

# Linking the Wisconsin Forward 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 Wisconsin Forward Assessments English Language Arts (ELA) and math with those of the MAP Reading and MAP for Mathematics assessments. In this report, we present the 2<sup>nd</sup> through 8<sup>th</sup> grade cut scores on MAP reading and mathematics scales that correspond to the benchmarks on the Forward 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 Forward 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

Forward includes a series of achievement tests aligned to the Wisconsin Academic Standards in ELA and math for grades 3-8. Forward tests are delivered both online and 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.

MAP tests are interim assessments that are administered in the form of 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 Wisconsin State Standards. Like Forward, 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 Forward Readiness Levels

Tables 1 to 4 report the Forward scaled scores associated with each of the four performance levels, as well as the estimated score range on the MAP tests associated with each Forward performance level. 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 Forward performance level, based on their observed MAP scores. For example, a 5<sup>th</sup> 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 Forward taken during that same testing season (see Table 2). Similarly, a 3<sup>rd</sup> grade student who obtained a MAP reading score of 215 in the fall testing season is likely to be at Level 4 (Advanced) on the Forward taken in the spring of 3<sup>rd</sup> grade (see Table 3).

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

FORWARD								
Grade	Level 1 <i>Below Basic</i>		Level 2 <i>Basic</i>		Level 3 <i>Proficient</i>		Level 4 <i>Advanced</i>	
	3	330-521		522-569		<b>570-623</b>		624-900
4	340-545		546-591		<b>592-649</b>		650-930	
5	350-563		564-609		<b>610-669</b>		670-940	
6	360-571		572-621		<b>622-670</b>		671-950	
7	370-584		585-637		<b>638-696</b>		697-960	
8	380-591		592-651		<b>652-707</b>		708-970	

  

MAP								
Grade	Level 1 <i>Below Basic</i>		Level 2 <i>Basic</i>		Level 3 <i>Proficient</i>		Level 4 <i>Advanced</i>	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
	2	100-177	1-23	178-193	24-62	<b>194-207</b>	63-89	208-350
3	100-187	1-23	188-203	24-62	<b>204-217</b>	63-89	218-350	90-99
4	100-196	1-26	197-210	27-62	<b>211-225</b>	63-90	226-350	91-99
5	100-202	1-26	203-216	27-62	<b>217-230</b>	63-89	231-350	90-99
6	100-207	1-28	208-220	29-62	<b>221-232</b>	63-87	233-350	88-99
7	100-211	1-33	212-225	34-68	<b>226-238</b>	69-91	239-350	92-99
8	100-214	1-36	215-228	37-70	<b>229-240</b>	71-90	241-350	91-99

Notes. 1. %ile=percentile.

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

3. High-lighted text denotes Grade 2 benchmarks are extrapolated from Grade 3 cut scores.

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

FORWARD								
Grade	Level 1		Level 2		Level 3		Level 4	
	<i>Below Basic</i>		<i>Basic</i>		<i>Proficient</i>		<i>Advanced</i>	
3	360-516		517-559		<b>560-610</b>		611-760	
4	405-535		536-587		<b>588-632</b>		633-800	
5	430-573		574-610		<b>611-657</b>		658-830	
6	440-581		582-625		<b>626-687</b>		688-870	
7	450-605		606-646		<b>647-711</b>		712-880	
8	470-619		620-666		<b>667-717</b>		718-890	

  

MAP								
Grade	Level 1		Level 2		Level 3		Level 4	
	<i>Below Basic</i>		<i>Basic</i>		<i>Proficient</i>		<i>Advanced</i>	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
2	100-182	1-23	183-193	24-54	<b>194-209</b>	55-90	210-350	91-99
3	100-193	1-23	194-205	24-56	<b>206-221</b>	57-90	222-350	91-99
4	100-201	1-21	202-215	22-55	<b>216-230</b>	56-87	231-350	88-99
5	100-212	1-29	213-225	30-60	<b>226-242</b>	61-90	243-350	91-99
6	100-216	1-29	217-230	30-62	<b>231-249</b>	63-92	250-350	93-99
7	100-223	1-38	224-236	39-67	<b>237-258</b>	68-95*	259-350	95*-99
8	100-226	1-40	227-243	41-74	<b>244-263</b>	75-95	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. High-lighted text denotes Grade 2 benchmarks are extrapolated from Grade 3 cut scores.

