Linking the Pennsylvania PSSA 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 Pennsylvania System of School Assessment (PSSA) reading and math 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 PSSA reading 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 PSSA 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

PSSA includes a series of achievement tests aligned to the Pennsylvania Core Standards in English Language Arts (ELA) and math for grades 3-8, and science for grades 4 and 8. PSSA tests are delivered in the paper-and-pencil form. For each grade and subject, there are three cut scores that distinguish between performance levels: Level 1: *Below Basic*, Level 2: *Basic*, Level 3: *Proficient*, and Level 4: *Advanced*. The Level 3 cut score demarks the minimum level of performance considered to be "Proficient" for accountability purposes (Data Recognition Corporation, 2015).

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 Pennsylvania Core

Standards. Unlike PSSA, 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 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 PSSA Readiness Levels

Tables 1 to 4 report the PSSA scaled scores associated with each of the four performance levels, as well as the estimated cut scores on the MAP tests associated with the PSSA 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 PSSA performance level, based on their observed MAP scores. For example, a 5th grade student who obtained a MAP math score of 240 in the spring testing season is likely to be at the very high end of Level 3 (Proficient) on the PSSA taken during that same testing season (see Table 2). Similarly, a 3rd grade student who obtained a MAP reading score of 210 in the fall testing season is likely to be at Level 4 (Advanced) on the PSSA taken in the spring of 3rd grade (see Table 3).

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

Grade	PSSA			
	Level 1 *Below Basic*	Level 2 *Basic*	Level 3 *Proficient*	Level 4 *Advanced*
3	600-904	905-999	**1000**-1142	1143-1586
4	600-886	887-999	**1000**-1106	1107-1724
5	600-892	893-999	**1000**-1138	1139-1730
6	600-874	875-999	**1000**-1114	1115-1699
7	600-844	845-999	**1000**-1129	1130-1652
8	600-885	886-999	**1000**-1129	1130-1636

Grade	MAP							
	Level 1 *Below Basic*		Level 2 *Basic*		Level 3 *Proficient*		Level 4 *Advanced*	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-177	1-8	178-195	9-41	**196**-215	42-86	216-350	87-99
4	100-185	1-8	186-205	9-48	**206**-218	49-80	219-350	81-99
5	100-191	1-8	192-211	9-49	**212**-226	50-84	227-350	85-99
6	100-195	1-8	196-215	9-49	**216**-227	50-78	228-350	79-99
7	100-195	1-6	196-217	7-48	**218**-233	49-84	234-350	85-99
8	100-196	1-6	197-220	7-51	**221**-236	52-85	237-350	86-99

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 PSSA AND MAP MATH (WHEN MAP IS TAKEN IN SPRING)

Grade	PSSA			
	Level 1 *Below Basic*	Level 2 *Basic*	Level 3 *Proficient*	Level 4 *Advanced*
3	600-922	923-999	**1000**-1109	1110-1594
4	600-907	908-999	**1000**-1106	1107-1627
5	600-900	901-999	**1000**-1112	1113-1594
6	600-896	897-999	**1000**-1104	1105-1531
7	600-903	904-999	**1000**-1108	1109-1536
8	600-905	906-999	**1000**-1107	1108-1558

Grade	MAP							
	Level 1 *Below Basic*		Level 2 *Basic*		Level 3 *Proficient*		Level 4 *Advanced*	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-194	1-25	195-203	26-50	**204**-214	51-78	215-350	79-99
4	100-203	1-25	204-216	26-57	**217**-229	58-85	230-350	86-99
5	100-214	1-33	215-228	34-67	**229**-242	68-90	243-350	91-99
6	100-215	1-27	216-231	28-64	**232**-245	65-88	246-350	89-99
7	100-224	1-40	225-239	41-73	**240**-254	74-92	255-350	93-99
8	100-231	1-51	232-248	52-82	**249**-262	83-95*	263-350	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 3. CONCORDANCE OF PERFORMANCE LEVEL SCORE RANGES BETWEEN PSSA ELA AND MAP READING (WHEN MAP IS TAKEN IN FALL OR WINTER PRIOR TO SPRING PSSA TESTS)

Grade	PSSA			
	Level 1 *Below basic*	Level 2 *Basic*	Level 3 *Proficient*	Level 4 *Advanced*
3	600-904	905-999	**1000**-1142	1143-1586
4	600-886	887-999	**1000**-1106	1107-1724
5	600-892	893-999	**1000**-1138	1139-1730
6	600-874	875-999	**1000**-1114	1115-1699
7	600-844	845-999	**1000**-1129	1130-1652
8	600-885	886-999	**1000**-1129	1130-1636

