Linking the Georgia Milestones Assessments to NWEA MAP Tests

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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 Georgia Milestones Assessment System (Georgia Milestones) English Language Arts (ELA) and Mathematics with those of the MAP Reading and MAP for Mathematics assessments. In this report, we present the 3rd through 8th grade cut scores on MAP reading and mathematics scales that correspond to the benchmarks on the Milestones 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 3 (i.e., "Proficient") or higher performance designation on the Milestones 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

Georgia Milestones assessments include a series of computer-based achievement tests aligned to the Georgia state-mandated academic standards in ELA, math, science, and social studies from grade 3 through high school. For each grade and subject, there are three cut scores that distinguish between performance levels: Level 1: *Beginning Learner*, Level 2: *Developing Learner*, Level 3: *Proficient Learner*, and Level 4: *Distinguished Learner*. The Level 3 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 Georgia state-mandated academic standards. Unlike the Georgia Milestones, MAP assessments are vertically scaled across

grades, a feature that supports direct measurement of academic growth and change. MAP scores are reported on a **R**asch Un**it** (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 NWEA 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 Milestones Readiness Levels

Tables 1 to 4 report the Milestones scaled scores associated with each of the four performance levels, as well as the estimated cut scores on the MAP tests associated with the Milestones 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 students' most probable Milestones performance level, based on their observed MAP scores. For example, a 4th grade student who obtained a MAP math score of 230 in the spring testing season is likely to be at the very high end of Level 3 (Proficient) on the Milestones taken during that same testing season (see Table 2). Similarly, a 3rd grade student who obtained a MAP reading score of 220 in the fall testing season is likely to be at Level 4 (Distinguished Learner) on the Milestones taken in the spring of 3rd grade (see Table 3).

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

Grade	MILESTONES			
	Level 1 *Beginning Learner*	Level 2 *Developing Learner*	Level 3 *Proficient Learner*	Level 4 *Distinguished Learner*
3	180-474	475-524	**525**-580	581-830
4	210-474	475-524	**525**-573	574-775
5	210-474	475-524	**525**-586	587-760
6	140-474	475-524	**525**-598	599-820
7	165-474	475-524	**525**-591	592-785
8	225-474	475-524	**525**-580	581-730

Grade	MAP							
	Level 1 *Beginning Learner*		Level 2 *Developing Learner*		Level 3 *Proficient Learner*		Level 4 *Distinguished Learner*	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-192	1-34	193-205	35-67	**206**-216	68-88	217-350	89-99
4	100-196	1-26	197-211	27-64	**212**-223	65-88	224-350	89-99
5	100-202	1-26	203-217	27-65	**218**-231	66-90	232-350	91-99
6	100-209	1-33	210-220	34-62	**221**-233	63-88	234-350	89-99
7	100-212	1-35	213-224	36-66	**225**-238	67-91	239-350	92-99
8	100-212	1-31	213-227	32-68	**228**-240	69-90	241-350	91-99

Notes. 1. %ile=percentile.
2. Bolded numbers indicate the cut scores considered to be at least "proficient" for accountability purposes.

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

Grade	MILESTONES			
	Level 1 *Beginning Learner*	Level 2 *Developing Learner*	Level 3 *Proficient Learner*	Level 4 *Distinguished Learner*
3	290-474	475-524	**525**-579	580-705
4	270-474	475-524	**525**-584	585-715
5	265-474	475-524	**525**-579	580-725
6	285-474	475-524	**525**-579	580-700
7	265-474	475-524	**525**-579	580-740
8	275-474	475-524	**525**-578	579-755

Grade	MAP							
	Level 1 *Beginning Learner*		Level 2 *Developing Learner*		Level 3 *Proficient Learner*		Level 4 *Distinguished Learner*	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-189	1-15	190-205	16-56	**206**-218	57-86	219-350	87-99
4	100-197	1-14	198-214	15-52	**215-**230	53-87	231-350	88-99
5	100-208	1-21	209-226	22-62	**227**-241	63-89	242-350	90-99
6	100-211	1-20	212-228	21-57	**229**-241	58-83	242-350	84-99
7	100-216	1-24	217-233	25-60	**234**-247	61-85	248-350	86-99
8	100-220	1-29	221-239	30-67	**240**-255	68-90*	256-350	90*-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 MILESTONES ELA AND MAP READING (WHEN MAP IS TAKEN IN FALL OR WINTER PRIOR TO SPRING MILESTONES TESTS)