4. \* 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 FORWARD ELA AND MAP READING (WHEN MAP IS TAKEN IN FALL OR WINTER PRIOR TO SPRING FORWARD TESTS)

FORWARD								
Grade	Level 1		Level 2		Level 3		Level 4	
	<i>Below Basic</i>		<i>Basic</i>		<i>Proficient</i>		<i>Advanced</i>	
3	330-521		522-569		<b>570-623</b>		624-900	
4	340-545		546-591		<b>592-649</b>		650-930	
5	350-563		564-609		<b>610-669</b>		670-940	
6	360-571		572-621		<b>622-670</b>		671-950	
7	370-584		585-637		<b>638-696</b>		697-960	
8	380-591		592-651		<b>652-707</b>		708-970	

  

MAP FALL								
Grade	Level 1		Level 2		Level 3		Level 4	
	<i>Below Basic</i>		<i>Basic</i>		<i>Proficient</i>		<i>Advanced</i>	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
2	100-161	1-19	162-180	20-64	<b>181-197</b>	65-92	198-350	93-99
3	100-175	1-20	176-194	21-65	<b>195-210</b>	66-91	211-350	92-99
4	100-187	1-24	188-203	25-63	<b>204-220</b>	64-92	221-350	93-99
5	100-194	1-23	195-211	24-64	<b>212-227</b>	65-92	228-350	93-99
6	100-201	1-26	202-216	27-64	<b>217-230</b>	65-90	231-350	91-99
7	100-206	1-30	207-222	31-70	<b>223-236</b>	71-92	237-350	93-99
8	100-210	1-33	211-226	34-72	<b>227-238</b>	73-91	239-350	92-99

  

MAP WINTER								
Grade	Level 1		Level 2		Level 3		Level 4	
	<i>Below Basic</i>		<i>Basic</i>		<i>Proficient</i>		<i>Advanced</i>	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
2	100-172	1-21	173-189	22-63	<b>190-203</b>	64-90	204-350	91-99
3	100-183	1-21	184-200	22-62	<b>201-215</b>	63-90	216-350	91-99
4	100-193	1-24	194-208	25-62	<b>209-224</b>	63-91	225-350	92-99
5	100-199	1-24	200-214	25-62	<b>215-229</b>	63-91	230-350	92-99
6	100-205	1-27	206-219	28-64	<b>220-231</b>	65-88	232-350	89-99
7	100-209	1-31	210-224	32-69	<b>225-237</b>	70-91	238-350	92-99
8	100-213	1-35	214-227	36-70	<b>228-239</b>	71-90	240-350	91-99

Notes. 1. %ile=percentile.

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

3. High-lighted text denotes Grade 2 benchmarks are extrapolated from Grade 3 cut scores.

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

FORWARD									
Grade	Level 1 <i>Below Basic</i>		Level 2 <i>Basic</i>		Level 3 <i>Proficient</i>		Level 4 <i>Advanced</i>		
	3	360-516		517-559		<b>560-610</b>		611-760	
4	405-535		536-587		<b>588-632</b>		633-800		
5	430-573		574-610		<b>611-657</b>		658-830		
6	440-581		582-625		<b>626-687</b>		688-870		
7	450-605		606-646		<b>647-711</b>		712-880		
8	470-619		620-666		<b>667-717</b>		718-890		
MAP FALL									
Grade	Level 1 <i>Below Basic</i>		Level 2 <i>Basic</i>		Level 3 <i>Proficient</i>		Level 4 <i>Advanced</i>		
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile	
2	100-165	1-19	166-178	20-54	<b>179-196</b>	55-93	197-350	94-99	
3	100-179	1-20	180-192	21-56	<b>193-209</b>	57-92	210-350	93-99	
4	100-189	1-18	190-203	19-54	<b>204-219</b>	55-89	220-350	90-99	
5	100-202	1-27	203-215	28-60	<b>216-232</b>	61-92	233-350	93-99	
6	100-208	1-27	209-222	28-62	<b>223-242</b>	63-94	243-350	95-99	
7	100-217	1-37	218-230	38-68	<b>231-252</b>	69-96	253-350	96-99	
8	100-221	1-39	222-239	40-77	<b>240-259</b>	78-96	260-350	97-99	
MAP WINTER									
Grade	Level 1 <i>Below Basic</i>		Level 2 <i>Basic</i>		Level 3 <i>Proficient</i>		Level 4 <i>Advanced</i>		
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile	
2	100-176	1-22	177-187	23-53	<b>188-204</b>	54-91	205-350	92-99	
3	100-188	1-23	189-200	24-56	<b>201-216</b>	57-91	217-350	92-99	
4	100-196	1-19	197-210	20-54	<b>211-225</b>	55-88	226-350	89-99	
5	100-208	1-28	209-221	29-60	<b>222-238</b>	61-91	239-350	92-99	
6	100-213	1-29	214-227	30-63	<b>228-246</b>	64-93	247-350	94-99	
7	100-221	1-39	222-234	40-68	<b>235-256</b>	69-96*	257-350	96*-99	
8	100-224	1-39	225-241	40-75	<b>242-261</b>	76-96*	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. High-lighted text denotes Grade 2 benchmarks are extrapolated from Grade 3 cut scores.

