

# Linking the PARCC Assessments to NWEA MAP Tests for Colorado

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## Introduction

Northwest Evaluation Association™ (NWEA™) is committed to providing partners with useful tools to help make inferences from the Measures of Academic Progress® (MAP®) interim assessment scores. One important tool is the concordance table between MAP and state summative assessments. Concordance tables have been used for decades to relate scores on different tests measuring similar but distinct constructs. These tables, typically derived from statistical linking procedures, provide a direct link between scores on different tests and serve various purposes. Aside from describing how a score on one test relates to performance on another test, they can also be used to identify benchmark scores on one test corresponding to performance categories on another test, or to maintain continuity of scores on a test after the test is redesigned or changed. Concordance tables are helpful for educators, parents, administrators, researchers, and policy makers to evaluate and formulate academic standing and growth.

Recently, NWEA completed a concordance study to connect the scales of the Partnership for Assessment of Readiness for College and Careers (PARCC) English language arts (ELA) and math with those of the MAP Reading and MAP for Mathematics assessments for Colorado (CO). In this report, we present the 3<sup>rd</sup> through 8<sup>th</sup> grade cut scores on MAP reading and mathematics scales that correspond to the benchmarks that Colorado adopted for its PARCC ELA and math tests. Information about the consistency rate of classification based on the estimated MAP cut scores is also provided, along with a series of tables that predict the probability of receiving a Level 4 (i.e., “Proficient”) or higher performance designation on the PARCC assessments, based on the observed MAP scores taken during the same school year. A detailed description of the data and analysis method used in this study is provided in the Appendix.

## Overview of Assessments

PARCC assessments include a series of computer-based achievement tests aligned to the Common Core State Standards (CCSS) in ELA and math for grades 3-8 and high school. For Colorado, each grade and subject has four cut scores that distinguish between performance levels: Level 1: *Did not yet meet expectations*, Level 2: *Partially met expectations*, Level 3: *Approached expectations*, Level 4: *Met expectations*, and Level 5: *Exceeded expectations*. The Level 4 cut score demarks the minimum level of performance considered to be “Proficient” for accountability purposes.

MAP tests are interim assessments that are administered in the form of a computerized adaptive test (CAT). MAP tests are constructed to measure student achievement from Grades K to 12 in math, reading, language usage, and science and aligned to the CCSS. Unlike PARCC tests,

MAP assessments are vertically scaled across grades, a feature that supports direct measurement of academic growth and change. MAP scores are reported on a **Rasch Unit (RIT)** scale with a range from 100 to 350. Each subject has its own RIT scale.

To aid interpretation of MAP scores, NWEA periodically conducts norming studies of student and school performance on MAP. For example, the 2015 RIT Scale norming study (Thum & Hauser, 2015) employed multi-level growth models on nearly 500,000 longitudinal test scores from over 100,000 students that were weighted to create large, nationally representative norms for math, reading, language usage, and general science.

## Estimated MAP Cut Scores Associated with PARCC Readiness Levels

Tables 1 to 4 report the PARCC scaled scores associated with each of the five performance levels adopted by Colorado, as well as the estimated cut scores on the MAP tests associated with those performance levels. Specifically, Tables 1 and 2 apply to MAP scores obtained during the spring testing season for reading and math, respectively. Tables 3 and 4 apply to MAP tests taken in a prior testing season (fall or winter) for reading and math, respectively. The tables also report the percentile rank (based on the *NWEA 2015 MAP Norms*) associated with each estimated MAP cut score. The MAP cut scores can be used to predict Colorado students' most probable PARCC performance level, based on their observed MAP scores. For example, a 3<sup>rd</sup> grade student who obtained a MAP math score of 220 in the spring testing season is likely to be at the very high end of Level 4 (Proficient) on the PARCC test taken during that same testing season (see Table 2). Similarly, a 6<sup>th</sup> grade student who obtained a MAP reading score of 240 in the fall testing season is likely to be at Level 5 on the PARCC test taken in the spring of 6<sup>th</sup> grade (see Table 3).

TABLE 1. CONCORDANCE OF PERFORMANCE LEVEL SCORE RANGES BETWEEN CO PARCC ELA AND MAP READING (WHEN MAP IS TAKEN IN SPRING)

Grade	PARCC									
	Level 1		Level 2		Level 3		Level 4		Level 5	
	<i>Did not Meet</i>		<i>Partially Met</i>		<i>Approached</i>		<i>Met</i>		<i>Exceeded</i>	
3	650-699		700-724		725-749		<b>750-809</b>		810-850	
4	650-699		700-724		725-749		<b>750-789</b>		790-850	
5	650-699		700-724		725-749		<b>750-798</b>		799-850	
6	650-699		700-724		725-749		<b>750-789</b>		790-850	
7	650-699		700-724		725-749		<b>750-784</b>		785-850	
8	650-699		700-724		725-749		<b>750-793</b>		794-850	

  

Grade	MAP									
	Level 1		Level 2		Level 3		Level 4		Level 5	
	<i>Did not Meet</i>		<i>Partially Met</i>		<i>Approached</i>		<i>Met</i>		<i>Exceeded</i>	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-187	1-23	188-197	24-47	198-205	48-67	<b>206-222</b>	68-94	223-350	95-99
4	100-188	1-12	189-199	13-33	200-209	34-59	<b>210-224</b>	60-89	225-350	90-99
5	100-193	1-10	194-207	11-38	208-217	39-65	<b>218-235</b>	66-94	236-350	95-99
6	100-200	1-14	201-212	15-41	213-222	42-67	<b>223-237</b>	68-93*	238-350	93*-99
7	100-206	1-22	207-216	23-45	217-225	46-68	<b>226-237</b>	69-89	238-350	90-99
8	100-213	1-33	214-221	34-53	222-230	54-74	<b>231-244</b>	75-93	245-350	94-99

Notes. 1. %ile=percentile.

2. Bolded numbers indicate the cut scores considered to be at least “proficient” for accountability purposes.

3. \* reflects occasional departure from one-to-one correspondence between RITs and percentiles due to the larger range of the RIT scale relative to the percentile scale.