Grade	MILESTONES			
	Level 1 *Beginning Learner*	Level 2 *Developing Learner*	Level 3 *Proficient Learner*	Level 4 *Distinguished Learner*
3	180-474	475-524	**525**-580	581-830
4	210-474	475-524	**525**-573	574-775
5	210-474	475-524	**525**-586	587-760
6	140-474	475-524	**525**-598	599-820
7	165-474	475-524	**525**-591	592-785
8	225-474	475-524	**525**-580	581-730

Grade	MAP FALL							
	Level 1 *Beginning Learner*		Level 2 *Developing Learner*		Level 3 *Proficient Learner*		Level 4 *Distinguished Learner*	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-180	1-31	181-196	32-69	**197**-209	70-90	210-350	91-99
4	100-187	1-24	188-204	25-65	**205**-218	66-90	219-350	91-99
5	100-194	1-23	195-212	24-67	**213**-228	68-93	229-350	94-99
6	100-203	1-30	204-216	31-64	**217**-231	65-91	232-350	92-99
7	100-208	1-34	209-221	35-67	**222**-236	68-92	237-350	93-99
8	100-208	1-28	209-225	29-70	**226**-238	71-91	239-350	92-99

Grade	MAP WINTER							
	Level 1 *Beginning Learner*		Level 2 *Developing Learner*		Level 3 *Proficient Learner*		Level 4 *Distinguished Learner*	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-189	1-34	190-202	35-67	**203**-214	68-89	215-350	90-99
4	100-193	1-24	194-209	25-65	**210**-222	66-89	223-350	90-99
5	100-199	1-24	200-215	25-65	**216**-230	66-92	231-350	93-99
6	100-207	1-32	208-219	33-64	**220**-232	65-89	233-350	90-99
7	100-210	1-33	211-223	34-66	**224**-237	67-91	238-350	92-99
8	100-211	1-31	212-226	32-68	**227**-239	69-90	240-350	91-99

Notes. 1. %ile=percentile.
2. Bolded numbers indicate the cut scores considered to be at least "proficient" for accountability purposes.

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

Grade	MILESTONES			
	Level 1 *Beginning Learner*	Level 2 *Developing Learner*	Level 3 *Proficient Learner*	Level 4 *Distinguished Learner*
3	290-474	475-524	**525**-579	580-705
4	270-474	475-524	**525**-584	585-715
5	265-474	475-524	**525**-579	580-725
6	285-474	475-524	**525**-579	580-700
7	265-474	475-524	**525**-579	580-740
8	275-474	475-524	**525**-578	579-755

Grade	MAP FALL							
	Level 1 *Beginning Learner*		Level 2 *Developing Learner*		Level 3 *Proficient Learner*		Level 4 *Distinguished Learner*	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-175	1-12	176-192	13-56	**193**-206	57-89	207-350	90-99
4	100-185	1-11	186-202	12-51	**203**-219	52-89	220-350	90-99
5	100-198	1-18	199-216	19-63	**217**-231	64-91	232-350	92-99
6	100-203	1-18	204-220	19-57	**221**-234	58-86	235-350	87-99
7	100-210	1-23	211-227	24-61	**228**-241	62-87	242-350	88-99
8	100-215	1-27	216-235	28-69	**236**-251	70-92*	252-350	92*-99

Grade	MAP WINTER							
	Level 1 *Beginning Learner*		Level 2 *Developing Learner*		Level 3 *Proficient Learner*		Level 4 *Distinguished Learner*	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-183	1-13	184-200	14-56	**201**-213	57-87	214-350	88-99
4	100-192	1-12	193-209	13-52	**210**-225	53-88	226-350	89-99
5	100-204	1-20	205-222	21-63	**223**-237	64-90	238-350	91-99
6	100-208	1-19	209-225	20-58	**226**-238	59-84	239-400	86-99
7	100-214	1-24	215-231	25-62	**232**-245	63-87	246-350	88-99
8	100-218	1-28	219-237	29-67	**238**-253	68-90	254-350	91-99

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 Milestones 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 Milestones and MAP scores. The results in Table 5 demonstrate that on average, MAP reading scores can consistently classify students' proficiency (Level 3 or higher) status on Milestones ELA test approximately 84% of the time and MAP math scores can consistently classify students on Milestones math test approximately 87% 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 Milestones tests.

