	6349	697.38	52.49	487	850	5156	659.04	46.11	487	850	898	658.06	51.16	487	850
	C	6293	699.06	51.81	487	850	5081	660.32	45.95	487	850	942	661.55	47.20	487	850
	D	6209	699.14	52.60	487	850	5096	658.16	47.04	487	850	902	665.34	50.21	487	850
	E	6260	698.03	52.24	487	850	5033	658.66	46.55	487	850	899	660.30	50.93	487	850
	Total	31539	697.89	52.42	487	850	25625	658.62	46.51	487	850	4594	660.79	49.51	487	850
MA8	A	6652	715.40	51.93	502	872	5394	674.97	45.23	502	872	940	685.66	47.70	502	872
	B	6712	718.98	50.70	502	872	5166	676.37	42.60	502	872	879	682.67	49.40	502	872
	C	6595	718.39	49.02	502	872	5226	678.39	43.23	502	872	880	681.97	49.99	502	872
	D	6557	718.88	50.30	502	872	5172	677.55	43.11	502	872	872	688.62	45.01	502	872
	E	6488	719.30	50.32	502	872	5133	677.50	42.63	502	872	887	682.27	45.89	502	872
	Total	33004	718.18	50.48	502	872	26091	676.94	43.40	502	872	4458	684.25	47.69	502	872

Table 11
NRT Scale Score Descriptive Statistics by Gender

Grade Content	Test Form	Male					Female				
		N	Mean	SD	MIN	MAX	N	Mean	SD	MIN	MAX
MA3	A	6514	620.99	49.95	385	740	5845	617.31	45.40	385	740
	B	6292	624.30	48.94	385	740	5896	619.49	45.12	385	740
	C	6166	624.52	48.75	385	740	5890	620.50	45.25	385	740
	D	6038	624.34	49.29	385	740	5850	619.96	45.44	385	740
	E	5933	622.45	48.82	385	740	5840	620.05	45.95	385	740
	Total	30943	623.30	49.18	385	740	29321	619.46	45.44	385	740
MA4	A	6560	639.20	47.82	403	770	6034	638.04	43.92	403	770
	B	6363	641.42	46.94	403	770	6128	640.52	43.84	403	770
	C	6260	643.57	45.72	403	770	6052	640.55	43.92	403	770
	D	6127	642.82	47.64	403	770	6100	640.18	44.16	403	770
	E	6089	642.60	47.30	403	770	5947	640.24	44.57	403	770
	Total	31399	641.89	47.11	403	770	30261	639.91	44.09	403	770
MA5	A	6687	665.76	55.28	430	797	6246	664.43	53.16	430	797
	B	6571	669.14	54.83	430	797	6232	667.59	52.31	430	797
	C	6456	668.90	53.79	430	797	6245	668.36	51.87	430	797
	D	6327	670.06	54.06	430	797	6200	667.81	52.35	430	797
	E	6374	670.99	54.67	430	797	6025	666.57	52.74	430	797
	Total	32415	668.94	54.56	430	797	30948	666.95	52.50	430	797
MA6	A	6941	673.14	53.25	477	820	6217	674.10	50.37	477	820
	B	6679	677.09	51.51	477	820	6228	677.87	49.65	477	820
	C	6576	677.35	52.72	477	820	6258	676.98	49.05	477	820
	D	6481	677.23	51.02	477	820	6279	677.28	50.36	477	820
	E	6583	677.16	52.86	477	820	6102	676.75	49.42	477	820
	Total	33260	676.36	52.31	477	820	31084	676.60	49.79	477	820
MA7	A	6935	678.62	56.13	487	850	6383	678.99	52.38	487	850
	B	6726	680.81	55.88	487	850	6404	679.96	52.97	487	850
	C	6590	682.98	55.11	487	850	6417	680.91	51.58	487	850
	D	6597	681.23	56.67	487	850	6326	681.55	52.93	487	850
	E	6553	681.66	55.89	487	850	6313	679.81	52.67	487	850
	Total	33401	681.03	55.95	487	850	31843	680.24	52.51	487	850
MA8	A	7027	701.14	56.48	502	872	6640	695.07	49.59	502	872
	B	6988	703.34	55.80	502	872	6486	698.87	49.62	502	872
	C	6856	704.05	54.82	502	872	6551	698.26	48.17	502	872
	D	6809	705.08	55.48	502	872	6509	698.44	48.62	502	872
	E	6826	704.79	54.93	502	872	6422	697.69	48.49	502	872
	Total	34506	703.66	55.53	502	872	32608	697.65	48.92	502	872