TABLE 2. CONCORDANCE OF PERFORMANCE LEVEL SCORE RANGES BETWEEN CO PARCC AND MAP MATH (WHEN MAP IS TAKEN IN SPRING)

Grade	PARCC									
	Level 1		Level 2		Level 3		Level 4		Level 5	
	<i>Did not Meet</i>		<i>Partially Met</i>		<i>Approached</i>		<i>Met</i>		<i>Exceeded</i>	
3	650-699		700-724		725-749		<b>750-789</b>		790-850	
4	650-699		700-724		725-749		<b>750-795</b>		796-850	
5	650-699		700-724		725-749		<b>750-789</b>		790-850	
6	650-699		700-724		725-749		<b>750-787</b>		788-850	
7	650-699		700-724		725-749		<b>750-785</b>		786-850	
8	650-699		700-724		725-749		<b>750-800</b>		801-850	

  

Grade	MAP									
	Level 1		Level 2		Level 3		Level 4		Level 5	
	<i>Did not Meet</i>		<i>Partially Met</i>		<i>Approached</i>		<i>Met</i>		<i>Exceeded</i>	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-187	1-12	188-197	13-33	198-207	34-61	<b>208-224</b>	62-93	225-350	94-99
4	100-195	1-11	196-209	12-39	210-221	40-70	<b>222-243</b>	71-97	244-350	98-99
5	100-203	1-13	204-217	14-40	218-231	41-73	<b>232-252</b>	74-97*	253-350	97*-99
6	100-206	1-12	207-220	13-38	221-233	39-68	<b>234-253</b>	69-95*	254-350	95*-99
7	100-209	1-14	210-226	15-45	227-241	46-76	<b>242-261</b>	77-96	262-350	97-99
8	100-221	1-31	222-232	32-53	233-242	54-72	<b>243-263</b>	73-95	264-350	96-99

Notes. 1. %ile=percentile.

2. Bolded numbers indicate the cut scores considered to be at least “proficient” for accountability purposes.

3. \* reflects occasional departure from one-to-one correspondence between RITs and percentiles due to the larger range of the RIT scale relative to the percentile scale.

TABLE 3. CONCORDANCE OF PERFORMANCE LEVEL SCORE RANGES BETWEEN CO PARCC ELA AND MAP READING (WHEN MAP IS TAKEN IN FALL OR WINTER PRIOR TO SPRING PARCC TESTS)

Grade	PARCC									
	Level 1		Level 2		Level 3		Level 4		Level 5	
	<i>Did not Meet</i>		<i>Partially Met</i>		<i>Approached</i>		<i>Met</i>		<i>Exceeded</i>	
3	650-699		700-724		725-749		<b>750-809</b>		810-850	
4	650-699		700-724		725-749		<b>750-789</b>		790-850	
5	650-699		700-724		725-749		<b>750-798</b>		799-850	
6	650-699		700-724		725-749		<b>750-789</b>		790-850	
7	650-699		700-724		725-749		<b>750-784</b>		785-850	
8	650-699		700-724		725-749		<b>750-793</b>		794-850	

  

Grade	MAP FALL									
	Level 1		Level 2		Level 3		Level 4		Level 5	
	<i>Did not Meet</i>		<i>Partially Met</i>		<i>Approached</i>		<i>Met</i>		<i>Exceeded</i>	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-175	1-20	176-186	21-45	187-196	46-69	<b>197-216</b>	70-96*	217-350	96*-99
4	100-177	1-9	178-190	10-31	191-202	32-60	<b>203-219</b>	61-91	220-350	92-99
5	100-184	1-8	185-200	9-36	201-212	37-67	<b>213-233</b>	68-96	234-250	97-99
6	100-193	1-12	194-207	13-40	208-218	41-69	<b>219-235</b>	70-94	236-350	95-99
7	100-201	1-19	202-212	20-44	213-222	45-70	<b>223-235</b>	71-91	236-350	92-99
8	100-209	1-31	210-218	32-53	219-228	54-76	<b>229-242</b>	77-94	243-350	95-99

  

Grade	MAP WINTER									
	Level 1		Level 2		Level 3		Level 4		Level 5	
	<i>Did not Meet</i>		<i>Partially Met</i>		<i>Approached</i>		<i>Met</i>		<i>Exceeded</i>	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-183	1-21	184-194	22-47	195-202	48-67	<b>203-221</b>	68-95	222-350	96-99
4	100-185	1-11	186-196	12-31	197-207	32-60	<b>208-223</b>	61-90	224-350	91-99
5	100-190	1-9	191-205	10-38	206-215	39-65	<b>216-234</b>	66-95	235-350	96-99
6	100-198	1-13	199-210	14-39	211-221	40-69	<b>222-236</b>	70-93	237-350	94-99
7	100-204	1-20	205-215	21-46	216-224	47-69	<b>225-236</b>	70-90	237-350	91-99
8	100-212	1-33	213-220	34-53	221-229	54-75	<b>230-243</b>	76-94	244-350	95-99

Notes. 1. %ile=percentile.

2. Bolded numbers indicate the cut scores considered to be at least "proficient" for accountability purposes.

3. \* reflects occasional departure from one-to-one correspondence between RITs and percentiles due to the larger range of the RIT scale relative to the percentile scale.

TABLE 4. CONCORDANCE OF PERFORMANCE LEVEL SCORE RANGES BETWEEN CO PARCC AND MAP MATH (WHEN MAP IS TAKEN IN FALL OR WINTER PRIOR TO SPRING PARCC TESTS)

		PARCC									
Grade	Level 1		Level 2		Level 3		Level 4		Level 5		
	<i>Did not Meet</i>		<i>Partially Met</i>		<i>Approached</i>		<i>Met</i>		<i>Exceeded</i>		
3	650-699		700-724		725-749		<b>750-789</b>		790-850		
4	650-699		700-724		725-749		<b>750-795</b>		796-850		
5	650-699		700-724		725-749		<b>750-789</b>		790-850		
6	650-699		700-724		725-749		<b>750-787</b>		788-850		
7	650-699		700-724		725-749		<b>750-785</b>		786-850		
8	650-699		700-724		725-749		<b>750-800</b>		801-850		

  