TABLE 5. CONSISTENCY RATE OF CLASSIFICATION FOR MAP AND MILESTONES LEVEL 3 EQUIPERCENTILE CONCORDANCES

Grade	ELA/Reading			Math		
	Consistency Rate	False Positives	False Negatives	Consistency Rate	False Positives	False Negatives
3	0.84	0.07	0.09	0.84	0.09	0.07
4	0.84	0.08	0.08	0.87	0.07	0.06
5	0.84	0.08	0.08	0.87	0.07	0.06
6	0.85	0.08	0.07	0.87	0.07	0.06
7	0.84	0.09	0.07	0.87	0.07	0.06
8	0.85	0.06	0.09	0.88	0.06	0.06

Proficiency Projection

Proficiency projection tells how likely a student is classified as "proficient" on Milestones 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 Milestones tests are presented in Tables 6 to 8. These tables estimate the probability of scoring at Level 3 or above on Milestones in the spring and the prior fall or winter testing season. For example, if a 3rd grade student obtained a MAP math score of 199 in the fall, the probability of obtaining a Level 3 or higher Milestones score in the spring of 3rd grade is 78%. Table 6 presents the estimated probability of meeting Level 3 benchmark when MAP is taken in the spring, whereas Tables 7 and 8 present the estimated probability of meeting Level 3 benchmark when MAP is taken in the fall or winter prior to taking the Milestones tests.