Figure 1
NRT Mathematics Mean Scale Scores by Grade and Ethnicity

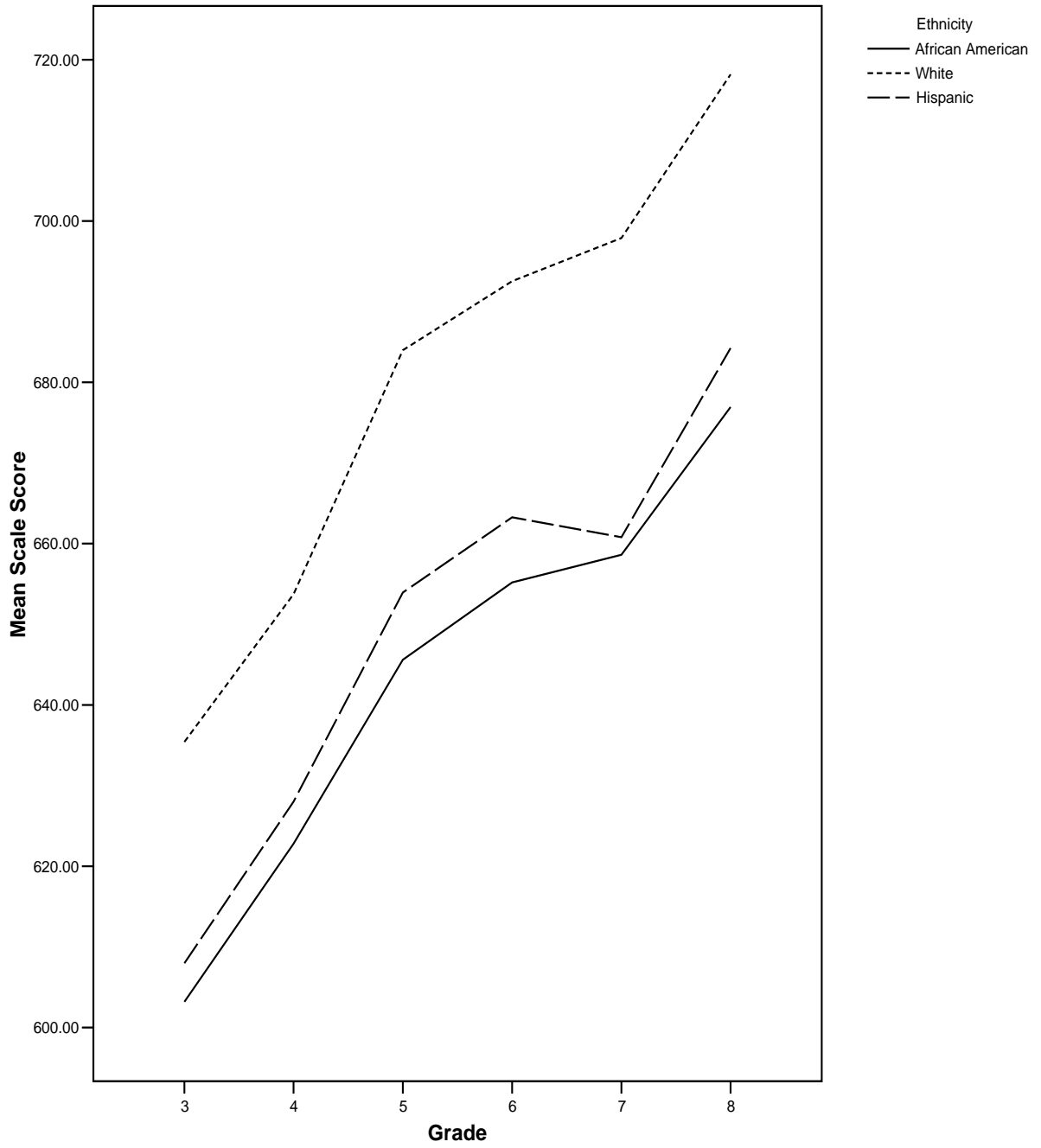


Table 12
Grade 3 Mathematics NRT Item p-values

Item	2005 (N=61509)	2006 (N=60388)	Difference
1	0.86	0.87	0.01
2	0.92	0.93	0.01
3	0.91	0.92	0.01
4	0.89	0.90	0.01
5	0.76	0.77	0.01
6	0.96	0.96	0.00
7	0.69	0.70	0.01
8	0.72	0.72	0.00
9	0.83	0.79	-0.04
10	0.90	0.91	0.01
11	0.91	0.91	0.00
12	0.90	0.91	0.01
13	0.88	0.88	0.00
14	0.88	0.90	0.02
15	0.86	0.87	0.01
16	0.96	0.97	0.01
17	0.91	0.92	0.01
18	0.97	0.97	0.00
19	0.68	0.69	0.01
20	0.63	0.63	0.00
21	0.57	0.58	0.01
22	0.75	0.75	0.00
23	0.88	0.89	0.01
24	0.97	0.98	0.01
25	0.91	0.92	0.01
26	0.73	0.74	0.01
27	0.71	0.71	0.00
28	0.51	0.53	0.02
29	0.41	0.42	0.01
30	0.46	0.49	0.03
Average	0.80	0.80	0.01

Table 13
Grade 4 Mathematics NRT Item p-values

Item	2005 (N=63330)	2006 (N=61785)	Difference
1	0.81	0.84	0.03
2	0.66	0.70	0.04
3	0.83	0.86	0.03
4	0.60	0.62	0.02
5	0.55	0.57	0.02
6	0.82	0.83	0.01
7	0.70	0.72	0.02
8	0.52	0.53	0.01
9	0.56	0.59	0.03
10	0.53	0.55	0.02
11	0.98	0.98	0.00
12	0.95	0.96	0.01