4. \* 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 on the Forward 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 Forward 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 Forward ELA test 81-83% of the time and MAP math scores can consistently classify students on Forward math test 86-88% of the time. Those numbers are high suggesting that both MAP reading and math tests are great predictors of students’ proficiency status on the Forward tests.

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

Grade	ELA/Reading			Math		
	Consistency Rate	False		Consistency Rate	False	
		Positives	Negatives		Positives	Negatives
3	0.82	0.09	0.09	0.86	0.08	0.06
4	0.82	0.10	0.08	0.87	0.08	0.05
5	0.81	0.10	0.09	0.86	0.08	0.06
6	0.82	0.10	0.08	0.87	0.06	0.07
7	0.83	0.08	0.09	0.88	0.08	0.04
8	0.82	0.09	0.09	0.87	0.08	0.05



## Proficiency Projection

Proficiency projection tells how likely a student is classified as “Proficient” on Forward 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 Forward tests are presented in Tables 6 to 8. These tables estimate the probability of scoring at Level 3 or above on Forward in the spring and the prior fall or winter testing season. For example, if a 3<sup>rd</sup> grade student obtained a MAP reading score of 199 in the fall, the probability of obtaining a Level 3 or higher Forward score in the spring of 3<sup>rd</sup> grade is 71%. 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 Forward tests.