TABLE 6. PROFICIENCY PROJECTION AND PROBABILITY FOR PASSING MILESTONES LEVEL 3 (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 3	Prob.			Cut Score	Level 3	Prob.
3	5	174	206	No	<0.01	5	181	206	No	<0.01
	10	179	206	No	<0.01	10	186	206	No	<0.01
	15	183	206	No	<0.01	15	189	206	No	<0.01
	20	186	206	No	<0.01	20	192	206	No	<0.01
	25	188	206	No	<0.01	25	194	206	No	<0.01
	30	191	206	No	<0.01	30	196	206	No	<0.01
	35	193	206	No	<0.01	35	198	206	No	<0.01
	40	195	206	No	<0.01	40	200	206	No	0.02
	45	197	206	No	<0.01	45	202	206	No	0.08
	50	199	206	No	0.01	50	203	206	No	0.15
	55	201	206	No	0.06	55	205	206	No	0.37
	60	202	206	No	0.11	60	207	206	Yes	0.63
	65	204	206	No	0.27	65	209	206	Yes	0.85
	70	207	206	Yes	0.62	70	211	206	Yes	0.96
	75	209	206	Yes	0.83	75	213	206	Yes	0.99
	80	211	206	Yes	0.94	80	215	206	Yes	>0.99
	85	214	206	Yes	0.99	85	218	206	Yes	>0.99
	90	218	206	Yes	>0.99	90	221	206	Yes	>0.99
	95	223	206	Yes	>0.99	95	226	206	Yes	>0.99
4	5	181	212	No	<0.01	5	189	215	No	<0.01
	10	187	212	No	<0.01	10	194	215	No	<0.01
	15	190	212	No	<0.01	15	198	215	No	<0.01
	20	193	212	No	<0.01	20	201	215	No	<0.01
	25	196	212	No	<0.01	25	203	215	No	<0.01
	30	198	212	No	<0.01	30	206	215	No	<0.01
	35	200	212	No	<0.01	35	208	215	No	0.01
	40	202	212	No	<0.01	40	210	215	No	0.04
	45	204	212	No	0.01	45	212	215	No	0.15
	50	206	212	No	0.03	50	213	215	No	0.25
	55	208	212	No	0.11	55	215	215	Yes	0.50
	60	210	212	No	0.27	60	217	215	Yes	0.75
	65	212	212	Yes	0.50	65	219	215	Yes	0.92
	70	214	212	Yes	0.73	70	221	215	Yes	0.98
	75	216	212	Yes	0.89	75	224	215	Yes	>0.99
	80	218	212	Yes	0.97	80	226	215	Yes	>0.99
	85	221	212	Yes	>0.99	85	229	215	Yes	>0.99
	90	225	212	Yes	>0.99	90	233	215	Yes	>0.99
	95	230	212	Yes	>0.99	95	238	215	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 3	Prob.			Cut Score	Level 3	Prob.
5	5	188	218	No	<0.01	5	195	227	No	<0.01
	10	193	218	No	<0.01	10	201	227	No	<0.01
	15	197	218	No	<0.01	15	205	227	No	<0.01
	20	199	218	No	<0.01	20	208	227	No	<0.01
	25	202	218	No	<0.01	25	210	227	No	<0.01
	30	204	218	No	<0.01	30	213	227	No	<0.01
	35	206	218	No	<0.01	35	215	227	No	<0.01
	40	208	218	No	<0.01	40	217	227	No	<0.01
	45	210	218	No	0.01	45	219	227	No	<0.01
	50	212	218	No	0.03	50	221	227	No	0.02
	55	214	218	No	0.11	55	223	227	No	0.08
	60	216	218	No	0.27	60	225	227	No	0.25
	65	217	218	No	0.38	65	228	227	Yes	0.63
	70	220	218	Yes	0.73	70	230	227	Yes	0.85
	75	222	218	Yes	0.89	75	232	227	Yes	0.96
	80	224	218	Yes	0.97	80	235	227	Yes	>0.99
	85	227	218	Yes	>0.99	85	238	227	Yes	>0.99
	90	231	218	Yes	>0.99	90	242	227	Yes	>0.99
	95	236	218	Yes	>0.99	95	248	227	Yes	>0.99
6	5	192	221	No	<0.01	5	198	229	No	<0.01
	10	197	221	No	<0.01	10	204	229	No	<0.01
	15	201	221	No	<0.01	15	208	229	No	<0.01
	20	203	221	No	<0.01	20	211	229	No	<0.01
	25	206	221	No	<0.01	25	214	229	No	<0.01
	30	208	221	No	<0.01	30	217	229	No	<0.01
	35	210	221	No	<0.01	35	219	229	No	<0.01
	40	212	221	No	<0.01	40	221	229	No	<0.01
	45	214	221	No	0.01	45	223	229	No	0.02
	50	216	221	No	0.06	50	225	229	No	0.08
	55	218	221	No	0.17	55	227	229	No	0.25
	60	219	221	No	0.27	60	230	229	Yes	0.63
	65	221	221	Yes	0.50	65	232	229	Yes	0.85
	70	223	221	Yes	0.73	70	234	229	Yes	0.96
	75	226	221	Yes	0.94	75	237	229	Yes	>0.99
	80	228	221	Yes	0.99	80	239	229	Yes	>0.99
	85	231	221	Yes	>0.99	85	243	229	Yes	>0.99
	90	235	221	Yes	>0.99	90	247	229	Yes	>0.99
	95	240	221	Yes	>0.99	95	253	229	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 3	Prob.			Cut Score	Level 3	Prob.
7	5	193	225	No	<0.01	5	199	234	No	<0.01
	10	199	225	No	<0.01	10	206	234	No	<0.01
	15	202	225	No	<0.01	15	210	234	No	<0.01
	20	205	225	No	<0.01	20	214	234	No	<0.01
	25	208	225	No	<0.01	25	217	234	No	<0.01
	30	210	225	No	<0.01	30	219	234	No	<0.01
	35	212	225	No	<0.01	35	222	234	No	<0.01
	40	214	225	No	<0.01	40	224	234	No	<0.01
	45	216	225	No	<0.01	45	226	234	No	<0.01
	50	218	225	No	0.01	50	229	234	No	0.04
	55	220	225	No	0.06	55	231	234	No	0.15
	60	222	225	No	0.17	60	233	234	No	0.37
	65	224	225	No	0.38	65	235	234	Yes	0.63
	70	226	225	Yes	0.62	70	238	234	Yes	0.92
	75	228	225	Yes	0.83	75	241	234	Yes	0.99
	80	231	225	Yes	0.97	80	244	234	Yes	>0.99
	85	234	225	Yes	>0.99	85	247	234	Yes	>0.99
	90	238	225	Yes	>0.99	90	251	234	Yes	>0.99
	95	243	225	Yes	>0.99	95	258	234	Yes	>0.99
8	5	194	228	No	<0.01	5	199	240	No	<0.01
	10	200	228	No	<0.01	10	206	240	No	<0.01
	15	204	228	No	<0.01	15	211	240	No	<0.01
	20	207	228	No	<0.01	20	215	240	No	<0.01
	25	209	228	No	<0.01	25	218	240	No	<0.01
	30	212	228	No	<0.01	30	221	240	No	<0.01
	35	214	228	No	<0.01	35	224	240	No	<0.01
	40	216	228	No	<0.01	40	226	240	No	<0.01
	45	218	228	No	<0.01	45	229	240	No	<0.01
	50	220	228	No	0.01	50	231	240	No	<0.01
	55	222	228	No	0.03	55	233	240	No	0.01
	60	224	228	No	0.11	60	236	240	No	0.08
	65	226	228	No	0.27	65	238	240	No	0.25
	70	228	228	Yes	0.50	70	241	240	Yes	0.63
	75	231	228	Yes	0.83	75	244	240	Yes	0.92
	80	233	228	Yes	0.94	80	247	240	Yes	0.99
	85	236	228	Yes	0.99	85	251	240	Yes	>0.99
	90	240	228	Yes	>0.99	90	255	240	Yes	>0.99
	95	246	228	Yes	>0.99	95	262	240	Yes	>0.99