13	0.38	0.39	0.01
14	0.73	0.75	0.02
15	0.82	0.83	0.01
16	0.85	0.87	0.02
17	0.91	0.92	0.01
18	0.56	0.59	0.03
19	0.89	0.90	0.01
20	0.74	0.75	0.01
21	0.66	0.71	0.05
22	0.84	0.85	0.01
23	0.68	0.70	0.02
24	0.86	0.87	0.01
25	0.85	0.87	0.02
26	0.71	0.73	0.02
27	0.61	0.65	0.04
28	0.87	0.89	0.02
29	0.64	0.64	0.00
30	0.82	0.84	0.02
31	0.51	0.53	0.02
32	0.53	0.57	0.04
Average	0.72	0.74	0.02

Table 14
Grade 5 Mathematics NRT Item p-values

Item	2005 (N=65123)	2006 (N=63473)	Difference
1	0.85	0.87	0.02
2	0.74	0.78	0.04
3	0.78	0.81	0.03
4	0.69	0.72	0.03
5	0.73	0.74	0.01
6	0.81	0.84	0.03
7	0.77	0.79	0.02
8	0.63	0.65	0.02
9	0.92	0.93	0.01
10	0.92	0.93	0.01
11	0.94	0.94	0.00
12	0.75	0.78	0.03
13	0.81	0.81	0.00
14	0.71	0.73	0.02
15	0.82	0.83	0.01
16	0.91	0.92	0.01
17	0.67	0.66	-0.01
18	0.98	0.98	0.00
19	0.62	0.64	0.02
20	0.95	0.96	0.01
21	0.82	0.84	0.02
22	0.75	0.76	0.01
23	0.68	0.71	0.03
24	0.58	0.62	0.04
25	0.56	0.57	0.01
26	0.55	0.60	0.05
27	0.66	0.70	0.04
28	0.66	0.68	0.02
29	0.81	0.82	0.01
30	0.73	0.75	0.02
31	0.61	0.64	0.03
32	0.84	0.87	0.03
Average	0.76	0.78	0.02