Grade	MAP FALL							
	Level 1 *Below basic*		Level 2 *Basic*		Level 3 *Proficient*		Level 4 *Advanced*	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-163	1-5	164-184	6-40	**185**-208	41-89	209-350	90-99
4	100-174	1-6	175-197	7-48	**198**-212	49-82	213-350	83-99
5	100-182	1-6	183-205	7-49	**206**-222	50-86	223-350	87-99
6	100-187	1-5	188-210	6-48	**211**-224	49-81	225-350	82-99
7	100-188	1-4	189-213	5-47	**214**-231	48-86	232-350	87-99
8	100-189	1-3	190-217	4-50	**218**-234	51-86	235-350	87-99

Grade	MAP WINTER							
	Level 1 *Below basic*		Level 2 *Basic*		Level 3 *Proficient*		Level 4 *Advanced*	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-173	1-7	174-192	8-41	**193**-213	42-88	214-350	89-99
4	100-181	1-6	182-203	7-49	**204**-217	50-82	218-350	83-99
5	100-188	1-7	189-209	8-49	**210**-225	50-85	226-350	86-99
6	100-192	1-6	193-213	7-48	**214**-226	49-80	227-350	81-99
7	100-193	1-5	194-216	6-48	**217**-232	49-85	233-350	86-99
8	100-194	1-5	195-219	6-51	**220**-235	52-85	236-350	86-99

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 PSSA AND MAP MATH (WHEN MAP IS TAKEN IN FALL OR WINTER PRIOR TO SPRING PSSA TESTS)

Grade	PSSA			
	Level 1 *Below basic*	Level 2 *Basic*	Level 3 *Proficient*	Level 4 *Advanced*
3	600-904	905-999	**1000**-1142	1143-1586
4	600-886	887-999	**1000**-1106	1107-1724
5	600-892	893-999	**1000**-1138	1139-1730
6	600-874	875-999	**1000**-1114	1115-1699
7	600-844	845-999	**1000**-1129	1130-1652
8	600-885	886-999	**1000**-1129	1130-1636

Grade	MAP FALL							
	Level 1 *Below basic*		Level 2 *Basic*		Level 3 *Proficient*		Level 4 *Advanced*	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-180	1-22	181-190	23-50	**191**-202	51-82	203-350	83-99
4	100-191	1-22	192-205	23-60	**206**-218	61-88	219-350	89-99
5	100-204	1-31	205-218	32-68	**219**-232	69-92	233-350	93-99
6	100-207	1-25	208-223	26-64	**224**-238	65-91	239-350	92-99
7	100-218	1-40	219-233	41-74	**234**-248	75-93	249-350	94-99
8	100-226	1-50	227-244	51-84	**245**-258	85-95	259-350	96-99

Grade	MAP WINTER							
	Level 1 *Below basic*		Level 2 *Basic*		Level 3 *Proficient*		Level 4 *Advanced*	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-189	1-25	190-198	26-50	**199**-209	51-80	210-350	81-99
4	100-198	1-23	199-211	24-57	**212**-224	58-86	225-350	87-99
5	100-210	1-33	211-224	34-68	**225**-238	69-91	239-350	92-99
6	100-212	1-27	213-228	28-65	**229**-242	66-89	243-350	90-99
7	100-222	1-41	223-237	42-74	**238**-252	75-94*	253-350	94*-99
8	100-229	1-50	230-246	51-82	**247**-260	83-96*	261-350	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 PSSA 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 PSSA and MAP cut scores. The results in Table 5 demonstrate that MAP reading scores can consistently classify students' proficiency (Level 3 or higher) status on PSSA reading test 86-91% of the time and MAP math scores can consistently classify students on PSSA math test 84-88% 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 PSSA tests.

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

Grade	Reading			Math		
	Consistency Rate	False		Consistency Rate	False	
		Positives	Negatives		Positives	Negatives
3	0.91	0.05	0.04	0.87	0.09	0.04
4	0.88	0.06	0.06	0.87	0.08	0.05
5	0.90	0.04	0.06	0.88	0.06	0.06
6	0.87	0.06	0.07	0.86	0.08	0.06
7	0.86	0.08	0.06	0.85	0.09	0.06
8	0.86	0.07	0.07	0.84	0.06	0.10

Proficiency Projection

Proficiency projection tells how likely a student is classified as "proficient" on PSSA 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 PSSA tests are

presented in Tables 6 to 8. These tables estimate the probability of scoring at Level 3 or above on PSSA in the spring and the prior fall or winter testing season. For example, if a 3rd grade student obtained a MAP reading score of 192 in the fall, the probability of obtaining a Level 3 or higher PSSA score in the spring of 3rd grade is 80%. 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 PSSA tests.