Note. %ile=percentile

TABLE 7. PROFICIENCY PROJECTION AND PROBABILITY FOR PASSING MILESTONES ELA LEVEL 3 (PROFICIENT) WHEN MAP IS TAKEN IN THE FALL OR WINTER PRIOR TO SPRING MILESTONES TESTS

Grade	Start %ile	RIT Fall	Projected Proficiency			Start %ile	RIT Winter	Projected Proficiency		
			Cut Score	Level 3	Prob.			Cut Score	Level 3	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	212	No	<0.01	5	179	212	No	<0.01
	10	178	212	No	<0.01	10	184	212	No	<0.01
	15	182	212	No	<0.01	15	188	212	No	<0.01
	20	185	212	No	0.01	20	191	212	No	<0.01
	25	188	212	No	0.01	25	194	212	No	<0.01
	30	190	212	No	0.03	30	196	212	No	0.01
	35	192	212	No	0.05	35	198	212	No	0.02
	40	194	212	No	0.07	40	200	212	No	0.04
	45	196	212	No	0.12	45	202	212	No	0.06
	50	198	212	No	0.18	50	204	212	No	0.12
	55	200	212	No	0.23	55	205	212	No	0.16
	60	202	212	No	0.33	60	207	212	No	0.28
	65	204	212	No	0.44	65	209	212	No	0.42
	70	206	212	Yes	0.56	70	211	212	Yes	0.58
	75	209	212	Yes	0.67	75	214	212	Yes	0.78
	80	211	212	Yes	0.77	80	216	212	Yes	0.88
	85	214	212	Yes	0.85	85	219	212	Yes	0.94
	90	218	212	Yes	0.95	90	223	212	Yes	0.99
	95	224	212	Yes	0.99	95	228	212	Yes	>0.99

TABLE 7. (CONTINUED)

Grade	Start %ile	RIT Fall	Projected Proficiency			Start %ile	RIT Winter	Projected Proficiency		
			Cut-Score	Level 3	Prob.			Cut-Score	Level 3	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	221	No	<0.01	5	190	221	No	<0.01
	10	192	221	No	<0.01	10	196	221	No	<0.01
	15	196	221	No	<0.01	15	199	221	No	<0.01
	20	198	221	No	0.01	20	202	221	No	<0.01
	25	201	221	No	0.02	25	204	221	No	<0.01
	30	203	221	No	0.04	30	207	221	No	0.01
	35	205	221	No	0.07	35	209	221	No	0.03
	40	207	221	No	0.10	40	211	221	No	0.06
	45	209	221	No	0.16	45	212	221	No	0.09
	50	211	221	No	0.23	50	214	221	No	0.17
	55	213	221	No	0.33	55	216	221	No	0.22
	60	215	221	No	0.39	60	218	221	No	0.35
	65	217	221	Yes	0.50	65	220	221	Yes	0.50
	70	219	221	Yes	0.61	70	222	221	Yes	0.65
	75	221	221	Yes	0.67	75	224	221	Yes	0.78
	80	224	221	Yes	0.81	80	226	221	Yes	0.88
	85	226	221	Yes	0.88	85	229	221	Yes	0.96
	90	230	221	Yes	0.94	90	233	221	Yes	0.99
	95	236	221	Yes	0.99	95	238	221	Yes	>0.99

TABLE 7. (CONTINUED)