		MAP FALL									
Grade	Level 1		Level 2		Level 3		Level 4		Level 5		
	<i>Did not Meet</i>		<i>Partially Met</i>		<i>Approached</i>		<i>Met</i>		<i>Exceeded</i>		
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile	
3	100-173	1-9	174-184	10-32	185-194	33-62	<b>195-213</b>	63-96*	214-350	96*-99	
4	100-183	1-9	184-197	10-37	198-210	38-73	<b>211-232</b>	74-98*	233-350	98*-99	
5	100-193	1-11	194-207	12-39	208-221	40-75	<b>222-242</b>	76-98*	243-350	98*-99	
6	100-198	1-10	199-212	11-37	213-225	38-69	<b>226-246</b>	70-96	247-350	97-99	
7	100-203	1-12	204-220	13-44	221-235	45-78	<b>236-255</b>	79-97*	256-350	97*-99	
8	100-216	1-29	217-227	30-52	228-238	53-75	<b>239-259</b>	76-96	260-350	97-99	

  

		MAP WINTER									
Grade	Level 1		Level 2		Level 3		Level 4		Level 5		
	<i>Did not Meet</i>		<i>Partially Met</i>		<i>Approached</i>		<i>Met</i>		<i>Exceeded</i>		
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile	
3	100-181	1-10	182-192	11-33	193-202	34-62	<b>203-219</b>	63-94	220-350	95-99	
4	100-190	1-10	191-204	11-38	205-216	39-70	<b>217-238</b>	71-98*	239-350	98*-99	
5	100-199	1-12	200-213	13-40	214-227	41-74	<b>228-248</b>	75-97	249-350	98-99	
6	100-203	1-12	204-217	13-38	218-230	39-70	<b>231-250</b>	71-96*	251-350	96*-99	
7	100-207	1-13	208-224	14-46	225-239	47-78	<b>240-259</b>	79-97*	260-350	97*-99	
8	100-219	1-29	220-230	30-52	231-240	53-73	<b>241-261</b>	74-96*	262-350	96*-99	

Notes. 1. %ile=percentile.

2. Bolded numbers indicate the cut scores considered to be at least “proficient” for accountability purposes.

3. \* reflects occasional departure from one-to-one correspondence between RITs and percentiles due to the larger range of the RIT scale relative to the percentile scale.

## Consistency Rate of Classification

Consistency rate of classification (Pommerich, Hanson, Harris, & Sconing, 2004), expressed in the form of a rate between 0 and 1, provides a means to measure the departure from equity for concordances (Hanson et al., 2001). This index can also be used as an indicator for the predictive validity of the MAP tests, i.e., how accurately the MAP scores can predict a student’s proficiency status in the PARCC test. For each pair of concordant scores, a classification is considered consistent if the examinee is classified into the same performance category regardless of the test used for making a decision. Consistency rate provided in this report can be calculated as, for the “proficient” performance category concordant scores, the percentage of examinees who score at or above both concordant scores plus the percentage of examinees who score below both concordant scores on each test. Higher consistency rate indicates stronger congruence between PARCC and MAP scores. The results in Table 5 demonstrate that on average, MAP reading scores can consistently classify students’ proficiency (Level 4 or higher) status on PARCC ELA test approximately 82% of the time and MAP math scores can consistently classify students on PARCC math test approximately 88% of the time. Those numbers are high suggesting that both MAP reading and math tests are great predictors of the students’ proficiency status on the PARCC tests.

TABLE 5. CONSISTENCY RATE OF CLASSIFICATION FOR MAP AND PARCC LEVEL 4 EQUIPERCENTILE CONCORDANCES

Grade	ELA/Reading			Math		
	Consistency Rate	False		Consistency Rate	False	
		Positives	Negatives		Positives	Negatives
3	0.84	0.08	0.08	0.86	0.07	0.07
4	0.84	0.08	0.08	0.89	0.05	0.06
5	0.82	0.09	0.09	0.89	0.06	0.05
6	0.89	0.11	0.07	0.88	0.05	0.07
7	0.85	0.08	0.07	0.89	0.05	0.06
8	0.76	0.13	0.11	0.84	0.09	0.07



## Proficiency Projection

Proficiency projection tells how likely a student is classified as “proficient” on PARCC tests based on his/her observed MAP scores. The conditional growth norms provided in the 2015 MAP Norms were used to calculate this information (Thum & Hauser, 2015). The results of proficiency projection and corresponding probability of achieving “proficient” on the PARCC tests are presented in Tables 6 to 8. These tables estimate the probability of scoring at Level 4 or above on PARCC in the spring and the prior fall or winter testing season. For example, if a 3<sup>rd</sup> grade student obtained a MAP math score of 201 in the fall, the probability of obtaining a Level 4 or higher PARCC score in the spring of 3<sup>rd</sup> grade is 78%. Table 6 presents the estimated probability of meeting Level 4 benchmark when MAP is taken in the spring, whereas Tables 7 and 8 present the estimated probability of meeting Level 4 benchmark when MAP is taken in the fall or winter prior to taking the PARCC tests.