Table 15
Grade 6 Mathematics NRT Item p-values

Item	2005 (N=65846)	2006 (N=64750)	Difference
1	0.74	0.77	0.03
2	0.78	0.79	0.01
3	0.70	0.72	0.02
4	0.75	0.77	0.02
5	0.81	0.82	0.01
6	0.71	0.73	0.02
7	0.56	0.60	0.04
8	0.75	0.76	0.01
9	0.92	0.93	0.01
10	0.83	0.83	0.00
11	0.56	0.59	0.03
12	0.65	0.68	0.03
13	0.79	0.81	0.02
14	0.78	0.78	0.00
15	0.76	0.77	0.01
16	0.71	0.73	0.02
17	0.74	0.76	0.02
18	0.75	0.77	0.02
19	0.69	0.70	0.01
20	0.70	0.72	0.02
21	0.53	0.55	0.02
22	0.58	0.60	0.02
23	0.58	0.59	0.01
24	0.69	0.70	0.01
25	0.63	0.65	0.02
26	0.61	0.65	0.04
27	0.64	0.64	0.00
28	0.56	0.56	0.00
29	0.52	0.56	0.04
30	0.58	0.63	0.05
31	0.56	0.56	0.00
Average	0.68	0.70	0.02

Table 16
Grade 7 Mathematics NRT Item p-values

Item	2005 (N=68130)	2006 (N=65829)	Difference
1	0.73	0.76	0.03
2	0.65	0.67	0.02
3	0.52	0.54	0.02
4	0.81	0.83	0.02
5	0.73	0.75	0.02
6	0.82	0.84	0.02
7	0.50	0.51	0.01
8	0.63	0.64	0.01
9	0.69	0.70	0.01
10	0.90	0.91	0.01
11	0.67	0.68	0.01
12	0.74	0.74	0.00
13	0.62	0.65	0.03
14	0.57	0.58	0.01
15	0.89	0.90	0.01
16	0.57	0.64	0.07
17	0.72	0.74	0.02
18	0.67	0.69	0.02
19	0.68	0.69	0.01
20	0.68	0.70	0.02
21	0.81	0.83	0.02
22	0.72	0.73	0.01
23	0.74	0.77	0.03
24	0.59	0.60	0.01
25	0.63	0.64	0.01
26	0.52	0.55	0.03
27	0.67	0.68	0.01
28	0.54	0.56	0.02
29	0.51	0.53	0.02
30	0.38	0.40	0.02
31	0.55	0.59	0.04
32	0.52	0.54	0.02
Average	0.66	0.67	0.02

Table 17
Grade 8 Mathematics NRT Item p-values

Item	2005 (N=68696)	2006 (N=67740)	Difference
1	0.81	0.81	0.00
2	0.57	0.60	0.03
3	0.32	0.34	0.02
4	0.84	0.83	-0.01
5	0.76	0.75	-0.01
6	0.65	0.66	0.01
7	0.64	0.64	0.00
8	0.83	0.84	0.01
9	0.66	0.65	-0.01
10	0.89	0.89	0.00
11	0.90	0.90	0.00
12	0.79	0.79	0.00
13	0.88	0.90	0.02
14	0.76	0.76	0.00
15	0.64	0.65	0.01
16	0.87	0.88	0.01
17	0.75	0.77	0.02
18	0.58	0.59	0.01
19	0.63	0.63	0.00
20	0.42	0.44	0.02
21	0.74	0.75	0.01
22	0.70	0.72	0.02
23	0.72	0.70	-0.02
24	0.52	0.51	-0.01
25	0.63	0.64	0.01
26	0.42	0.41	-0.01
27	0.59	0.61	0.02
28	0.53	0.53	0.00
29	0.55	0.56	0.01
30	0.43	0.43	0.00
31	0.49	0.51	0.02
Average	0.66	0.67	0.01