Grade	Start %ile	RIT Fall	Projected Proficiency			Start %ile	RIT Winter	Projected Proficiency		
			Cut-Score	Level 3	Prob.			Cut-Score	Level 3	Prob.
7	5	189	225	No	<0.01	5	192	225	No	<0.01
	10	195	225	No	<0.01	10	198	225	No	<0.01
	15	199	225	No	<0.01	15	201	225	No	<0.01
	20	202	225	No	<0.01	20	204	225	No	<0.01
	25	204	225	No	0.01	25	207	225	No	<0.01
	30	206	225	No	0.02	30	209	225	No	<0.01
	35	209	225	No	0.04	35	211	225	No	0.01
	40	211	225	No	0.07	40	213	225	No	0.02
	45	213	225	No	0.12	45	215	225	No	0.04
	50	214	225	No	0.15	50	217	225	No	0.09
	55	216	225	No	0.19	55	219	225	No	0.17
	60	218	225	No	0.28	60	221	225	No	0.28
	65	220	225	No	0.39	65	223	225	No	0.42
	70	222	225	Yes	0.50	70	225	225	Yes	0.58
	75	225	225	Yes	0.61	75	227	225	Yes	0.72
	80	227	225	Yes	0.72	80	230	225	Yes	0.88
	85	230	225	Yes	0.85	85	232	225	Yes	0.91
	90	234	225	Yes	0.93	90	236	225	Yes	0.98
	95	240	225	Yes	0.99	95	242	225	Yes	>0.99
8	5	191	228	No	<0.01	5	194	228	No	<0.01
	10	197	228	No	<0.01	10	199	228	No	<0.01
	15	201	228	No	<0.01	15	203	228	No	<0.01
	20	204	228	No	0.01	20	206	228	No	<0.01
	25	207	228	No	0.02	25	209	228	No	<0.01
	30	209	228	No	0.03	30	211	228	No	<0.01
	35	211	228	No	0.05	35	213	228	No	0.01
	40	213	228	No	0.06	40	215	228	No	0.01
	45	215	228	No	0.10	45	217	228	No	0.03
	50	217	228	No	0.16	50	219	228	No	0.07
	55	219	228	No	0.22	55	221	228	No	0.14
	60	221	228	No	0.26	60	223	228	No	0.23
	65	223	228	No	0.35	65	225	228	No	0.36
	70	225	228	No	0.45	70	227	228	Yes	0.50
	75	228	228	Yes	0.55	75	229	228	Yes	0.64
	80	230	228	Yes	0.65	80	232	228	Yes	0.77
	85	234	228	Yes	0.81	85	235	228	Yes	0.90
	90	237	228	Yes	0.87	90	239	228	Yes	0.98
	95	243	228	Yes	0.97	95	244	228	Yes	>0.99

Note. %ile=percentile

TABLE 8. PROFICIENCY PROJECTION AND PROBABILITY FOR PASSING MILESTONES MATH LEVEL 3 (PROFICIENT) WHEN MAP IS TAKEN IN THE FALL OR WINTER PRIOR TO SPRING MILESTONES TESTS

Grade	Start %ile	RIT Fall	Projected Proficiency			Start %ile	RIT Winter	Projected Proficiency		
			Cut Score	Level 3	Prob.			Cut Score	Level 3	Prob.
3	5	169	206	No	<0.01	5	176	206	No	<0.01
	10	174	206	No	<0.01	10	181	206	No	<0.01
	15	177	206	No	0.01	15	184	206	No	<0.01
	20	179	206	No	0.02	20	187	206	No	<0.01
	25	182	206	No	0.06	25	189	206	No	0.01
	30	184	206	No	0.08	30	191	206	No	0.02
	35	185	206	No	0.11	35	193	206	No	0.05
	40	187	206	No	0.17	40	195	206	No	0.10
	45	189	206	No	0.27	45	197	206	No	0.20
	50	190	206	No	0.32	50	198	206	No	0.26
	55	192	206	No	0.44	55	200	206	No	0.42
	60	194	206	Yes	0.56	60	202	206	Yes	0.58
	65	195	206	Yes	0.62	65	203	206	Yes	0.66
	70	197	206	Yes	0.73	70	205	206	Yes	0.80
	75	199	206	Yes	0.78	75	207	206	Yes	0.90
	80	201	206	Yes	0.86	80	209	206	Yes	0.95
	85	204	206	Yes	0.94	85	212	206	Yes	0.99
	90	207	206	Yes	0.98	90	215	206	Yes	>0.99
	95	212	206	Yes	>0.99	95	220	206	Yes	>0.99
4	5	179	215	No	<0.01	5	185	215	No	<0.01
	10	184	215	No	<0.01	10	190	215	No	<0.01
	15	188	215	No	0.01	15	194	215	No	<0.01
	20	190	215	No	0.02	20	197	215	No	<0.01
	25	193	215	No	0.06	25	199	215	No	0.01
	30	195	215	No	0.11	30	201	215	No	0.03
	35	197	215	No	0.17	35	203	215	No	0.07
	40	198	215	No	0.22	40	205	215	No	0.14
	45	200	215	No	0.32	45	207	215	No	0.26
	50	202	215	No	0.44	50	209	215	No	0.42
	55	204	215	Yes	0.56	55	211	215	Yes	0.58
	60	205	215	Yes	0.56	60	212	215	Yes	0.66
	65	207	215	Yes	0.68	65	214	215	Yes	0.80
	70	209	215	Yes	0.78	70	216	215	Yes	0.90
	75	211	215	Yes	0.86	75	218	215	Yes	0.95
	80	214	215	Yes	0.94	80	221	215	Yes	0.99
	85	216	215	Yes	0.97	85	223	215	Yes	>0.99
	90	220	215	Yes	0.99	90	227	215	Yes	>0.99
	95	225	215	Yes	>0.99	95	232	215	Yes	>0.99