TABLE 6. PROFICIENCY PROJECTION AND PROBABILITY FOR PASSING PARCC LEVEL 4 (PROFICIENT) WHEN MAP IS TAKEN IN THE SPRING

Grade	ELA/Reading					Math				
	Start %ile	RIT Spring	Projected Proficiency			Start %ile	RIT Spring	Projected Proficiency		
			Cut Score	Level 4	Prob.			Cut Score	Level 4	Prob.
3	5	174	206	No	<0.01	5	181	208	No	<0.01
	10	179	206	No	<0.01	10	186	208	No	<0.01
	15	183	206	No	<0.01	15	189	208	No	<0.01
	20	186	206	No	<0.01	20	192	208	No	<0.01
	25	188	206	No	<0.01	25	194	208	No	<0.01
	30	191	206	No	<0.01	30	196	208	No	<0.01
	35	193	206	No	<0.01	35	198	208	No	<0.01
	40	195	206	No	<0.01	40	200	208	No	<0.01
	45	197	206	No	<0.01	45	202	208	No	0.02
	50	199	206	No	0.01	50	203	208	No	0.04
	55	201	206	No	0.06	55	205	208	No	0.15
	60	202	206	No	0.11	60	207	208	No	0.37
	65	204	206	No	0.27	65	209	208	Yes	0.63
	70	207	206	Yes	0.62	70	211	208	Yes	0.85
	75	209	206	Yes	0.83	75	213	208	Yes	0.96
	80	211	206	Yes	0.94	80	215	208	Yes	0.99
85	214	206	Yes	0.99	85	218	208	Yes	>0.99	
90	218	206	Yes	>0.99	90	221	208	Yes	>0.99	
95	223	206	Yes	>0.99	95	226	208	Yes	>0.99	
4	5	181	210	No	<0.01	5	189	222	No	<0.01
	10	187	210	No	<0.01	10	194	222	No	<0.01
	15	190	210	No	<0.01	15	198	222	No	<0.01
	20	193	210	No	<0.01	20	201	222	No	<0.01
	25	196	210	No	<0.01	25	203	222	No	<0.01
	30	198	210	No	<0.01	30	206	222	No	<0.01
	35	200	210	No	<0.01	35	208	222	No	<0.01
	40	202	210	No	0.01	40	210	222	No	<0.01
	45	204	210	No	0.03	45	212	222	No	<0.01
	50	206	210	No	0.11	50	213	222	No	<0.01
	55	208	210	No	0.27	55	215	222	No	0.01
	60	210	210	Yes	0.50	60	217	222	No	0.04
	65	212	210	Yes	0.73	65	219	222	No	0.15
	70	214	210	Yes	0.89	70	221	222	No	0.37
	75	216	210	Yes	0.97	75	224	222	Yes	0.75
	80	218	210	Yes	0.99	80	226	222	Yes	0.92
85	221	210	Yes	>0.99	85	229	222	Yes	0.99	
90	225	210	Yes	>0.99	90	233	222	Yes	>0.99	
95	230	210	Yes	>0.99	95	238	222	Yes	>0.99	

TABLE 6. (CONTINUED)

Grade	ELA/Reading					Math				
	Start %ile	RIT Spring	Projected Proficiency			Start %ile	RIT Spring	Projected Proficiency		
			Cut Score	Level 4	Prob.			Cut Score	Level 4	Prob.
5	5	188	218	No	<0.01	5	195	232	No	<0.01
	10	193	218	No	<0.01	10	201	232	No	<0.01
	15	197	218	No	<0.01	15	205	232	No	<0.01
	20	199	218	No	<0.01	20	208	232	No	<0.01
	25	202	218	No	<0.01	25	210	232	No	<0.01
	30	204	218	No	<0.01	30	213	232	No	<0.01
	35	206	218	No	<0.01	35	215	232	No	<0.01
	40	208	218	No	<0.01	40	217	232	No	<0.01
	45	210	218	No	0.01	45	219	232	No	<0.01
	50	212	218	No	0.03	50	221	232	No	<0.01
	55	214	218	No	0.11	55	223	232	No	<0.01
	60	216	218	No	0.27	60	225	232	No	0.01
	65	217	218	No	0.38	65	228	232	No	0.08
	70	220	218	Yes	0.73	70	230	232	No	0.25
	75	222	218	Yes	0.89	75	232	232	Yes	0.50
	80	224	218	Yes	0.97	80	235	232	Yes	0.85
85	227	218	Yes	>0.99	85	238	232	Yes	0.98	
90	231	218	Yes	>0.99	90	242	232	Yes	>0.99	
95	236	218	Yes	>0.99	95	248	232	Yes	>0.99	
6	5	192	223	No	<0.01	5	198	234	No	<0.01
	10	197	223	No	<0.01	10	204	234	No	<0.01
	15	201	223	No	<0.01	15	208	234	No	<0.01
	20	203	223	No	<0.01	20	211	234	No	<0.01
	25	206	223	No	<0.01	25	214	234	No	<0.01
	30	208	223	No	<0.01	30	217	234	No	<0.01
	35	210	223	No	<0.01	35	219	234	No	<0.01
	40	212	223	No	<0.01	40	221	234	No	<0.01
	45	214	223	No	<0.01	45	223	234	No	<0.01
	50	216	223	No	0.01	50	225	234	No	<0.01
	55	218	223	No	0.06	55	227	234	No	0.01
	60	219	223	No	0.11	60	230	234	No	0.08
	65	221	223	No	0.27	65	232	234	No	0.25
	70	223	223	Yes	0.50	70	234	234	Yes	0.50
	75	226	223	Yes	0.83	75	237	234	Yes	0.85
	80	228	223	Yes	0.94	80	239	234	Yes	0.96
85	231	223	Yes	0.99	85	243	234	Yes	>0.99	
90	235	223	Yes	>0.99	90	247	234	Yes	>0.99	
95	240	223	Yes	>0.99	95	253	234	Yes	>0.99	

TABLE 6. (CONTINUED)

Grade	ELA/Reading					Math				
	Start %ile	RIT Spring	Projected Proficiency			Start %ile	RIT Spring	Projected Proficiency		
			Cut Score	Level 4	Prob.			Cut Score	Level 4	Prob.
7	5	193	226	No	<0.01	5	199	242	No	<0.01
	10	199	226	No	<0.01	10	206	242	No	<0.01
	15	202	226	No	<0.01	15	210	242	No	<0.01
	20	205	226	No	<0.01	20	214	242	No	<0.01
	25	208	226	No	<0.01	25	217	242	No	<0.01
	30	210	226	No	<0.01	30	219	242	No	<0.01
	35	212	226	No	<0.01	35	222	242	No	<0.01
	40	214	226	No	<0.01	40	224	242	No	<0.01
	45	216	226	No	<0.01	45	226	242	No	<0.01
	50	218	226	No	0.01	50	229	242	No	<0.01
	55	220	226	No	0.03	55	231	242	No	<0.01
	60	222	226	No	0.11	60	233	242	No	<0.01
	65	224	226	No	0.27	65	235	242	No	0.01
	70	226	226	Yes	0.50	70	238	242	No	0.08
	75	228	226	Yes	0.73	75	241	242	No	0.37
	80	231	226	Yes	0.94	80	244	242	Yes	0.75
85	234	226	Yes	0.99	85	247	242	Yes	0.96	
90	238	226	Yes	>0.99	90	251	242	Yes	>0.99	
95	243	226	Yes	>0.99	95	258	242	Yes	>0.99	
8	5	194	231	No	<0.01	5	199	243	No	<0.01
	10	200	231	No	<0.01	10	206	243	No	<0.01
	15	204	231	No	<0.01	15	211	243	No	<0.01
	20	207	231	No	<0.01	20	215	243	No	<0.01
	25	209	231	No	<0.01	25	218	243	No	<0.01
	30	212	231	No	<0.01	30	221	243	No	<0.01
	35	214	231	No	<0.01	35	224	243	No	<0.01
	40	216	231	No	<0.01	40	226	243	No	<0.01
	45	218	231	No	<0.01	45	229	243	No	<0.01
	50	220	231	No	<0.01	50	231	243	No	<0.01
	55	222	231	No	<0.01	55	233	243	No	<0.01
	60	224	231	No	0.01	60	236	243	No	0.01
	65	226	231	No	0.06	65	238	243	No	0.04
	70	228	231	No	0.17	70	241	243	No	0.25
	75	231	231	Yes	0.50	75	244	243	Yes	0.63
	80	233	231	Yes	0.73	80	247	243	Yes	0.92
85	236	231	Yes	0.94	85	251	243	Yes	>0.99	
90	240	231	Yes	>0.99	90	255	243	Yes	>0.99	
95	246	231	Yes	>0.99	95	262	243	Yes	>0.99	

