

Linking the Ohio State Assessments to NWEA MAP Growth Tests^{*}

^{*}As of June 2017 Measures of Academic Progress® (MAP®) is known as MAP® Growth™.

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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 Ohio’s state tests in English language arts (ELA) 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 Ohio’s state test in ELA and math. 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 Ohio state 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

Ohio state assessments include a series of achievement tests aligned to Ohio’s Learning Standards in ELA and math for grades 3-8. For each grade and subject, there are four cut scores that distinguish between performance levels into five levels with Level 1 as the lowest and Level 5 as the highest. 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 are aligned to the Ohio state standards. Unlike Ohio state tests, MAP assessments are vertically scaled across grades, a feature that supports direct measurement of academic growth and change. MAP scores are reported on a Rasch Unit (RIT) scale with a range from 100 to 350. Each subject has its own RIT scale.

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

Estimated MAP Cut Scores Associated with Ohio State Test Readiness Levels

Tables 1 to 4 report the Ohio state test scaled scores associated with each of the five performance levels, as well as the estimated score range on the MAP tests associated with each Ohio state test 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 Ohio students' most probable performance level on state tests, based on their observed MAP scores. For example, a 3rd grade student who obtained a MAP math score of 205 in the spring testing season is likely to be at the very high end of Level 3 (Proficient) on the Ohio state test taken during that same testing season (see Table 2). Similarly, a 6th grade student who obtained a MAP reading score of 230 in the fall testing season is likely to be at Level 5 (Advanced) on the Ohio state test taken in the spring of 6th grade (see Table 3).

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

OHIO STATE TEST										
Grade	Level 1		Level 2		Level 3		Level 4		Level 5	
	<i>Limited</i>		<i>Basic</i>		<i>Proficient</i>		<i>Accelerated</i>		<i>Advanced</i>	
3	545-671		672-699		700-724		725-751		752-863	
4	549-673		674-699		700-724		725-752		753-846	
5	552-668		669-699		700-724		725-754		755-848	
6	555-667		668-699		700-724		725-750		751-851	
7	568-669		670-699		700-724		725-748		749-833	
8	586-681		682-699		700-724		725-743		744-805	

MAP										
Grade	Level 1		Level 2		Level 3		Level 4		Level 5	
	<i>Limited</i>		<i>Basic</i>		<i>Proficient</i>		<i>Accelerated</i>		<i>Advanced</i>	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-191	1-31	192-200	32-54	201-207	55-72	208-213	73-83	214-350	84-99
4	100-197	1-28	198-206	29-51	207-213	52-69	214-220	70-83	221-350	84-99
5	100-201	1-24	202-212	25-51	213-219	52-69	220-226	70-84	227-350	85-99
6	100-205	1-24	206-216	25-52	217-223	53-70	224-229	71-82	230-350	83-99
7	100-209	1-28	210-220	29-56	221-228	57-75	229-234	76-85	235-350	86-99
8	100-217	1-43	218-225	44-63	226-235	64-83	236-240	84-90	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 OHIO STATE TEST AND MAP MATH (WHEN MAP IS TAKEN IN SPRING)

OHIO STATE TEST										
Grade	Level 1		Level 2		Level 3		Level 4		Level 5	
	<i>Limited</i>		<i>Basic</i>		<i>Proficient</i>		<i>Accelerated</i>		<i>Advanced</i>	
3	587-682		683-699		700-724		725-752		753-818	
4	605-685		686-699		700-724		725-758		759-835	
5	624-686		687-699		700-724		725-748		749-804	
6	616-681		682-699		700-724		725-743		744-790	
7	605-683		684-699		700-724		725-754		755-806	
8	633-689		690-699		700-724		725-743		744-774	