TABLE 8. (CONTINUED)

Grade	Start %ile	RIT Fall	Projected Proficiency			Start %ile	RIT Winter	Projected Proficiency		
			Cut-Score	Level 3	Prob.			Cut-Score	Level 3	Prob.
5	5	187	227	No	<0.01	5	192	227	No	<0.01
	10	193	227	No	<0.01	10	198	227	No	<0.01
	15	196	227	No	<0.01	15	201	227	No	<0.01
	20	199	227	No	<0.01	20	204	227	No	<0.01
	25	202	227	No	0.01	25	207	227	No	<0.01
	30	204	227	No	0.03	30	209	227	No	<0.01
	35	206	227	No	0.05	35	211	227	No	0.01
	40	208	227	No	0.09	40	213	227	No	0.02
	45	210	227	No	0.15	45	215	227	No	0.05
	50	211	227	No	0.19	50	217	227	No	0.11
	55	213	227	No	0.28	55	219	227	No	0.20
	60	215	227	No	0.38	60	221	227	No	0.34
	65	217	227	Yes	0.50	65	223	227	Yes	0.50
	70	219	227	Yes	0.62	70	225	227	Yes	0.66
	75	221	227	Yes	0.72	75	228	227	Yes	0.85
	80	224	227	Yes	0.85	80	230	227	Yes	0.93
	85	227	227	Yes	0.93	85	233	227	Yes	0.98
	90	230	227	Yes	0.97	90	237	227	Yes	>0.99
	95	236	227	Yes	>0.99	95	242	227	Yes	>0.99
6	5	192	229	No	<0.01	5	196	229	No	<0.01
	10	198	229	No	<0.01	10	202	229	No	<0.01
	15	202	229	No	<0.01	15	205	229	No	<0.01
	20	205	229	No	0.01	20	209	229	No	<0.01
	25	207	229	No	0.02	25	211	229	No	<0.01
	30	209	229	No	0.04	30	214	229	No	0.01
	35	212	229	No	0.09	35	216	229	No	0.02
	40	214	229	No	0.15	40	218	229	No	0.05
	45	216	229	No	0.23	45	220	229	No	0.11
	50	218	229	No	0.33	50	222	229	No	0.20
	55	220	229	No	0.44	55	224	229	No	0.34
	60	222	229	Yes	0.56	60	226	229	Yes	0.50
	65	224	229	Yes	0.67	65	228	229	Yes	0.66
	70	226	229	Yes	0.77	70	230	229	Yes	0.80
	75	228	229	Yes	0.85	75	233	229	Yes	0.93
	80	231	229	Yes	0.93	80	236	229	Yes	0.98
	85	234	229	Yes	0.96	85	239	229	Yes	>0.99
	90	238	229	Yes	0.99	90	243	229	Yes	>0.99
	95	243	229	Yes	>0.99	95	248	229	Yes	>0.99

TABLE 8. (CONTINUED)