Note. %ile=percentile

TABLE 7. PROFICIENCY PROJECTION AND PROBABILITY FOR PASSING PARCC ELA LEVEL 4 (PROFICIENT) WHEN MAP IS TAKEN IN THE FALL OR WINTER PRIOR TO SPRING PARCC TESTS

Grade	Start %ile	RIT Fall	Projected Proficiency			Start %ile	RIT Winter	Projected Proficiency		
			Cut Score	Level 4	Prob.			Cut Score	Level 4	Prob.
3	5	162	206	No	<0.01	5	171	206	No	<0.01
	10	168	206	No	<0.01	10	176	206	No	<0.01
	15	172	206	No	<0.01	15	180	206	No	<0.01
	20	175	206	No	<0.01	20	183	206	No	<0.01
	25	178	206	No	0.01	25	185	206	No	<0.01
	30	180	206	No	0.03	30	188	206	No	<0.01
	35	182	206	No	0.03	35	190	206	No	0.01
	40	184	206	No	0.06	40	192	206	No	0.02
	45	186	206	No	0.10	45	194	206	No	0.04
	50	188	206	No	0.13	50	196	206	No	0.09
	55	190	206	No	0.20	55	198	206	No	0.17
	60	192	206	No	0.29	60	199	206	No	0.22
	65	194	206	No	0.34	65	201	206	No	0.35
	70	197	206	Yes	0.50	70	204	206	Yes	0.58
	75	199	206	Yes	0.61	75	206	206	Yes	0.65
	80	202	206	Yes	0.71	80	208	206	Yes	0.78
	85	205	206	Yes	0.84	85	211	206	Yes	0.91
90	209	206	Yes	0.92	90	215	206	Yes	0.98	
95	214	206	Yes	0.97	95	221	206	Yes	>0.99	
4	5	173	210	No	<0.01	5	179	210	No	<0.01
	10	178	210	No	<0.01	10	184	210	No	<0.01
	15	182	210	No	<0.01	15	188	210	No	<0.01
	20	185	210	No	0.01	20	191	210	No	<0.01
	25	188	210	No	0.03	25	194	210	No	0.01
	30	190	210	No	0.05	30	196	210	No	0.02
	35	192	210	No	0.09	35	198	210	No	0.04
	40	194	210	No	0.12	40	200	210	No	0.08
	45	196	210	No	0.18	45	202	210	No	0.12
	50	198	210	No	0.27	50	204	210	No	0.22
	55	200	210	No	0.33	55	205	210	No	0.28
	60	202	210	No	0.44	60	207	210	No	0.42
	65	204	210	Yes	0.56	65	209	210	Yes	0.58
	70	206	210	Yes	0.67	70	211	210	Yes	0.72
	75	209	210	Yes	0.77	75	214	210	Yes	0.88
	80	211	210	Yes	0.85	80	216	210	Yes	0.94
	85	214	210	Yes	0.91	85	219	210	Yes	0.98
90	218	210	Yes	0.97	90	223	210	Yes	>0.99	
95	224	210	Yes	>0.99	95	228	210	Yes	>0.99	

TABLE 7. (CONTINUED)

Grade	Start %ile	RIT Fall	Projected Proficiency			Start %ile	RIT Winter	Projected Proficiency		
			Cut-Score	Level 4	Prob.			Cut-Score	Level 4	Prob.
5	5	181	218	No	<0.01	5	186	218	No	<0.01
	10	186	218	No	<0.01	10	191	218	No	<0.01
	15	190	218	No	<0.01	15	195	218	No	<0.01
	20	193	218	No	0.01	20	197	218	No	<0.01
	25	195	218	No	0.01	25	200	218	No	<0.01
	30	198	218	No	0.03	30	202	218	No	<0.01
	35	200	218	No	0.05	35	204	218	No	0.01
	40	202	218	No	0.09	40	206	218	No	0.03
	45	204	218	No	0.12	45	208	218	No	0.06
	50	206	218	No	0.19	50	210	218	No	0.12
	55	208	218	No	0.28	55	212	218	No	0.22
	60	210	218	No	0.38	60	214	218	No	0.35
	65	212	218	No	0.44	65	215	218	No	0.42
	70	214	218	Yes	0.56	70	218	218	Yes	0.65
	75	216	218	Yes	0.67	75	220	218	Yes	0.72
	80	218	218	Yes	0.72	80	222	218	Yes	0.83
	85	221	218	Yes	0.85	85	225	218	Yes	0.94
90	225	218	Yes	0.93	90	229	218	Yes	0.99	
95	231	218	Yes	0.99	95	234	218	Yes	>0.99	
6	5	186	223	No	<0.01	5	190	223	No	<0.01
	10	192	223	No	<0.01	10	196	223	No	<0.01
	15	196	223	No	<0.01	15	199	223	No	<0.01
	20	198	223	No	<0.01	20	202	223	No	<0.01
	25	201	223	No	0.01	25	204	223	No	<0.01
	30	203	223	No	0.02	30	207	223	No	<0.01
	35	205	223	No	0.04	35	209	223	No	0.01
	40	207	223	No	0.06	40	211	223	No	0.03
	45	209	223	No	0.10	45	212	223	No	0.04
	50	211	223	No	0.16	50	214	223	No	0.09
	55	213	223	No	0.23	55	216	223	No	0.12
	60	215	223	No	0.28	60	218	223	No	0.22
	65	217	223	No	0.39	65	220	223	No	0.35
	70	219	223	Yes	0.50	70	222	223	Yes	0.50
	75	221	223	Yes	0.56	75	224	223	Yes	0.65
	80	224	223	Yes	0.72	80	226	223	Yes	0.78
	85	226	223	Yes	0.81	85	229	223	Yes	0.91
90	230	223	Yes	0.90	90	233	223	Yes	0.98	
95	236	223	Yes	0.99	95	238	223	Yes	>0.99	