**TABLE 6. PROFICIENCY PROJECTION AND PROBABILITY FOR PASSING FORWARD 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.
2	5	164	194	No	<0.01	5	170	194	No	<0.01
	10	169	194	No	<0.01	10	175	194	No	<0.01
	15	173	194	No	<0.01	15	178	194	No	<0.01
	20	176	194	No	<0.01	20	181	194	No	<0.01
	25	178	194	No	<0.01	25	183	194	No	<0.01
	30	181	194	No	<0.01	30	185	194	No	<0.01
	35	183	194	No	<0.01	35	187	194	No	0.01
	40	185	194	No	<0.01	40	189	194	No	0.04
	45	187	194	No	0.01	45	190	194	No	0.08
	50	189	194	No	0.06	50	192	194	No	0.25
	55	191	194	No	0.17	55	194	194	Yes	0.50
	60	193	194	No	0.38	60	196	194	Yes	0.75
	65	195	194	Yes	0.62	65	197	194	Yes	0.85
	70	197	194	Yes	0.83	70	199	194	Yes	0.96
	75	199	194	Yes	0.94	75	201	194	Yes	0.99
	80	201	194	Yes	0.99	80	204	194	Yes	>0.99
	85	204	194	Yes	>0.99	85	206	194	Yes	>0.99
90	208	194	Yes	>0.99	90	209	194	Yes	>0.99	
95	214	194	Yes	>0.99	95	214	194	Yes	>0.99	
3	5	174	204	No	<0.01	5	181	206	No	<0.01
	10	179	204	No	<0.01	10	186	206	No	<0.01
	15	183	204	No	<0.01	15	189	206	No	<0.01
	20	186	204	No	<0.01	20	192	206	No	<0.01
	25	188	204	No	<0.01	25	194	206	No	<0.01
	30	191	204	No	<0.01	30	196	206	No	<0.01
	35	193	204	No	<0.01	35	198	206	No	<0.01
	40	195	204	No	<0.01	40	200	206	No	0.02
	45	197	204	No	0.01	45	202	206	No	0.08
	50	199	204	No	0.06	50	203	206	No	0.15
	55	201	204	No	0.17	55	205	206	No	0.37
	60	202	204	No	0.27	60	207	206	Yes	0.63
	65	204	204	Yes	0.50	65	209	206	Yes	0.85
	70	207	204	Yes	0.83	70	211	206	Yes	0.96
	75	209	204	Yes	0.94	75	213	206	Yes	0.99
	80	211	204	Yes	0.99	80	215	206	Yes	>0.99
	85	214	204	Yes	>0.99	85	218	206	Yes	>0.99
90	218	204	Yes	>0.99	90	221	206	Yes	>0.99	
95	223	204	Yes	>0.99	95	226	206	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.
4	5	181	211	No	<0.01	5	189	216	No	<0.01
	10	187	211	No	<0.01	10	194	216	No	<0.01
	15	190	211	No	<0.01	15	198	216	No	<0.01
	20	193	211	No	<0.01	20	201	216	No	<0.01
	25	196	211	No	<0.01	25	203	216	No	<0.01
	30	198	211	No	<0.01	30	206	216	No	<0.01
	35	200	211	No	<0.01	35	208	216	No	<0.01
	40	202	211	No	<0.01	40	210	216	No	0.02
	45	204	211	No	0.01	45	212	216	No	0.08
	50	206	211	No	0.06	50	213	216	No	0.15
	55	208	211	No	0.17	55	215	216	No	0.37
	60	210	211	No	0.38	60	217	216	Yes	0.63
	65	212	211	Yes	0.62	65	219	216	Yes	0.85
	70	214	211	Yes	0.83	70	221	216	Yes	0.96
	75	216	211	Yes	0.94	75	224	216	Yes	>0.99
	80	218	211	Yes	0.99	80	226	216	Yes	>0.99
85	221	211	Yes	>0.99	85	229	216	Yes	>0.99	
90	225	211	Yes	>0.99	90	233	216	Yes	>0.99	
95	230	211	Yes	>0.99	95	238	216	Yes	>0.99	
5	5	188	217	No	<0.01	5	195	226	No	<0.01
	10	193	217	No	<0.01	10	201	226	No	<0.01
	15	197	217	No	<0.01	15	205	226	No	<0.01
	20	199	217	No	<0.01	20	208	226	No	<0.01
	25	202	217	No	<0.01	25	210	226	No	<0.01
	30	204	217	No	<0.01	30	213	226	No	<0.01
	35	206	217	No	<0.01	35	215	226	No	<0.01
	40	208	217	No	<0.01	40	217	226	No	<0.01
	45	210	217	No	0.01	45	219	226	No	0.01
	50	212	217	No	0.06	50	221	226	No	0.04
	55	214	217	No	0.17	55	223	226	No	0.15
	60	216	217	No	0.38	60	225	226	No	0.37
	65	217	217	Yes	0.50	65	228	226	Yes	0.75
	70	220	217	Yes	0.83	70	230	226	Yes	0.92
	75	222	217	Yes	0.94	75	232	226	Yes	0.98
	80	224	217	Yes	0.99	80	235	226	Yes	>0.99
85	227	217	Yes	>0.99	85	238	226	Yes	>0.99	
90	231	217	Yes	>0.99	90	242	226	Yes	>0.99	
95	236	217	Yes	>0.99	95	248	226	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.
6	5	192	221	No	<0.01	5	198	231	No	<0.01
	10	197	221	No	<0.01	10	204	231	No	<0.01
	15	201	221	No	<0.01	15	208	231	No	<0.01
	20	203	221	No	<0.01	20	211	231	No	<0.01
	25	206	221	No	<0.01	25	214	231	No	<0.01
	30	208	221	No	<0.01	30	217	231	No	<0.01
	35	210	221	No	<0.01	35	219	231	No	<0.01
	40	212	221	No	<0.01	40	221	231	No	<0.01
	45	214	221	No	0.01	45	223	231	No	<0.01
	50	216	221	No	0.06	50	225	231	No	0.02
	55	218	221	No	0.17	55	227	231	No	0.08
	60	219	221	No	0.27	60	230	231	No	0.37
	65	221	221	Yes	0.50	65	232	231	Yes	0.63
	70	223	221	Yes	0.73	70	234	231	Yes	0.85
	75	226	221	Yes	0.94	75	237	231	Yes	0.98
	80	228	221	Yes	0.99	80	239	231	Yes	>0.99
85	231	221	Yes	>0.99	85	243	231	Yes	>0.99	
90	235	221	Yes	>0.99	90	247	231	Yes	>0.99	
95	240	221	Yes	>0.99	95	253	231	Yes	>0.99	
7	5	193	226	No	<0.01	5	199	237	No	<0.01
	10	199	226	No	<0.01	10	206	237	No	<0.01
	15	202	226	No	<0.01	15	210	237	No	<0.01
	20	205	226	No	<0.01	20	214	237	No	<0.01
	25	208	226	No	<0.01	25	217	237	No	<0.01
	30	210	226	No	<0.01	30	219	237	No	<0.01
	35	212	226	No	<0.01	35	222	237	No	<0.01
	40	214	226	No	<0.01	40	224	237	No	<0.01
	45	216	226	No	<0.01	45	226	237	No	<0.01
	50	218	226	No	0.01	50	229	237	No	<0.01
	55	220	226	No	0.03	55	231	237	No	0.02
	60	222	226	No	0.11	60	233	237	No	0.08
	65	224	226	No	0.27	65	235	237	No	0.25
	70	226	226	Yes	0.50	70	238	237	Yes	0.63
	75	228	226	Yes	0.73	75	241	237	Yes	0.92
	80	231	226	Yes	0.94	80	244	237	Yes	0.99
85	234	226	Yes	0.99	85	247	237	Yes	>0.99	
90	238	226	Yes	>0.99	90	251	237	Yes	>0.99	
95	243	226	Yes	>0.99	95	258	237	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.
8	5	194	229	No	<0.01	5	199	244	No	<0.01
	10	200	229	No	<0.01	10	206	244	No	<0.01
	15	204	229	No	<0.01	15	211	244	No	<0.01
	20	207	229	No	<0.01	20	215	244	No	<0.01
	25	209	229	No	<0.01	25	218	244	No	<0.01
	30	212	229	No	<0.01	30	221	244	No	<0.01
	35	214	229	No	<0.01	35	224	244	No	<0.01
	40	216	229	No	<0.01	40	226	244	No	<0.01
	45	218	229	No	<0.01	45	229	244	No	<0.01
	50	220	229	No	<0.01	50	231	244	No	<0.01
	55	222	229	No	0.01	55	233	244	No	<0.01
	60	224	229	No	0.06	60	236	244	No	<0.01
	65	226	229	No	0.17	65	238	244	No	0.02
	70	228	229	No	0.38	70	241	244	No	0.15
	75	231	229	Yes	0.73	75	244	244	Yes	0.50
	80	233	229	Yes	0.89	80	247	244	Yes	0.85
85	236	229	Yes	0.99	85	251	244	Yes	0.99	
90	240	229	Yes	>0.99	90	255	244	Yes	>0.99	
95	246	229	Yes	>0.99	95	262	244	Yes	>0.99	