MAP										
Grade	Level 1		Level 2		Level 3		Level 4		Level 5	
	<i>Limited</i>		<i>Basic</i>		<i>Proficient</i>		<i>Accelerated</i>		<i>Advanced</i>	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-197	1-33	198-201	34-44	202-206	45-58	207-212	59-74	213-350	75-99
4	100-205	1-29	206-209	30-39	210-215	40-55	216-223	56-74	224-350	75-99
5	100-213	1-31	214-218	32-42	219-227	43-64	228-235	65-80	236-350	81-99
6	100-218	1-34	219-223	35-45	224-231	46-64	232-237	65-76	238-350	77-99
7	100-225	1-43	226-231	44-56	232-240	57-74	241-249	75-88	250-350	89-99
8	100-229	1-47	230-234	48-57	235-246	58-79	247-255	80-90*	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 OHIO STATE TEST ELA AND MAP READING (WHEN MAP IS TAKEN IN FALL OR WINTER PRIOR TO SPRING OHIO STATE TESTS)

OHIO STATE TEST										
Grade	Level 1		Level 2		Level 3		Level 4		Level 5	
	<i>Limited</i>		<i>Basic</i>		<i>Proficient</i>		<i>Accelerated</i>		<i>Advanced</i>	
3	545-671		672-699		700-724		725-751		752-863	
4	549-673		674-699		700-724		725-752		753-846	
5	552-668		669-699		700-724		725-754		755-848	
6	555-667		668-699		700-724		725-750		751-851	
7	568-669		670-699		700-724		725-748		749-833	
8	586-681		682-699		700-724		725-743		744-805	

MAP FALL										
Grade	Level 1		Level 2		Level 3		Level 4		Level 5	
	<i>Limited</i>		<i>Basic</i>		<i>Proficient</i>		<i>Accelerated</i>		<i>Advanced</i>	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-179	1-28	180-190	29-55	191-198	56-74	199-206	75-87	207-350	88-99
4	100-188	1-26	189-198	27-50	199-206	51-70	207-215	71-86	216-350	87-99
5	100-193	1-21	194-206	22-52	207-214	53-72	215-222	73-86	223-350	87-99
6	100-199	1-22	200-211	23-51	212-219	52-71	220-226	72-85	227-350	86-99
7	100-204	1-25	205-217	26-57	218-226	58-78	227-232	79-88	233-350	89-99
8	100-214	1-43	215-223	44-65	224-233	66-84	234-238	85-91	239-350	92-99

MAP WINTER										
Grade	Level 1		Level 2		Level 3		Level 4		Level 5	
	<i>Limited</i>		<i>Basic</i>		<i>Proficient</i>		<i>Accelerated</i>		<i>Advanced</i>	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-187	1-29	188-197	30-54	198-205	55-74	206-211	75-85	212-350	86-99
4	100-194	1-27	195-204	28-52	205-211	53-70	212-219	71-85	220-350	86-99
5	100-198	1-21	199-210	22-51	211-218	52-72	219-225	73-85	226-350	86-99
6	100-203	1-23	204-215	24-53	216-222	54-71	223-228	72-83	229-350	84-99
7	100-207	1-26	208-219	27-56	220-227	57-76	228-233	77-86	234-350	87-99
8	100-216	1-43	217-224	44-63	225-234	64-84	235-239	85-90	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 OHIO STATE TEST AND MAP MATH (WHEN MAP IS TAKEN IN FALL OR WINTER PRIOR TO SPRING OHIO STATE TESTS)