TABLE 6. PROFICIENCY PROJECTION AND PROBABILITY FOR PASSING PSSA LEVEL 3 (PROFICIENT) WHEN MAP IS TAKEN IN THE SPRING

Grade	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	196	No	<0.01	5	181	204	No	<0.01
	10	179	196	No	<0.01	10	186	204	No	<0.01
	15	183	196	No	<0.01	15	189	204	No	<0.01
	20	186	196	No	<0.01	20	192	204	No	<0.01
	25	188	196	No	0.01	25	194	204	No	<0.01
	30	191	196	No	0.06	30	196	204	No	<0.01
	35	193	196	No	0.17	35	198	204	No	0.02
	40	195	196	No	0.38	40	200	204	No	0.08
	45	197	196	Yes	0.62	45	202	204	No	0.25
	50	199	196	Yes	0.83	50	203	204	No	0.37
	55	201	196	Yes	0.94	55	205	204	Yes	0.63
	60	202	196	Yes	0.97	60	207	204	Yes	0.85
	65	204	196	Yes	0.99	65	209	204	Yes	0.96
	70	207	196	Yes	>0.99	70	211	204	Yes	0.99
	75	209	196	Yes	>0.99	75	213	204	Yes	>0.99
	80	211	196	Yes	>0.99	80	215	204	Yes	>0.99
	85	214	196	Yes	>0.99	85	218	204	Yes	>0.99
	90	218	196	Yes	>0.99	90	221	204	Yes	>0.99
	95	223	196	Yes	>0.99	95	226	204	Yes	>0.99
4	5	181	206	No	<0.01	5	189	217	No	<0.01
	10	187	206	No	<0.01	10	194	217	No	<0.01
	15	190	206	No	<0.01	15	198	217	No	<0.01
	20	193	206	No	<0.01	20	201	217	No	<0.01
	25	196	206	No	<0.01	25	203	217	No	<0.01
	30	198	206	No	0.01	30	206	217	No	<0.01
	35	200	206	No	0.03	35	208	217	No	<0.01
	40	202	206	No	0.11	40	210	217	No	0.01
	45	204	206	No	0.27	45	212	217	No	0.04
	50	206	206	Yes	0.50	50	213	217	No	0.08
	55	208	206	Yes	0.73	55	215	217	No	0.25
	60	210	206	Yes	0.89	60	217	217	Yes	0.50
	65	212	206	Yes	0.97	65	219	217	Yes	0.75
	70	214	206	Yes	0.99	70	221	217	Yes	0.92
	75	216	206	Yes	>0.99	75	224	217	Yes	0.99
	80	218	206	Yes	>0.99	80	226	217	Yes	>0.99
	85	221	206	Yes	>0.99	85	229	217	Yes	>0.99
	90	225	206	Yes	>0.99	90	233	217	Yes	>0.99
	95	230	206	Yes	>0.99	95	238	217	Yes	>0.99

TABLE 6. (CONTINUED)

Grade	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	212	No	<0.01	5	195	229	No	<0.01
	10	193	212	No	<0.01	10	201	229	No	<0.01
	15	197	212	No	<0.01	15	205	229	No	<0.01
	20	199	212	No	<0.01	20	208	229	No	<0.01
	25	202	212	No	<0.01	25	210	229	No	<0.01
	30	204	212	No	0.01	30	213	229	No	<0.01
	35	206	212	No	0.03	35	215	229	No	<0.01
	40	208	212	No	0.11	40	217	229	No	<0.01
	45	210	212	No	0.27	45	219	229	No	<0.01
	50	212	212	Yes	0.50	50	221	229	No	<0.01
	55	214	212	Yes	0.73	55	223	229	No	0.02
	60	216	212	Yes	0.89	60	225	229	No	0.08
	65	217	212	Yes	0.94	65	228	229	No	0.37
	70	220	212	Yes	0.99	70	230	229	Yes	0.63
	75	222	212	Yes	>0.99	75	232	229	Yes	0.85
	80	224	212	Yes	>0.99	80	235	229	Yes	0.98
	85	227	212	Yes	>0.99	85	238	229	Yes	>0.99
	90	231	212	Yes	>0.99	90	242	229	Yes	>0.99
	95	236	212	Yes	>0.99	95	248	229	Yes	>0.99
6	5	192	216	No	<0.01	5	198	232	No	<0.01
	10	197	216	No	<0.01	10	204	232	No	<0.01
	15	201	216	No	<0.01	15	208	232	No	<0.01
	20	203	216	No	<0.01	20	211	232	No	<0.01
	25	206	216	No	<0.01	25	214	232	No	<0.01
	30	208	216	No	0.01	30	217	232	No	<0.01
	35	210	216	No	0.03	35	219	232	No	<0.01
	40	212	216	No	0.11	40	221	232	No	<0.01
	45	214	216	No	0.27	45	223	232	No	<0.01
	50	216	216	Yes	0.50	50	225	232	No	0.01
	55	218	216	Yes	0.73	55	227	232	No	0.04
	60	219	216	Yes	0.83	60	230	232	No	0.25
	65	221	216	Yes	0.94	65	232	232	Yes	0.50
	70	223	216	Yes	0.99	70	234	232	Yes	0.75
	75	226	216	Yes	>0.99	75	237	232	Yes	0.96
	80	228	216	Yes	>0.99	80	239	232	Yes	0.99
	85	231	216	Yes	>0.99	85	243	232	Yes	>0.99
	90	235	216	Yes	>0.99	90	247	232	Yes	>0.99
	95	240	216	Yes	>0.99	95	253	232	Yes	>0.99