Note. %ile=percentile

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

Grade	Start %ile	RIT Fall	Projected Proficiency			Start %ile	RIT Winter	Projected Proficiency		
			Cut Score	Level 3	Prob.			Cut Score	Level 3	Prob.
2	5	149	194	No	<0.01	5	160	194	No	<0.01
	10	155	194	No	<0.01	10	165	194	No	<0.01
	15	159	194	No	0.01	15	169	194	No	<0.01
	20	162	194	No	0.02	20	172	194	No	<0.01
	25	164	194	No	0.04	25	174	194	No	<0.01
	30	167	194	No	0.06	30	176	194	No	0.01
	35	169	194	No	0.10	35	178	194	No	0.02
	40	171	194	No	0.15	40	180	194	No	0.05
	45	173	194	No	0.19	45	182	194	No	0.10
	50	175	194	No	0.26	50	184	194	No	0.18
	55	177	194	No	0.35	55	186	194	No	0.23
	60	179	194	No	0.40	60	188	194	No	0.36
	65	181	194	Yes	0.50	65	190	194	Yes	0.50
	70	183	194	Yes	0.60	70	192	194	Yes	0.64
	75	185	194	Yes	0.65	75	194	194	Yes	0.77
	80	188	194	Yes	0.78	80	197	194	Yes	0.90
	85	191	194	Yes	0.85	85	200	194	Yes	0.97
90	195	194	Yes	0.94	90	203	194	Yes	0.99	
95	200	194	Yes	0.98	95	209	194	Yes	>0.99	
3	5	162	204	No	<0.01	5	171	204	No	<0.01
	10	168	204	No	<0.01	10	176	204	No	<0.01
	15	172	204	No	<0.01	15	180	204	No	<0.01
	20	175	204	No	0.01	20	183	204	No	<0.01
	25	178	204	No	0.03	25	185	204	No	<0.01
	30	180	204	No	0.05	30	188	204	No	0.01
	35	182	204	No	0.06	35	190	204	No	0.02
	40	184	204	No	0.10	40	192	204	No	0.04
	45	186	204	No	0.16	45	194	204	No	0.09
	50	188	204	No	0.20	50	196	204	No	0.17
	55	190	204	No	0.29	55	198	204	No	0.28
	60	192	204	No	0.39	60	199	204	No	0.35
	65	194	204	No	0.44	65	201	204	Yes	0.50
	70	197	204	Yes	0.61	70	204	204	Yes	0.72
	75	199	204	Yes	0.71	75	206	204	Yes	0.78
	80	202	204	Yes	0.80	80	208	204	Yes	0.87
	85	205	204	Yes	0.90	85	211	204	Yes	0.96
90	209	204	Yes	0.95	90	215	204	Yes	0.99	
95	214	204	Yes	0.99	95	221	204	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.
4	5	173	211	No	<0.01	5	179	211	No	<0.01
	10	178	211	No	<0.01	10	184	211	No	<0.01
	15	182	211	No	<0.01	15	188	211	No	<0.01
	20	185	211	No	0.01	20	191	211	No	<0.01
	25	188	211	No	0.02	25	194	211	No	<0.01
	30	190	211	No	0.04	30	196	211	No	0.01
	35	192	211	No	0.07	35	198	211	No	0.02
	40	194	211	No	0.09	40	200	211	No	0.06
	45	196	211	No	0.15	45	202	211	No	0.08
	50	198	211	No	0.23	50	204	211	No	0.16
	55	200	211	No	0.27	55	205	211	No	0.22
	60	202	211	No	0.38	60	207	211	No	0.35
	65	204	211	Yes	0.50	65	209	211	Yes	0.50
	70	206	211	Yes	0.62	70	211	211	Yes	0.65
	75	209	211	Yes	0.73	75	214	211	Yes	0.84
	80	211	211	Yes	0.82	80	216	211	Yes	0.92
	85	214	211	Yes	0.88	85	219	211	Yes	0.96
90	218	211	Yes	0.96	90	223	211	Yes	0.99	
95	224	211	Yes	0.99	95	228	211	Yes	>0.99	
5	5	181	217	No	<0.01	5	186	217	No	<0.01
	10	186	217	No	<0.01	10	191	217	No	<0.01
	15	190	217	No	<0.01	15	195	217	No	<0.01
	20	193	217	No	0.01	20	197	217	No	<0.01
	25	195	217	No	0.02	25	200	217	No	<0.01
	30	198	217	No	0.04	30	202	217	No	0.01
	35	200	217	No	0.07	35	204	217	No	0.02
	40	202	217	No	0.12	40	206	217	No	0.04
	45	204	217	No	0.15	45	208	217	No	0.09
	50	206	217	No	0.23	50	210	217	No	0.17
	55	208	217	No	0.33	55	212	217	No	0.28
	60	210	217	No	0.44	60	214	217	No	0.42
	65	212	217	Yes	0.50	65	215	217	Yes	0.50
	70	214	217	Yes	0.62	70	218	217	Yes	0.72
	75	216	217	Yes	0.72	75	220	217	Yes	0.78
	80	218	217	Yes	0.77	80	222	217	Yes	0.88
	85	221	217	Yes	0.88	85	225	217	Yes	0.96
90	225	217	Yes	0.95	90	229	217	Yes	0.99	
95	231	217	Yes	0.99	95	234	217	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.
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	
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	