OHIO STATE TEST										
Grade	Level 1 <i>Limited</i>		Level 2 <i>Basic</i>		Level 3 <i>Proficient</i>		Level 4 <i>Accelerated</i>		Level 5 <i>Advanced</i>	
3	587-682		683-699		700-724		725-752		753-818	
4	605-685		686-699		700-724		725-758		759-835	
5	624-686		687-699		700-724		725-748		749-804	
6	616-681		682-699		700-724		725-743		744-790	
7	605-683		684-699		700-724		725-754		755-806	
8	633-689		690-699		700-724		725-743		744-774	
MAP FALL										
Grade	Level 1 <i>Limited</i>		Level 2 <i>Basic</i>		Level 3 <i>Proficient</i>		Level 4 <i>Accelerated</i>		Level 5 <i>Advanced</i>	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-184	1-32	185-188	33-44	189-193	45-59	194-200	60-77	201-350	78-99
4	100-193	1-26	194-197	27-37	198-203	38-54	204-212	55-77	213-350	78-99
5	100-203	1-29	204-208	30-42	209-217	43-66	218-225	67-83	226-350	84-99
6	100-210	1-32	211-215	33-44	216-223	45-64	224-229	65-77	230-350	78-99
7	100-219	1-42	220-225	43-56	226-234	57-76	235-243	77-89	244-350	90-99
8	100-224	1-45	225-229	46-57	230-242	58-81	243-251	82-92	252-350	92-99
MAP WINTER										
Grade	Level 1 <i>Limited</i>		Level 2 <i>Basic</i>		Level 3 <i>Proficient</i>		Level 4 <i>Accelerated</i>		Level 5 <i>Advanced</i>	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-192	1-33	193-196	34-44	197-201	45-59	202-207	60-75	208-350	76-99
4	100-200	1-28	201-204	29-38	205-210	39-54	211-218	55-75	219-350	76-99
5	100-209	1-30	210-214	31-42	215-223	43-65	224-231	66-82	232-350	83-99
6	100-215	1-34	216-220	35-46	221-228	47-65	229-234	66-78	235-350	79-99
7	100-223	1-43	224-229	44-57	230-238	58-76	239-247	77-89	248-350	90-99
8	100-227	1-46	228-232	47-57	233-244	58-79	245-253	80-90	254-350	91-99

Notes. 1. %ile=percentile.

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

Consistency Rate of Classification

Consistency rate of classification (Pommerich, Hanson, Harris, & Scoring, 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 Ohio state 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 Ohio state test 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 Ohio state ELA test approximately 82% of the time and MAP math scores can consistently classify students on Ohio state math test approximately 83% 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 Ohio state tests.

TABLE 5. CONSISTENCY RATE OF CLASSIFICATION FOR MAP AND OHIO STATE TEST LEVEL 3 EQUIPERCENTILE CONCORDANCES

Grade	ELA/Reading			Math		
	Consistency Rate	False		Consistency Rate	False	
		Positives	Negatives		Positives	Negatives
3	0.79	0.11	0.10	0.83	0.08	0.09
4	0.81	0.10	0.09	0.82	0.09	0.09
5	0.82	0.10	0.08	0.82	0.09	0.09
6	0.83	0.11	0.06	0.85	0.08	0.07
7	0.84	0.09	0.07	0.87	0.06	0.07
8	0.83	0.09	0.08	0.80	0.10	0.10

Proficiency Projection

Proficiency projection tells how likely a student is classified as “proficient” on Ohio state 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 Ohio state tests are presented in Tables 6 to 8. These tables estimate the probability of scoring at Level 3 or above on Ohio state test in the spring and the prior fall or winter testing season. For example, if a 3rd grade student obtained a MAP math score of 194 in the fall, the probability of obtaining a Level 3 or higher Ohio state test 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 Ohio state tests.