TABLE 6. (CONTINUED)

Grade	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	218	No	<0.01	5	199	240	No	<0.01
	10	199	218	No	<0.01	10	206	240	No	<0.01
	15	202	218	No	<0.01	15	210	240	No	<0.01
	20	205	218	No	<0.01	20	214	240	No	<0.01
	25	208	218	No	<0.01	25	217	240	No	<0.01
	30	210	218	No	0.01	30	219	240	No	<0.01
	35	212	218	No	0.03	35	222	240	No	<0.01
	40	214	218	No	0.11	40	224	240	No	<0.01
	45	216	218	No	0.27	45	226	240	No	<0.01
	50	218	218	Yes	0.50	50	229	240	No	<0.01
	55	220	218	Yes	0.73	55	231	240	No	<0.01
	60	222	218	Yes	0.89	60	233	240	No	0.01
	65	224	218	Yes	0.97	65	235	240	No	0.04
	70	226	218	Yes	0.99	70	238	240	No	0.25
	75	228	218	Yes	>0.99	75	241	240	Yes	0.63
	80	231	218	Yes	>0.99	80	244	240	Yes	0.92
	85	234	218	Yes	>0.99	85	247	240	Yes	0.99
	90	238	218	Yes	>0.99	90	251	240	Yes	>0.99
	95	243	218	Yes	>0.99	95	258	240	Yes	>0.99
8	5	194	221	No	<0.01	5	199	249	No	<0.01
	10	200	221	No	<0.01	10	206	249	No	<0.01
	15	204	221	No	<0.01	15	211	249	No	<0.01
	20	207	221	No	<0.01	20	215	249	No	<0.01
	25	209	221	No	<0.01	25	218	249	No	<0.01
	30	212	221	No	<0.01	30	221	249	No	<0.01
	35	214	221	No	0.01	35	224	249	No	<0.01
	40	216	221	No	0.06	40	226	249	No	<0.01
	45	218	221	No	0.17	45	229	249	No	<0.01
	50	220	221	No	0.38	50	231	249	No	<0.01
	55	222	221	Yes	0.62	55	233	249	No	<0.01
	60	224	221	Yes	0.83	60	236	249	No	<0.01
	65	226	221	Yes	0.94	65	238	249	No	<0.01
	70	228	221	Yes	0.99	70	241	249	No	<0.01
	75	231	221	Yes	>0.99	75	244	249	No	0.04
	80	233	221	Yes	>0.99	80	247	249	No	0.25
	85	236	221	Yes	>0.99	85	251	249	Yes	0.75
	90	240	221	Yes	>0.99	90	255	249	Yes	0.98
	95	246	221	Yes	>0.99	95	262	249	Yes	>0.99