TABLE 7. (CONTINUED)

Grade	Start %ile	RIT Fall	Projected Proficiency			Start %ile	RIT Winter	Projected Proficiency		
			Cut-Score	Level 4	Prob.			Cut-Score	Level 4	Prob.
7	5	189	226	No	<0.01	5	192	226	No	<0.01
	10	195	226	No	<0.01	10	198	226	No	<0.01
	15	199	226	No	<0.01	15	201	226	No	<0.01
	20	202	226	No	<0.01	20	204	226	No	<0.01
	25	204	226	No	0.01	25	207	226	No	<0.01
	30	206	226	No	0.01	30	209	226	No	<0.01
	35	209	226	No	0.03	35	211	226	No	0.01
	40	211	226	No	0.05	40	213	226	No	0.01
	45	213	226	No	0.10	45	215	226	No	0.03
	50	214	226	No	0.12	50	217	226	No	0.06
	55	216	226	No	0.15	55	219	226	No	0.12
	60	218	226	No	0.23	60	221	226	No	0.22
	65	220	226	No	0.33	65	223	226	No	0.35
	70	222	226	No	0.44	70	225	226	Yes	0.50
	75	225	226	Yes	0.56	75	227	226	Yes	0.65
	80	227	226	Yes	0.67	80	230	226	Yes	0.83
	85	230	226	Yes	0.81	85	232	226	Yes	0.88
90	234	226	Yes	0.90	90	236	226	Yes	0.97	
95	240	226	Yes	0.99	95	242	226	Yes	>0.99	
8	5	191	231	No	<0.01	5	194	231	No	<0.01
	10	197	231	No	<0.01	10	199	231	No	<0.01
	15	201	231	No	<0.01	15	203	231	No	<0.01
	20	204	231	No	<0.01	20	206	231	No	<0.01
	25	207	231	No	0.01	25	209	231	No	<0.01
	30	209	231	No	0.01	30	211	231	No	<0.01
	35	211	231	No	0.02	35	213	231	No	<0.01
	40	213	231	No	0.03	40	215	231	No	<0.01
	45	215	231	No	0.05	45	217	231	No	0.01
	50	217	231	No	0.08	50	219	231	No	0.02
	55	219	231	No	0.13	55	221	231	No	0.05
	60	221	231	No	0.16	60	223	231	No	0.10
	65	223	231	No	0.22	65	225	231	No	0.18
	70	225	231	No	0.31	70	227	231	No	0.29
	75	228	231	No	0.40	75	229	231	No	0.43
	80	230	231	Yes	0.50	80	232	231	Yes	0.57
	85	234	231	Yes	0.69	85	235	231	Yes	0.77
90	237	231	Yes	0.78	90	239	231	Yes	0.93	
95	243	231	Yes	0.94	95	244	231	Yes	0.99	

Note. %ile=percentile

TABLE 8. PROFICIENCY PROJECTION AND PROBABILITY FOR PASSING PARCC MATH LEVEL 4 (PROFICIENT) WHEN MAP IS TAKEN IN THE FALL OR WINTER PRIOR TO SPRING PARCC TESTS

Grade	Start %ile	RIT Fall	Projected Proficiency			Start %ile	RIT Winter	Projected Proficiency		
			Cut Score	Level 4	Prob.			Cut Score	Level 4	Prob.
3	5	169	208	No	<0.01	5	176	208	No	<0.01
	10	174	208	No	<0.01	10	181	208	No	<0.01
	15	177	208	No	<0.01	15	184	208	No	<0.01
	20	179	208	No	0.01	20	187	208	No	<0.01
	25	182	208	No	0.03	25	189	208	No	<0.01
	30	184	208	No	0.04	30	191	208	No	0.01
	35	185	208	No	0.06	35	193	208	No	0.02
	40	187	208	No	0.11	40	195	208	No	0.05
	45	189	208	No	0.17	45	197	208	No	0.10
	50	190	208	No	0.22	50	198	208	No	0.14
	55	192	208	No	0.32	55	200	208	No	0.26
	60	194	208	No	0.44	60	202	208	No	0.42
	65	195	208	Yes	0.50	65	203	208	Yes	0.50
	70	197	208	Yes	0.62	70	205	208	Yes	0.66
	75	199	208	Yes	0.68	75	207	208	Yes	0.80
	80	201	208	Yes	0.78	80	209	208	Yes	0.90
	4	5	179	222	No	<0.01	5	185	222	No
10		184	222	No	<0.01	10	190	222	No	<0.01
15		188	222	No	<0.01	15	194	222	No	<0.01
20		190	222	No	<0.01	20	197	222	No	<0.01
25		193	222	No	<0.01	25	199	222	No	<0.01
30		195	222	No	0.01	30	201	222	No	<0.01
35		197	222	No	0.02	35	203	222	No	<0.01
40		198	222	No	0.03	40	205	222	No	0.01
45		200	222	No	0.06	45	207	222	No	0.02
50		202	222	No	0.11	50	209	222	No	0.05
55		204	222	No	0.17	55	211	222	No	0.10
60		205	222	No	0.17	60	212	222	No	0.14
65		207	222	No	0.27	65	214	222	No	0.26
70		209	222	No	0.38	70	216	222	No	0.42
75		211	222	Yes	0.50	75	218	222	Yes	0.58
80		214	222	Yes	0.68	80	221	222	Yes	0.80
85		216	222	Yes	0.78	85	223	222	Yes	0.90
90	220	222	Yes	0.92	90	227	222	Yes	0.98	
95	225	222	Yes	0.99	95	232	222	Yes	>0.99	



TABLE 8. (CONTINUED)