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

Note. %ile=percentile

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

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	201	No	<0.01	5	171	201	No	<0.01
	10	168	201	No	<0.01	10	176	201	No	<0.01
	15	172	201	No	0.01	15	180	201	No	<0.01
	20	175	201	No	0.03	20	183	201	No	<0.01
	25	178	201	No	0.06	25	185	201	No	0.01
	30	180	201	No	0.10	30	188	201	No	0.04
	35	182	201	No	0.13	35	190	201	No	0.06
	40	184	201	No	0.20	40	192	201	No	0.13
	45	186	201	No	0.29	45	194	201	No	0.22
	50	188	201	No	0.34	50	196	201	No	0.35
	55	190	201	No	0.44	55	198	201	Yes	0.50
	60	192	201	Yes	0.56	60	199	201	Yes	0.58
	65	194	201	Yes	0.61	65	201	201	Yes	0.72
	70	197	201	Yes	0.76	70	204	201	Yes	0.87
	75	199	201	Yes	0.84	75	206	201	Yes	0.91
	80	202	201	Yes	0.90	80	208	201	Yes	0.96
85	205	201	Yes	0.95	85	211	201	Yes	0.99	
90	209	201	Yes	0.98	90	215	201	Yes	>0.99	
95	214	201	Yes	>0.99	95	221	201	Yes	>0.99	
4	5	173	207	No	<0.01	5	179	207	No	<0.01
	10	178	207	No	<0.01	10	184	207	No	<0.01
	15	182	207	No	0.01	15	188	207	No	<0.01
	20	185	207	No	0.04	20	191	207	No	0.01
	25	188	207	No	0.07	25	194	207	No	0.02
	30	190	207	No	0.12	30	196	207	No	0.06
	35	192	207	No	0.18	35	198	207	No	0.12
	40	194	207	No	0.23	40	200	207	No	0.22
	45	196	207	No	0.33	45	202	207	No	0.28
	50	198	207	No	0.44	50	204	207	No	0.42
	55	200	207	Yes	0.50	55	205	207	Yes	0.50
	60	202	207	Yes	0.62	60	207	207	Yes	0.65
	65	204	207	Yes	0.73	65	209	207	Yes	0.78
	70	206	207	Yes	0.82	70	211	207	Yes	0.88
	75	209	207	Yes	0.88	75	214	207	Yes	0.96
	80	211	207	Yes	0.93	80	216	207	Yes	0.98
85	214	207	Yes	0.96	85	219	207	Yes	0.99	
90	218	207	Yes	0.99	90	223	207	Yes	>0.99	
95	224	207	Yes	>0.99	95	228	207	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	213	No	<0.01	5	186	213	No	<0.01
	10	186	213	No	<0.01	10	191	213	No	<0.01
	15	190	213	No	0.01	15	195	213	No	<0.01
	20	193	213	No	0.04	20	197	213	No	0.01
	25	195	213	No	0.07	25	200	213	No	0.03
	30	198	213	No	0.12	30	202	213	No	0.04
	35	200	213	No	0.19	35	204	213	No	0.09
	40	202	213	No	0.28	40	206	213	No	0.17
	45	204	213	No	0.33	45	208	213	No	0.28
	50	206	213	No	0.44	50	210	213	No	0.42
	55	208	213	Yes	0.56	55	212	213	Yes	0.58
	60	210	213	Yes	0.67	60	214	213	Yes	0.72
	65	212	213	Yes	0.72	65	215	213	Yes	0.78
	70	214	213	Yes	0.81	70	218	213	Yes	0.91
	75	216	213	Yes	0.88	75	220	213	Yes	0.94
	80	218	213	Yes	0.91	80	222	213	Yes	0.97
	85	221	213	Yes	0.96	85	225	213	Yes	0.99