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.
8	5	191	229	No	<0.01	5	194	229	No	<0.01
	10	197	229	No	<0.01	10	199	229	No	<0.01
	15	201	229	No	<0.01	15	203	229	No	<0.01
	20	204	229	No	0.01	20	206	229	No	<0.01
	25	207	229	No	0.01	25	209	229	No	<0.01
	30	209	229	No	0.02	30	211	229	No	<0.01
	35	211	229	No	0.04	35	213	229	No	<0.01
	40	213	229	No	0.05	40	215	229	No	0.01
	45	215	229	No	0.08	45	217	229	No	0.02
	50	217	229	No	0.13	50	219	229	No	0.05
	55	219	229	No	0.19	55	221	229	No	0.10
	60	221	229	No	0.22	60	223	229	No	0.18
	65	223	229	No	0.31	65	225	229	No	0.29
	70	225	229	No	0.40	70	227	229	No	0.43
	75	228	229	Yes	0.50	75	229	229	Yes	0.57
	80	230	229	Yes	0.60	80	232	229	Yes	0.71
	85	234	229	Yes	0.78	85	235	229	Yes	0.86
90	237	229	Yes	0.84	90	239	229	Yes	0.97	
95	243	229	Yes	0.96	95	244	229	Yes	>0.99	

Note. %ile=percentile

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

Grade	Start %ile	RIT Fall	Projected Proficiency			Start %ile	RIT Winter	Projected Proficiency		
			Cut Score	Level 3	Prob.			Cut Score	Level 3	Prob.
2	5	155	194	No	<0.01	5	165	194	No	<0.01
	10	160	194	No	0.01	10	170	194	No	<0.01
	15	163	194	No	0.02	15	173	194	No	<0.01
	20	166	194	No	0.06	20	175	194	No	<0.01
	25	168	194	No	0.07	25	178	194	No	0.02
	30	170	194	No	0.12	30	180	194	No	0.05
	35	172	194	No	0.19	35	181	194	No	0.08
	40	174	194	No	0.28	40	183	194	No	0.15
	45	175	194	No	0.28	45	185	194	No	0.27
	50	177	194	No	0.39	50	186	194	No	0.34
	55	179	194	Yes	0.50	55	188	194	Yes	0.50
	60	180	194	Yes	0.56	60	190	194	Yes	0.66
	65	182	194	Yes	0.67	65	191	194	Yes	0.73
	70	184	194	Yes	0.72	70	193	194	Yes	0.79
	75	186	194	Yes	0.81	75	195	194	Yes	0.89
	80	188	194	Yes	0.88	80	197	194	Yes	0.95
	85	191	194	Yes	0.94	85	200	194	Yes	0.99
90	194	194	Yes	0.97	90	203	194	Yes	>0.99	
95	199	194	Yes	>0.99	95	208	194	Yes	>0.99	
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	