Grade	Start %ile	RIT Fall	Projected Proficiency			Start %ile	RIT Winter	Projected Proficiency		
			Cut-Score	Level 4	Prob.			Cut-Score	Level 4	Prob.
5	5	187	232	No	<0.01	5	192	232	No	<0.01
	10	193	232	No	<0.01	10	198	232	No	<0.01
	15	196	232	No	<0.01	15	201	232	No	<0.01
	20	199	232	No	<0.01	20	204	232	No	<0.01
	25	202	232	No	<0.01	25	207	232	No	<0.01
	30	204	232	No	<0.01	30	209	232	No	<0.01
	35	206	232	No	0.01	35	211	232	No	<0.01
	40	208	232	No	0.02	40	213	232	No	<0.01
	45	210	232	No	0.04	45	215	232	No	<0.01
	50	211	232	No	0.05	50	217	232	No	0.01
	55	213	232	No	0.09	55	219	232	No	0.03
	60	215	232	No	0.15	60	221	232	No	0.07
	65	217	232	No	0.23	65	223	232	No	0.15
	70	219	232	No	0.33	70	225	232	No	0.27
	75	221	232	No	0.44	75	228	232	Yes	0.50
	80	224	232	Yes	0.62	80	230	232	Yes	0.66
	85	227	232	Yes	0.77	85	233	232	Yes	0.85
90	230	232	Yes	0.88	90	237	232	Yes	0.97	
95	236	232	Yes	0.98	95	242	232	Yes	>0.99	
6	5	192	234	No	<0.01	5	196	234	No	<0.01
	10	198	234	No	<0.01	10	202	234	No	<0.01
	15	202	234	No	<0.01	15	205	234	No	<0.01
	20	205	234	No	<0.01	20	209	234	No	<0.01
	25	207	234	No	<0.01	25	211	234	No	<0.01
	30	209	234	No	0.01	30	214	234	No	<0.01
	35	212	234	No	0.02	35	216	234	No	<0.01
	40	214	234	No	0.04	40	218	234	No	<0.01
	45	216	234	No	0.07	45	220	234	No	0.01
	50	218	234	No	0.12	50	222	234	No	0.03
	55	220	234	No	0.19	55	224	234	No	0.07
	60	222	234	No	0.28	60	226	234	No	0.15
	65	224	234	No	0.38	65	228	234	No	0.27
	70	226	234	Yes	0.50	70	230	234	No	0.42
	75	228	234	Yes	0.62	75	233	234	Yes	0.66
	80	231	234	Yes	0.77	80	236	234	Yes	0.85
	85	234	234	Yes	0.85	85	239	234	Yes	0.95
90	238	234	Yes	0.95	90	243	234	Yes	0.99	
95	243	234	Yes	0.99	95	248	234	Yes	>0.99	

TABLE 8. (CONTINUED)

Grade	Start %ile	RIT Fall	Projected Proficiency			Start %ile	RIT Winter	Projected Proficiency		
			Cut-Score	Level 4	Prob.			Cut-Score	Level 4	Prob.
7	5	195	242	No	<0.01	5	198	242	No	<0.01
	10	201	242	No	<0.01	10	204	242	No	<0.01
	15	205	242	No	<0.01	15	208	242	No	<0.01
	20	209	242	No	<0.01	20	212	242	No	<0.01
	25	211	242	No	<0.01	25	215	242	No	<0.01
	30	214	242	No	<0.01	30	217	242	No	<0.01
	35	216	242	No	<0.01	35	220	242	No	<0.01
	40	218	242	No	<0.01	40	222	242	No	<0.01
	45	221	242	No	0.01	45	224	242	No	<0.01
	50	223	242	No	0.02	50	226	242	No	<0.01
	55	225	242	No	0.05	55	228	242	No	0.01
	60	227	242	No	0.08	60	230	242	No	0.02
	65	229	242	No	0.14	65	233	242	No	0.07
	70	231	242	No	0.22	70	235	242	No	0.15
	75	234	242	No	0.38	75	238	242	No	0.34
	80	237	242	Yes	0.56	80	240	242	Yes	0.50
	85	240	242	Yes	0.73	85	244	242	Yes	0.80
90	244	242	Yes	0.89	90	248	242	Yes	0.95	
95	250	242	Yes	0.98	95	254	242	Yes	>0.99	
8	5	197	243	No	<0.01	5	199	243	No	<0.01
	10	203	243	No	<0.01	10	206	243	No	<0.01
	15	208	243	No	<0.01	15	210	243	No	<0.01
	20	211	243	No	<0.01	20	214	243	No	<0.01
	25	214	243	No	<0.01	25	217	243	No	<0.01
	30	217	243	No	<0.01	30	220	243	No	<0.01
	35	219	243	No	0.01	35	222	243	No	<0.01
	40	222	243	No	0.02	40	225	243	No	<0.01
	45	224	243	No	0.03	45	227	243	No	<0.01
	50	226	243	No	0.06	50	229	243	No	0.01
	55	229	243	No	0.12	55	231	243	No	0.02
	60	231	243	No	0.18	60	234	243	No	0.08
	65	233	243	No	0.26	65	236	243	No	0.16
	70	236	243	No	0.35	70	239	243	No	0.35
	75	238	243	No	0.45	75	241	243	Yes	0.50
	80	241	243	Yes	0.60	80	245	243	Yes	0.79
	85	245	243	Yes	0.78	85	248	243	Yes	0.92
90	249	243	Yes	0.90	90	253	243	Yes	0.99	
95	256	243	Yes	0.99	95	259	243	Yes	>0.99	

Note. %ile=percentile

## Summary and Discussion

This study produced a set of cut scores on MAP reading and math tests for Grades 3 to 8 that correspond to each Colorado PARCC performance level. By using matched score data from a sample of students from Colorado, the study demonstrates that MAP scores can accurately predict whether a student could be proficient or above on the basis of his/her MAP scores. This study also used the NWEA 2015 RIT Scale norming study results to project a student's probability to meet proficiency based on that student's prior MAP scores in fall and winter. These results will help educators predict student performance in PARCC tests as early as possible and identify those students who are at risk of failing to meet required standards so that they can receive necessary resources and assistance to meet their goals.

While concordance tables can be helpful and informative, they have general limitations. First, the concordance tables provide information about score comparability on different tests, but the scores cannot be assumed to be interchangeable. In the case for PARCC and MAP tests, as they are not parallel in content, scores from these two tests should not be directly compared. Second, the sample data used in this study were collected from 22 schools, which may limit the generalizability of the results to test takers who differ significantly from this sample. Finally, cautions should also be exercised if the concorded scores are used for a subpopulation. NWEA will continue to gather information about PARCC performance from other schools in Colorado to enhance the quality and generalizability of the study.