Note. %ile=percentile

TABLE 7. PROFICIENCY PROJECTION AND PROBABILITY FOR PASSING PSSA READING LEVEL 3 (PROFICIENT) WHEN MAP IS TAKEN IN THE FALL OR WINTER PRIOR TO SPRING PSSA 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	196	No	<0.01	5	171	196	No	<0.01
	10	168	196	No	0.03	10	176	196	No	<0.01
	15	172	196	No	0.06	15	180	196	No	0.01
	20	175	196	No	0.10	20	183	196	No	0.04
	25	178	196	No	0.20	25	185	196	No	0.09
	30	180	196	No	0.29	30	188	196	No	0.22
	35	182	196	No	0.34	35	190	196	No	0.28
	40	184	196	No	0.44	40	192	196	No	0.42
	45	186	196	Yes	0.56	45	194	196	Yes	0.58
	50	188	196	Yes	0.61	50	196	196	Yes	0.72
	55	190	196	Yes	0.71	55	198	196	Yes	0.83
	60	192	196	Yes	0.80	60	199	196	Yes	0.87
	65	194	196	Yes	0.84	65	201	196	Yes	0.94
	70	197	196	Yes	0.92	70	204	196	Yes	0.98
	75	199	196	Yes	0.95	75	206	196	Yes	0.99
	80	202	196	Yes	0.97	80	208	196	Yes	>0.99
	85	205	196	Yes	0.99	85	211	196	Yes	>0.99
	90	209	196	Yes	>0.99	90	215	196	Yes	>0.99
	95	214	196	Yes	>0.99	95	221	196	Yes	>0.99
4	5	173	206	No	<0.01	5	179	206	No	<0.01
	10	178	206	No	0.01	10	184	206	No	<0.01
	15	182	206	No	0.02	15	188	206	No	<0.01
	20	185	206	No	0.05	20	191	206	No	0.01
	25	188	206	No	0.09	25	194	206	No	0.04
	30	190	206	No	0.15	30	196	206	No	0.08
	35	192	206	No	0.23	35	198	206	No	0.16
	40	194	206	No	0.27	40	200	206	No	0.28
	45	196	206	No	0.38	45	202	206	No	0.35
	50	198	206	Yes	0.50	50	204	206	Yes	0.50
	55	200	206	Yes	0.56	55	205	206	Yes	0.58
	60	202	206	Yes	0.67	60	207	206	Yes	0.72
	65	204	206	Yes	0.77	65	209	206	Yes	0.84
	70	206	206	Yes	0.85	70	211	206	Yes	0.92
	75	209	206	Yes	0.91	75	214	206	Yes	0.98
	80	211	206	Yes	0.95	80	216	206	Yes	0.99
	85	214	206	Yes	0.97	85	219	206	Yes	>0.99
	90	218	206	Yes	0.99	90	223	206	Yes	>0.99
	95	224	206	Yes	>0.99	95	228	206	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	212	No	<0.01	5	186	212	No	<0.01
	10	186	212	No	0.01	10	191	212	No	<0.01
	15	190	212	No	0.02	15	195	212	No	<0.01
	20	193	212	No	0.05	20	197	212	No	0.01
	25	195	212	No	0.09	25	200	212	No	0.04
	30	198	212	No	0.15	30	202	212	No	0.06
	35	200	212	No	0.23	35	204	212	No	0.12
	40	202	212	No	0.33	40	206	212	No	0.22
	45	204	212	No	0.38	45	208	212	No	0.35
	50	206	212	Yes	0.50	50	210	212	Yes	0.50
	55	208	212	Yes	0.62	55	212	212	Yes	0.65
	60	210	212	Yes	0.72	60	214	212	Yes	0.78
	65	212	212	Yes	0.77	65	215	212	Yes	0.83
	70	214	212	Yes	0.85	70	218	212	Yes	0.94
	75	216	212	Yes	0.91	75	220	212	Yes	0.96
	80	218	212	Yes	0.93	80	222	212	Yes	0.98
	85	221	212	Yes	0.97	85	225	212	Yes	>0.99
	90	225	212	Yes	0.99	90	229	212	Yes	>0.99
	95	231	212	Yes	>0.99	95	234	212	Yes	>0.99
6	5	186	216	No	<0.01	5	190	216	No	<0.01
	10	192	216	No	0.01	10	196	216	No	<0.01
	15	196	216	No	0.03	15	199	216	No	<0.01
	20	198	216	No	0.04	20	202	216	No	0.01
	25	201	216	No	0.10	25	204	216	No	0.03
	30	203	216	No	0.16	30	207	216	No	0.09
	35	205	216	No	0.23	35	209	216	No	0.17
	40	207	216	No	0.28	40	211	216	No	0.28
	45	209	216	No	0.39	45	212	216	No	0.35
	50	211	216	Yes	0.50	50	214	216	Yes	0.50
	55	213	216	Yes	0.61	55	216	216	Yes	0.58
	60	215	216	Yes	0.67	60	218	216	Yes	0.72
	65	217	216	Yes	0.77	65	220	216	Yes	0.83
	70	219	216	Yes	0.84	70	222	216	Yes	0.91
	75	221	216	Yes	0.88	75	224	216	Yes	0.96
	80	224	216	Yes	0.94	80	226	216	Yes	0.98
	85	226	216	Yes	0.97	85	229	216	Yes	>0.99
	90	230	216	Yes	0.99	90	233	216	Yes	>0.99
	95	236	216	Yes	>0.99	95	238	216	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	218	No	<0.01	5	192	218	No	<0.01
	10	195	218	No	0.01	10	198	218	No	<0.01
	15	199	218	No	0.03	15	201	218	No	<0.01
	20	202	218	No	0.05	20	204	218	No	0.01
	25	204	218	No	0.10	25	207	218	No	0.04
	30	206	218	No	0.15	30	209	218	No	0.09
	35	209	218	No	0.23	35	211	218	No	0.17
	40	211	218	No	0.33	40	213	218	No	0.22
	45	213	218	No	0.44	45	215	218	No	0.35
	50	214	218	Yes	0.50	50	217	218	Yes	0.50
	55	216	218	Yes	0.56	55	219	218	Yes	0.65
	60	218	218	Yes	0.67	60	221	218	Yes	0.78
	65	220	218	Yes	0.77	65	223	218	Yes	0.88
	70	222	218	Yes	0.85	70	225	218	Yes	0.94
	75	225	218	Yes	0.90	75	227	218	Yes	0.97
	80	227	218	Yes	0.95	80	230	218	Yes	0.99
	85	230	218	Yes	0.98	85	232	218	Yes	>0.99
	90	234	218	Yes	0.99	90	236	218	Yes	>0.99
	95	240	218	Yes	>0.99	95	242	218	Yes	>0.99
8	5	191	221	No	<0.01	5	194	221	No	<0.01
	10	197	221	No	0.01	10	199	221	No	<0.01
	15	201	221	No	0.03	15	203	221	No	<0.01
	20	204	221	No	0.06	20	206	221	No	0.01
	25	207	221	No	0.10	25	209	221	No	0.02
	30	209	221	No	0.16	30	211	221	No	0.05
	35	211	221	No	0.22	35	213	221	No	0.10
	40	213	221	No	0.26	40	215	221	No	0.18
	45	215	221	No	0.35	45	217	221	No	0.29
	50	217	221	No	0.45	50	219	221	No	0.43
	55	219	221	Yes	0.55	55	221	221	Yes	0.57
	60	221	221	Yes	0.60	60	223	221	Yes	0.71
	65	223	221	Yes	0.69	65	225	221	Yes	0.82
	70	225	221	Yes	0.78	70	227	221	Yes	0.90
	75	228	221	Yes	0.84	75	229	221	Yes	0.95
	80	230	221	Yes	0.90	80	232	221	Yes	0.98
	85	234	221	Yes	0.96	85	235	221	Yes	0.99
	90	237	221	Yes	0.98	90	239	221	Yes	>0.99
	95	243	221	Yes	>0.99	95	244	221	Yes	>0.99