Grade	Start %ile	RIT Fall	Projected Proficiency			Start %ile	RIT Winter	Projected Proficiency		
			Cut-Score	Level 3	Prob.			Cut-Score	Level 3	Prob.
7	5	195	234	No	<0.01	5	198	234	No	<0.01
	10	201	234	No	<0.01	10	204	234	No	<0.01
	15	205	234	No	<0.01	15	208	234	No	<0.01
	20	209	234	No	<0.01	20	212	234	No	<0.01
	25	211	234	No	<0.01	25	215	234	No	<0.01
	30	214	234	No	0.02	30	217	234	No	<0.01
	35	216	234	No	0.03	35	220	234	No	0.01
	40	218	234	No	0.06	40	222	234	No	0.02
	45	221	234	No	0.14	45	224	234	No	0.05
	50	223	234	No	0.22	50	226	234	No	0.10
	55	225	234	No	0.32	55	228	234	No	0.20
	60	227	234	No	0.44	60	230	234	No	0.34
	65	229	234	Yes	0.56	65	233	234	Yes	0.58
	70	231	234	Yes	0.68	70	235	234	Yes	0.74
	75	234	234	Yes	0.82	75	238	234	Yes	0.90
	80	237	234	Yes	0.92	80	240	234	Yes	0.95
	85	240	234	Yes	0.97	85	244	234	Yes	0.99
	90	244	234	Yes	0.99	90	248	234	Yes	>0.99
	95	250	234	Yes	>0.99	95	254	234	Yes	>0.99
8	5	197	240	No	<0.01	5	199	240	No	<0.01
	10	203	240	No	<0.01	10	206	240	No	<0.01
	15	208	240	No	<0.01	15	210	240	No	<0.01
	20	211	240	No	<0.01	20	214	240	No	<0.01
	25	214	240	No	<0.01	25	217	240	No	<0.01
	30	217	240	No	0.01	30	220	240	No	<0.01
	35	219	240	No	0.02	35	222	240	No	<0.01
	40	222	240	No	0.04	40	225	240	No	<0.01
	45	224	240	No	0.08	45	227	240	No	0.01
	50	226	240	No	0.12	50	229	240	No	0.04
	55	229	240	No	0.22	55	231	240	No	0.08
	60	231	240	No	0.30	60	234	240	No	0.21
	65	233	240	No	0.40	65	236	240	No	0.35
	70	236	240	Yes	0.50	70	239	240	Yes	0.58
	75	238	240	Yes	0.60	75	241	240	Yes	0.72
	80	241	240	Yes	0.74	80	245	240	Yes	0.92
	85	245	240	Yes	0.88	85	248	240	Yes	0.98
	90	249	240	Yes	0.96	90	253	240	Yes	>0.99
	95	256	240	Yes	>0.99	95	259	240	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 Milestones performance level. By using matched score data from a sample of students from Georgia, 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 Milestones 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 Milestones 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 23 schools in Georgia, 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 Milestones performance from other schools 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 23 schools in Georgia. The sample contained matched Milestones ELA and MAP reading scores from 9,059 students in Grades 3 to 8 and matched Milestones and MAP math scores from 9,137 students in Grades 3 to 8 who completed both Milestones 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 Milestones ELA scores range from 0.79 to 0.83, and the correlation coefficients between MAP and Milestones math scores range from 0.83 to 0.87. All these correlations indicate a strong relationship between MAP and Milestones test scores.

TABLE A1. DESCRIPTIVE STATISTICS OF THE SAMPLE DATA

				MILESTONES				MAP			
Subject	**Grade**	**N**	***r***	**Mean**	**SD**	**Min**	**Max**	**Mean**	**SD**	**Min**	**Max**
ELA/ Reading	3	1,615	0.83	504	60.10	336	830	199	15.11	147	236
	4	1,521	0.81	508	48.67	364	693	206	14.68	147	249
	5	1,514	0.83	511	52.50	349	718	212	14.84	150	251
	6	1,497	0.81	508	62.04	333	820	215	14.68	143	260
	7	1,505	0.80	505	53.34	341	717	219	13.71	163	255
	8	1,407	0.79	506	43.57	373	657	221	13.62	158	254
Math	3	1,620	0.84	518	44.28	406	705	203	12.77	148	246
	4	1,546	0.86	519	45.35	403	715	212	13.85	144	260
	5	1,553	0.87	517	50.62	388	725	222	16.34	150	267
	6	1,470	0.85	512	46.42	403	700	222	14.69	154	258
	7	1,506	0.85	513	47.11	387	705	228	14.93	173	275
	8	1,442	0.83	510	46.88	394	790	233	15.64	162	282

Equipercentile Linking Procedure

The equipercentile procedure (e.g., Kolen & Brennan, 2004) was used to establish the concordance relationship between Milestones 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 concorded scores between two tests. x is a score on Test X (e.g., Milestones). 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 Milestones 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 3 or higher) on Milestones tests.

To calculate consistency rate of classification, sample students were designated "Below Milestones cut" or "At or above Milestones cut" based on their actual Milestones 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 Milestones 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 Milestones 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 Milestones 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 Milestones cut scores. Students classified in the *false negative* (FN) category were those predicated to be Not Proficient based on the MAP cut scores but were classified as Proficient based on the Milestones 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 MILESTONES TO MAP CONCORDANCE

		Milestones Score	
		Below Milestones cut	At or Above Milestones 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 the Milestones based on that student's MAP scores in prior seasons (e.g. fall and winter). The probability of a student achieving Level 3 (Proficient) on Milestones, based on his/her fall or winter MAP score is given in Equation (A2):

$$Pr(Achieveing\ Level\ 3\ in\ spring | a\ RIT\ score\ of\ x) = 1 - \Phi\left(\frac{x + g - c}{SD}\right) \qquad (A2)$$

where, Φ 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 3 on the Milestones tests, based on his/her spring score s, it can be calculated by Equation (A3):

$$Pr(Achieveing\ Level\ 3\ in\ spring | a\ RIT\ score\ of\ s\ in\ spring) = 1 - \Phi\left(\frac{s - c}{SE}\right) \qquad (A3)$$

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

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