## References

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## Appendix

### Data and Analysis

#### Data

Data used in this study were collected from 22 schools in Colorado. The sample contained matched PARCC ELA and MAP reading scores from 5,410 students in Grades 3 to 8 and matched PARCC and MAP math scores from 5,436 students in Grades 3 to 8 who completed both PARCC and MAP in the spring of 2015.

To understand the statistical characteristics of the test scores, descriptive statistics are provided in Table A1. As Table A1 indicates, the correlation coefficients between MAP reading and PARCC ELA scores range from 0.73 to 0.85, and the correlation coefficients between MAP and PARCC math scores range from 0.79 to 0.91. All these correlations indicate a strong relationship between MAP and PARCC test scores.

TABLE A1. DESCRIPTIVE STATISTICS OF THE SAMPLE DATA

Subject	Grade	N	<i>r</i>	PARCC				MAP			
				Mean	SD	Min	Max	Mean	SD	Min	Max
ELA/ Reading	3	996	0.83	750	40.15	650	850	204	14.12	150	240
	4	1,003	0.84	756	33.95	650	844	212	14.01	148	244
	5	1,033	0.82	755	32.87	651	843	219	14.19	162	252
	6	1,008	0.85	747	31.74	650	850	221	13.65	165	257
	7	821	0.81	747	34.76	650	850	224	13.21	174	263
	8	549	0.73	734	33.71	650	842	224	12.81	164	252
Math	3	996	0.89	747	30.32	650	826	207	12.56	155	245
	4	1,005	0.90	741	30.08	656	850	217	15.13	164	269
	5	1,038	0.91	741	29.98	650	826	227	16.77	166	272
	6	1,009	0.91	741	29.42	665	834	229	16.03	183	268
	7	820	0.88	739	25.75	653	804	234	15.70	184	271
	8	568	0.79	728	30.15	650	822	234	14.13	176	275

## Equipercentile Linking Procedure

The equipercentile procedure (e.g., Kolen & Brennan, 2004) was used to establish the concordance relationship between PARCC and MAP scores for grades 3 to 8 in ELA/reading and math. This procedure matches scores on the two scales that have the same percentile rank (i.e., the proportion of scores at or below each score).

Suppose we need to establish the concordance between two tests.  $x$  is a score on Test  $X$  (e.g., PARCC). Its equipercentile equivalent score on Test  $Y$  (e.g., MAP),  $e_y(x)$ , can be obtained through a cumulative-distribution-based linking function defined in Equation (A1):

$$e_y(x) = G^{-1}[P(x)] \quad (\text{A1})$$

where  $e_y(x)$  is the equipercentile equivalent of scores on PARCC on the scale of MAP,  $P(x)$  is the percentile rank of a given score on Test  $X$ .  $G^{-1}$  is the inverse of the percentile rank function for scores on Test  $Y$  which indicates the scores on Test  $Y$  corresponding to a given percentile. Polynomial loglinear pre-smoothing was applied to reduce irregularities of the frequency distributions as well as equipercentile linking curve.

## Consistency rate of Classification

Consistency rate of classification accuracy, expressed in the form of a rate between 0 and 1, measures the extent to which MAP scores (and the estimated MAP cut scores) accurately predicted whether students in the sample would be proficient (i.e., Level 4 or higher) on PARCC tests.

To calculate consistency rate of classification, sample students were designated “Below PARCC cut” or “At or above PARCC cut” based on their actual PARCC scores. Similarly, they were also designated as “Below MAP cut” or “At or above MAP cut” based on their actual MAP scores. A 2-way contingency table was then tabulated (see Table A2), classifying students as “Proficient” on the basis of PARCC cut score and concordant MAP cut score. Students classified in the *true positive* (TP) category were those predicted to be Proficient based on the MAP cut scores and were also classified as Proficient based on the PARCC cut scores. Students classified in the *true negative* (TN) category were those predicted to be Not Proficient based on the MAP cut scores and were also classified as Not Proficient based on the PARCC cut scores. Students classified in the *false positive* (FP) category were those predicted to be Proficient based on the MAP cut scores but were classified as Not Proficient based on the PARCC cut scores. Students classified in the *false negative* (FN) category were those predicted to be Not Proficient based on the MAP cut scores but were classified as Proficient based on the PARCC cut scores. The overall consistency rate of classification was computed as the proportion of correct classifications among the entire sample by  $(TP+TN) / (TP+TN+FP+FN)$ .

TABLE A2. DEFINITION OF CONSISTENCY RATE FOR PARCC TO MAP CONCORDANCE

		PARCC Score	
		Below PARCC cut	At or Above PARCC cut
MAP Score	Below MAP cut	True Negative	False Positive
	At or Above MAP cut	False Negative	True Positive

Note. Shaded cells are summed to compute the consistency rate.

### Proficiency Projection

MAP conditional growth norms provide student’s expected gain scores across testing seasons (Thum & Hauser, 2015). This information is utilized to predict a student’s performance on PARCC based on that student’s MAP scores in prior seasons (e.g. fall and winter). The probability of a student achieving Level 4 (Proficient) on PARCC, based on his/her fall or winter MAP score is given in Equation (A2):

$$Pr(\text{Achieving Level 4 in spring} | a \text{ RIT score of } x) = 1 - \Phi\left(\frac{x + g - c}{SD}\right) \quad (A2)$$

where,  $\Phi$  is a standardized normal cumulative distribution,  $x$  is the student’s RIT score in fall or winter,  $g$  is the expected growth from fall or winter to spring corresponding to  $x$ ,  $c$  is the MAP cut-score for spring, and  $SD$  is the conditional standard deviation of growth from fall or winter to spring.

For the probability of a student achieving Level 4 on the PARCC tests, based on his/her spring score  $s$ , it can be calculated by Equation (A3):

$$Pr(\text{Achieving Level 4 in spring} | a \text{ RIT score of } s \text{ in spring}) = 1 - \Phi\left(\frac{s - c}{SE}\right) \quad (A3)$$

where  $SE$  is the standard error of measurement for MAP reading or math test.

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