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.
4	5	179	216	No	<0.01	5	185	216	No	<0.01
	10	184	216	No	<0.01	10	190	216	No	<0.01
	15	188	216	No	0.01	15	194	216	No	<0.01
	20	190	216	No	0.01	20	197	216	No	<0.01
	25	193	216	No	0.04	25	199	216	No	0.01
	30	195	216	No	0.08	30	201	216	No	0.02
	35	197	216	No	0.14	35	203	216	No	0.05
	40	198	216	No	0.17	40	205	216	No	0.10
	45	200	216	No	0.27	45	207	216	No	0.20
	50	202	216	No	0.38	50	209	216	No	0.34
	55	204	216	Yes	0.50	55	211	216	Yes	0.50
	60	205	216	Yes	0.50	60	212	216	Yes	0.58
	65	207	216	Yes	0.62	65	214	216	Yes	0.74
	70	209	216	Yes	0.73	70	216	216	Yes	0.86
	75	211	216	Yes	0.83	75	218	216	Yes	0.93
	80	214	216	Yes	0.92	80	221	216	Yes	0.98
	85	216	216	Yes	0.96	85	223	216	Yes	0.99
90	220	216	Yes	0.99	90	227	216	Yes	>0.99	
95	225	216	Yes	>0.99	95	232	216	Yes	>0.99	
5	5	187	226	No	<0.01	5	192	226	No	<0.01
	10	193	226	No	<0.01	10	198	226	No	<0.01
	15	196	226	No	<0.01	15	201	226	No	<0.01
	20	199	226	No	0.01	20	204	226	No	<0.01
	25	202	226	No	0.02	25	207	226	No	<0.01
	30	204	226	No	0.04	30	209	226	No	<0.01
	35	206	226	No	0.07	35	211	226	No	0.01
	40	208	226	No	0.12	40	213	226	No	0.03
	45	210	226	No	0.19	45	215	226	No	0.07
	50	211	226	No	0.23	50	217	226	No	0.15
	55	213	226	No	0.33	55	219	226	No	0.27
	60	215	226	No	0.44	60	221	226	No	0.42
	65	217	226	Yes	0.56	65	223	226	Yes	0.58
	70	219	226	Yes	0.67	70	225	226	Yes	0.73
	75	221	226	Yes	0.77	75	228	226	Yes	0.89
	80	224	226	Yes	0.88	80	230	226	Yes	0.95
	85	227	226	Yes	0.95	85	233	226	Yes	0.99
90	230	226	Yes	0.98	90	237	226	Yes	>0.99	
95	236	226	Yes	>0.99	95	242	226	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.
6	5	192	231	No	<0.01	5	196	231	No	<0.01
	10	198	231	No	<0.01	10	202	231	No	<0.01
	15	202	231	No	<0.01	15	205	231	No	<0.01
	20	205	231	No	<0.01	20	209	231	No	<0.01
	25	207	231	No	0.01	25	211	231	No	<0.01
	30	209	231	No	0.02	30	214	231	No	<0.01
	35	212	231	No	0.05	35	216	231	No	0.01
	40	214	231	No	0.09	40	218	231	No	0.02
	45	216	231	No	0.15	45	220	231	No	0.05
	50	218	231	No	0.23	50	222	231	No	0.11
	55	220	231	No	0.33	55	224	231	No	0.20
	60	222	231	No	0.44	60	226	231	No	0.34
	65	224	231	Yes	0.56	65	228	231	Yes	0.50
	70	226	231	Yes	0.67	70	230	231	Yes	0.66
	75	228	231	Yes	0.77	75	233	231	Yes	0.85
	80	231	231	Yes	0.88	80	236	231	Yes	0.95
	85	234	231	Yes	0.93	85	239	231	Yes	0.99
90	238	231	Yes	0.98	90	243	231	Yes	>0.99	
95	243	231	Yes	>0.99	95	248	231	Yes	>0.99	
7	5	195	237	No	<0.01	5	198	237	No	<0.01
	10	201	237	No	<0.01	10	204	237	No	<0.01
	15	205	237	No	<0.01	15	208	237	No	<0.01
	20	209	237	No	<0.01	20	212	237	No	<0.01
	25	211	237	No	<0.01	25	215	237	No	<0.01
	30	214	237	No	<0.01	30	217	237	No	<0.01
	35	216	237	No	0.01	35	220	237	No	<0.01
	40	218	237	No	0.02	40	222	237	No	<0.01
	45	221	237	No	0.06	45	224	237	No	0.01
	50	223	237	No	0.11	50	226	237	No	0.03
	55	225	237	No	0.18	55	228	237	No	0.07
	60	227	237	No	0.27	60	230	237	No	0.15
	65	229	237	No	0.38	65	233	237	No	0.34
	70	231	237	Yes	0.50	70	235	237	Yes	0.50
	75	234	237	Yes	0.68	75	238	237	Yes	0.74
	80	237	237	Yes	0.82	80	240	237	Yes	0.85
	85	240	237	Yes	0.92	85	244	237	Yes	0.97
90	244	237	Yes	0.98	90	248	237	Yes	>0.99	
95	250	237	Yes	>0.99	95	254	237	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.
8	5	197	244	No	<0.01	5	199	244	No	<0.01
	10	203	244	No	<0.01	10	206	244	No	<0.01
	15	208	244	No	<0.01	15	210	244	No	<0.01
	20	211	244	No	<0.01	20	214	244	No	<0.01
	25	214	244	No	<0.01	25	217	244	No	<0.01
	30	217	244	No	<0.01	30	220	244	No	<0.01
	35	219	244	No	<0.01	35	222	244	No	<0.01
	40	222	244	No	0.01	40	225	244	No	<0.01
	45	224	244	No	0.02	45	227	244	No	<0.01
	50	226	244	No	0.04	50	229	244	No	<0.01
	55	229	244	No	0.10	55	231	244	No	0.01
	60	231	244	No	0.15	60	234	244	No	0.06
	65	233	244	No	0.22	65	236	244	No	0.12
	70	236	244	No	0.30	70	239	244	No	0.28
	75	238	244	No	0.40	75	241	244	No	0.42
	80	241	244	Yes	0.55	80	245	244	Yes	0.72
	85	245	244	Yes	0.74	85	248	244	Yes	0.88
90	249	244	Yes	0.88	90	253	244	Yes	0.99	
95	256	244	Yes	0.98	95	259	244	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 2 to 8 that correspond to each Forward performance level. By using matched score data from a sample of students from Wisconsin, 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 Forward 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 Forward 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 99 schools in Wisconsin, 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 Forward performance from other schools in Wisconsin to enhance the quality and generalizability of the study.