Note. %ile=percentile

TABLE 8. PROFICIENCY PROJECTION AND PROBABILITY FOR PASSING PSSA MATH LEVEL 3 (PROFICIENT) WHEN MAP IS TAKEN IN THE FALL OR WINTER PRIOR TO SPRING PSSA 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	204	No	<0.01	5	176	204	No	<0.01
	10	174	204	No	0.01	10	181	204	No	<0.01
	15	177	204	No	0.02	15	184	204	No	<0.01
	20	179	204	No	0.04	20	187	204	No	0.01
	25	182	204	No	0.11	25	189	204	No	0.02
	30	184	204	No	0.14	30	191	204	No	0.05
	35	185	204	No	0.17	35	193	204	No	0.10
	40	187	204	No	0.27	40	195	204	No	0.20
	45	189	204	No	0.38	45	197	204	No	0.34
	50	190	204	No	0.44	50	198	204	No	0.42
	55	192	204	Yes	0.56	55	200	204	Yes	0.58
	60	194	204	Yes	0.68	60	202	204	Yes	0.74
	65	195	204	Yes	0.73	65	203	204	Yes	0.80
	70	197	204	Yes	0.83	70	205	204	Yes	0.90
	75	199	204	Yes	0.86	75	207	204	Yes	0.95
	80	201	204	Yes	0.92	80	209	204	Yes	0.98
	85	204	204	Yes	0.97	85	212	204	Yes	>0.99
	90	207	204	Yes	0.99	90	215	204	Yes	>0.99
	95	212	204	Yes	>0.99	95	220	204	Yes	>0.99
4	5	179	217	No	<0.01	5	185	217	No	<0.01
	10	184	217	No	<0.01	10	190	217	No	<0.01
	15	188	217	No	<0.01	15	194	217	No	<0.01
	20	190	217	No	0.01	20	197	217	No	<0.01
	25	193	217	No	0.03	25	199	217	No	<0.01
	30	195	217	No	0.06	30	201	217	No	0.01
	35	197	217	No	0.11	35	203	217	No	0.03
	40	198	217	No	0.14	40	205	217	No	0.07
	45	200	217	No	0.22	45	207	217	No	0.14
	50	202	217	No	0.32	50	209	217	No	0.26
	55	204	217	No	0.44	55	211	217	No	0.42
	60	205	217	No	0.44	60	212	217	Yes	0.50
	65	207	217	Yes	0.56	65	214	217	Yes	0.66
	70	209	217	Yes	0.68	70	216	217	Yes	0.80
	75	211	217	Yes	0.78	75	218	217	Yes	0.90
	80	214	217	Yes	0.89	80	221	217	Yes	0.97
	85	216	217	Yes	0.94	85	223	217	Yes	0.99
	90	220	217	Yes	0.99	90	227	217	Yes	>0.99
	95	225	217	Yes	>0.99	95	232	217	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	229	No	<0.01	5	192	229	No	<0.01
	10	193	229	No	<0.01	10	198	229	No	<0.01
	15	196	229	No	<0.01	15	201	229	No	<0.01
	20	199	229	No	<0.01	20	204	229	No	<0.01
	25	202	229	No	0.01	25	207	229	No	<0.01
	30	204	229	No	0.01	30	209	229	No	<0.01
	35	206	229	No	0.03	35	211	229	No	<0.01
	40	208	229	No	0.05	40	213	229	No	0.01
	45	210	229	No	0.09	45	215	229	No	0.02
	50	211	229	No	0.12	50	217	229	No	0.05
	55	213	229	No	0.19	55	219	229	No	0.11
	60	215	229	No	0.28	60	221	229	No	0.20
	65	217	229	No	0.38	65	223	229	No	0.34
	70	219	229	Yes	0.50	70	225	229	Yes	0.50
	75	221	229	Yes	0.62	75	228	229	Yes	0.73
	80	224	229	Yes	0.77	80	230	229	Yes	0.85
	85	227	229	Yes	0.88	85	233	229	Yes	0.95
	90	230	229	Yes	0.95	90	237	229	Yes	0.99
	95	236	229	Yes	0.99	95	242	229	Yes	>0.99
6	5	192	232	No	<0.01	5	196	232	No	<0.01
	10	198	232	No	<0.01	10	202	232	No	<0.01
	15	202	232	No	<0.01	15	205	232	No	<0.01
	20	205	232	No	<0.01	20	209	232	No	<0.01