90	225	213	Yes	0.99	90	229	213	Yes	>0.99	
95	231	213	Yes	>0.99	95	234	213	Yes	>0.99	
6	5	186	217	No	<0.01	5	190	217	No	<0.01
	10	192	217	No	<0.01	10	196	217	No	<0.01
	15	196	217	No	0.02	15	199	217	No	<0.01
	20	198	217	No	0.03	20	202	217	No	0.01
	25	201	217	No	0.07	25	204	217	No	0.02
	30	203	217	No	0.12	30	207	217	No	0.06
	35	205	217	No	0.19	35	209	217	No	0.12
	40	207	217	No	0.23	40	211	217	No	0.22
	45	209	217	No	0.33	45	212	217	No	0.28
	50	211	217	No	0.44	50	214	217	No	0.42
	55	213	217	Yes	0.56	55	216	217	Yes	0.50
	60	215	217	Yes	0.61	60	218	217	Yes	0.65
	65	217	217	Yes	0.72	65	220	217	Yes	0.78
	70	219	217	Yes	0.81	70	222	217	Yes	0.88
	75	221	217	Yes	0.84	75	224	217	Yes	0.94
	80	224	217	Yes	0.93	80	226	217	Yes	0.97
	85	226	217	Yes	0.96	85	229	217	Yes	0.99
90	230	217	Yes	0.99	90	233	217	Yes	>0.99	
95	236	217	Yes	>0.99	95	238	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.
7	5	189	221	No	<0.01	5	192	221	No	<0.01
	10	195	221	No	<0.01	10	198	221	No	<0.01
	15	199	221	No	0.01	15	201	221	No	<0.01
	20	202	221	No	0.02	20	204	221	No	<0.01
	25	204	221	No	0.04	25	207	221	No	0.01
	30	206	221	No	0.07	30	209	221	No	0.03
	35	209	221	No	0.12	35	211	221	No	0.06
	40	211	221	No	0.19	40	213	221	No	0.09
	45	213	221	No	0.28	45	215	221	No	0.17
	50	214	221	No	0.33	50	217	221	No	0.28
	55	216	221	No	0.39	55	219	221	No	0.42
	60	218	221	Yes	0.50	60	221	221	Yes	0.58
	65	220	221	Yes	0.61	65	223	221	Yes	0.72
	70	222	221	Yes	0.72	70	225	221	Yes	0.83
	75	225	221	Yes	0.81	75	227	221	Yes	0.91
	80	227	221	Yes	0.88	80	230	221	Yes	0.97
	85	230	221	Yes	0.95	85	232	221	Yes	0.98
90	234	221	Yes	0.98	90	236	221	Yes	>0.99	
95	240	221	Yes	>0.99	95	242	221	Yes	>0.99	
8	5	191	226	No	<0.01	5	194	226	No	<0.01
	10	197	226	No	<0.01	10	199	226	No	<0.01
	15	201	226	No	0.01	15	203	226	No	<0.01
	20	204	226	No	0.02	20	206	226	No	<0.01
	25	207	226	No	0.03	25	209	226	No	<0.01
	30	209	226	No	0.05	30	211	226	No	0.01
	35	211	226	No	0.08	35	213	226	No	0.01
	40	213	226	No	0.10	40	215	226	No	0.03
	45	215	226	No	0.16	45	217	226	No	0.07
	50	217	226	No	0.22	50	219	226	No	0.14
	55	219	226	No	0.31	55	221	226	No	0.23
	60	221	226	No	0.35	60	223	226	No	0.36
	65	223	226	No	0.45	65	225	226	Yes	0.50
	70	225	226	Yes	0.55	70	227	226	Yes	0.64
	75	228	226	Yes	0.65	75	229	226	Yes	0.77
	80	230	226	Yes	0.74	80	232	226	Yes	0.86
	85	234	226	Yes	0.87	85	235	226	Yes	0.95
90	237	226	Yes	0.92	90	239	226	Yes	0.99	
95	243	226	Yes	0.98	95	244	226	Yes	>0.99	