## References

- Hanson, B. A., Harris, D. J., Pommerich, M., Sconing, J. A., & Yi, Q. (2001). *Suggestions for the evaluation and use of concordance results*. (ACT Research Report No. 2001-1). Iowa City, IA: ACT, Inc.
- Kolen, M. J., & Brennan, R. L. (2004). *Test equating, scaling, and linking*. New York: Springer.
- Pommerich, M., Hanson, B., Harris, D., & Sconing, J. (2004). Issues in conducting linkage between distinct tests. *Applied Psychological Measurement*, 28(4), 247-273.
- Thum Y. M., & Hauser, C. H. (2015). *NWEA 2015 MAP Norms for Student and School Achievement Status and Growth*. NWEA Research Report. Portland, OR: NWEA.

## Appendix

### Data and Analysis

#### Data

Data used in this study were collected from 99 schools in Wisconsin. The sample contained matched Forward ELA and MAP reading scores from 26,785 students in Grades 3 to 8 and matched Forward and MAP math scores from 27,467 students in Grades 3 to 8 who completed both Forward and MAP in the spring of 2016.

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 Forward ELA scores range from 0.78 to 0.81, and the correlation coefficients between MAP and Forward math scores range from 0.85 to 0.89. In general, all these correlations indicate a strong relationship between MAP and Forward test scores.

TABLE A1. DESCRIPTIVE STATISTICS OF THE SAMPLE DATA

Subject	Grade	N	<i>r</i>	FORWARD				MAP			
				Mean	SD	Min	Max	Mean	SD	Min	Max
ELA/ Reading	3	4282	0.79	570.64	46.10	431	761	202.7	14.69	150	242
	4	4127	0.79	593.23	47.75	412	816	210.04	14.13	147	252
	5	4616	0.78	612.71	49.76	414	846	216.36	14.00	141	256
	6	4686	0.81	619.16	51.33	360	847	219.27	13.95	154	257
	7	4697	0.81	631.30	51.96	445	960	223.19	13.51	155	261
	8	4377	0.80	645.72	56.79	463	970	226.72	13.62	153	267
Math	3	4530	0.86	565.70	44.98	360	760	208.15	13.38	144	255
	4	4337	0.85	589.71	50.66	405	800	218.25	14.24	141	281
	5	4866	0.86	613.52	46.66	430	830	227.40	15.67	160	288
	6	4685	0.89	623.81	52.51	440	870	229.80	16.36	160	290
	7	4689	0.88	639.33	54.26	450	880	235.57	16.77	157	294
	8	4360	0.85	653.44	52.57	470	890	240.34	17.91	157	317



## Equipercentile Linking Procedure

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

To calculate consistency rate of classification, sample students were designated “Below Forward cut” or “At or above Forward cut” based on their actual Forward 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 Forward 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 Forward cut scores. Students classified in the *true negative* (TN) category were those predicted to be Below Basic Expectations based on the MAP cut scores and were also classified as Below Basic Expectations based on the Forward cut scores. Students classified in the *false positive* (FP) category were those predicted to be Proficient Expectations based on the MAP cut scores but were classified as Below Basic Expectations based on the Forward cut scores. Students classified in the *false negative* (FN) category were those predicted to be Below Basic Expectations based on the MAP cut scores but were classified as Proficient Expectations based on the Forward 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 FORWARD TO MAP CONCORDANCE

		Forward Score	
		Below Forward cut	At or Above Forward cut
MAP Score	Below MAP cut	True Negative	False Negative
	At or Above MAP cut	False Positive	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 Forward 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 Forward, based on his/her fall or winter MAP score is given in Equation (A2):

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

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

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

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

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