	25	207	232	No	0.01	25	211	232	No	<0.01
	30	209	232	No	0.01	30	214	232	No	<0.01
	35	212	232	No	0.04	35	216	232	No	<0.01
	40	214	232	No	0.07	40	218	232	No	0.01
	45	216	232	No	0.12	45	220	232	No	0.03
	50	218	232	No	0.19	50	222	232	No	0.07
	55	220	232	No	0.28	55	224	232	No	0.15
	60	222	232	No	0.38	60	226	232	No	0.27
	65	224	232	Yes	0.50	65	228	232	No	0.42
	70	226	232	Yes	0.62	70	230	232	Yes	0.58
	75	228	232	Yes	0.72	75	233	232	Yes	0.80
	80	231	232	Yes	0.85	80	236	232	Yes	0.93
	85	234	232	Yes	0.91	85	239	232	Yes	0.98
	90	238	232	Yes	0.97	90	243	232	Yes	>0.99
	95	243	232	Yes	>0.99	95	248	232	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	240	No	<0.01	5	198	240	No	<0.01
	10	201	240	No	<0.01	10	204	240	No	<0.01
	15	205	240	No	<0.01	15	208	240	No	<0.01
	20	209	240	No	<0.01	20	212	240	No	<0.01
	25	211	240	No	<0.01	25	215	240	No	<0.01
	30	214	240	No	<0.01	30	217	240	No	<0.01
	35	216	240	No	<0.01	35	220	240	No	<0.01
	40	218	240	No	0.01	40	222	240	No	<0.01
	45	221	240	No	0.02	45	224	240	No	<0.01
	50	223	240	No	0.05	50	226	240	No	0.01
	55	225	240	No	0.08	55	228	240	No	0.02
	60	227	240	No	0.14	60	230	240	No	0.05
	65	229	240	No	0.22	65	233	240	No	0.15
	70	231	240	No	0.32	70	235	240	No	0.26
	75	234	240	Yes	0.50	75	238	240	Yes	0.50
	80	237	240	Yes	0.68	80	240	240	Yes	0.66
	85	240	240	Yes	0.82	85	244	240	Yes	0.90
	90	244	240	Yes	0.94	90	248	240	Yes	0.98
	95	250	240	Yes	0.99	95	254	240	Yes	>0.99
8	5	197	249	No	<0.01	5	199	249	No	<0.01
	10	203	249	No	<0.01	10	206	249	No	<0.01
	15	208	249	No	<0.01	15	210	249	No	<0.01
	20	211	249	No	<0.01	20	214	249	No	<0.01
	25	214	249	No	<0.01	25	217	249	No	<0.01
	30	217	249	No	<0.01	30	220	249	No	<0.01
	35	219	249	No	<0.01	35	222	249	No	<0.01
	40	222	249	No	<0.01	40	225	249	No	<0.01
	45	224	249	No	<0.01	45	227	249	No	<0.01
	50	226	249	No	0.01	50	229	249	No	<0.01
	55	229	249	No	0.02	55	231	249	No	<0.01
	60	231	249	No	0.04	60	234	249	No	<0.01
	65	233	249	No	0.08	65	236	249	No	0.01
	70	236	249	No	0.12	70	239	249	No	0.06
	75	238	249	No	0.18	75	241	249	No	0.12
	80	241	249	No	0.30	80	245	249	No	0.35
	85	245	249	Yes	0.50	85	248	249	Yes	0.58
	90	249	249	Yes	0.70	90	253	249	Yes	0.88
	95	256	249	Yes	0.92	95	259	249	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 PSSA performance level. By using matched score data from a sample of students from Pennsylvania, 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 2015 NWEA 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 PSSA 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 PSSA 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 18 schools in Pennsylvania, 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 PSSA performance from other schools in Pennsylvania to enhance the quality and generalizability of the study.

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Appendix

Data and Analysis

Data

Data used in this study were collected from 18 schools in Pennsylvania. The sample contained matched PSSA and MAP math scores from 6,275 students in Grades 3 to 8 and matched PSSA ELA and MAP reading scores from 6,252 students in Grades 3 to 8 who completed both PSSA and MAP in the spring of 2015.

To understand the statistical characteristics of the test scores, descriptive statistics are provided in Table A1 below. As Table A1 indicates, the correlation coefficients between MAP reading and PSSA ELA scores range from 0.72 to 0.80, and the correlation coefficients between MAP and PSSA math scores range from 0.85 to 0.88. In general, all these correlations indicate a strong relationship between MAP and PSSA test scores.

TABLE A1. DESCRIPTIVE STATISTICS OF THE SAMPLE DATA

				PSSA				MAP			
Subject	**Grade**	**N**	***r***	**Mean**	**SD**	**Min**	**Max**	**Mean**	**SD**	**Min**	**Max**
ELA/ Reading	3	1,207	0.80	1092	89.42	756	1461	208	13.02	143	238
	4	1,262	0.77	1090	99.88	784	1518	216	12.15	164	253
	5	1,262	0.78	1107	115.82	772	1730	222	12.14	176	257
	6	846	0.78	1086	114.29	770	1699	224	11.94	157	267
	7	854	0.72	854	93.85	820	1652	228	10.86	180	260
	8	821	0.75	1084	100.72	754	1511	230	12.05	179	262
Math	3	1,210	0.85	1081	114.06	773	1471	212	11.84	169	247
	4	1,265	0.87	1052	100.82	791	1499	223	12.20	174	263
	5	1,266	0.88	1049	114.57	770	1470	234	14.26	171	274
	6	850	0.86	1036	98.15	750	1343	236	13.58	183	282
	7	854	0.87	1011	98.05	734	1414	241	14.03	195	286
	8	830	0.85	1000	100.91	760	1436	246	15.45	169	290

Equipercentile Linking Procedure

The equipercentile procedure (e.g., Kolen & Brennan, 2004) was used to establish the concordance relationship between PSSA 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., PSSA). 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 PSSA 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 PSSA tests.

To calculate consistency rate of classification, sample students were designated "Below PSSA cut" or "At or above PSSA cut" based on their actual PSSA 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 PSSA 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 PSSA 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 PSSA 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 PSSA 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 PSSA 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 PSSA TO MAP CONCORDANCE

		PSSA Score	
		Below PSSA cut	At or Above PSSA 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 PSSA 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 PSSA, 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 PSSA 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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