Note. %ile=percentile

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

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	202	No	<0.01	5	176	202	No	<0.01
	10	174	202	No	0.01	10	181	202	No	<0.01
	15	177	202	No	0.04	15	184	202	No	0.01
	20	179	202	No	0.08	20	187	202	No	0.02
	25	182	202	No	0.17	25	189	202	No	0.05
	30	184	202	No	0.22	30	191	202	No	0.10
	35	185	202	No	0.27	35	193	202	No	0.20
	40	187	202	No	0.38	40	195	202	No	0.34
	45	189	202	Yes	0.50	45	197	202	Yes	0.50
	50	190	202	Yes	0.56	50	198	202	Yes	0.58
	55	192	202	Yes	0.68	55	200	202	Yes	0.74
	60	194	202	Yes	0.78	60	202	202	Yes	0.86
	65	195	202	Yes	0.83	65	203	202	Yes	0.90
	70	197	202	Yes	0.89	70	205	202	Yes	0.95
	75	199	202	Yes	0.92	75	207	202	Yes	0.98
	80	201	202	Yes	0.96	80	209	202	Yes	0.99
	85	204	202	Yes	0.99	85	212	202	Yes	1.00
90	207	202	Yes	1.00	90	215	202	Yes	1.00	
95	212	202	Yes	1.00	95	220	202	Yes	1.00	
4	5	179	210	No	<0.01	5	185	210	No	<0.01
	10	184	210	No	0.01	10	190	210	No	<0.01
	15	188	210	No	0.06	15	194	210	No	0.01
	20	190	210	No	0.11	20	197	210	No	0.05
	25	193	210	No	0.22	25	199	210	No	0.10
	30	195	210	No	0.32	30	201	210	No	0.20
	35	197	210	No	0.44	35	203	210	No	0.34
	40	198	210	Yes	0.50	40	205	210	Yes	0.50
	45	200	210	Yes	0.62	45	207	210	Yes	0.66
	50	202	210	Yes	0.73	50	209	210	Yes	0.80
	55	204	210	Yes	0.83	55	211	210	Yes	0.90
	60	205	210	Yes	0.83	60	212	210	Yes	0.93
	65	207	210	Yes	0.89	65	214	210	Yes	0.97
	70	209	210	Yes	0.94	70	216	210	Yes	0.99
	75	211	210	Yes	0.97	75	218	210	Yes	>0.99
	80	214	210	Yes	0.99	80	221	210	Yes	>0.99
	85	216	210	Yes	>0.99	85	223	210	Yes	>0.99
90	220	210	Yes	>0.99	90	227	210	Yes	>0.99	
95	225	210	Yes	>0.99	95	232	210	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	219	No	<0.01	5	192	219	No	<0.01
	10	193	219	No	0.01	10	198	219	No	<0.01
	15	196	219	No	0.03	15	201	219	No	<0.01
	20	199	219	No	0.07	20	204	219	No	0.01
	25	202	219	No	0.15	25	207	219	No	0.05
	30	204	219	No	0.23	30	209	219	No	0.11
	35	206	219	No	0.33	35	211	219	No	0.20
	40	208	219	No	0.44	40	213	219	No	0.34
	45	210	219	Yes	0.56	45	215	219	Yes	0.50
	50	211	219	Yes	0.62	50	217	219	Yes	0.66
	55	213	219	Yes	0.72	55	219	219	Yes	0.80
	60	215	219	Yes	0.81	60	221	219	Yes	0.89
	65	217	219	Yes	0.88	65	223	219	Yes	0.95
	70	219	219	Yes	0.93	70	225	219	Yes	0.98
	75	221	219	Yes	0.96	75	228	219	Yes	>0.99
	80	224	219	Yes	0.99	80	230	219	Yes	>0.99
	85	227	219	Yes	>0.99	85	233	219	Yes	>0.99
90	230	219	Yes	>0.99	90	237	219	Yes	>0.99	
95	236	219	Yes	>0.99	95	242	219	Yes	>0.99	
6	5	192	224	No	<0.01	5	196	224	No	<0.01
	10	198	224	No	<0.01	10	202	224	No	<0.01
	15	202	224	No	0.02	15	205	224	No	<0.01
	20	205	224	No	0.05	20	209	224	No	0.01
	25	207	224	No	0.09	25	211	224	No	0.02
	30	209	224	No	0.15	30	214	224	No	0.07
	35	212	224	No	0.28	35	216	224	No	0.15
	40	214	224	No	0.38	40	218	224	No	0.27
	45	216	224	Yes	0.50	45	220	224	No	0.42
	50	218	224	Yes	0.62	50	222	224	Yes	0.58
	55	220	224	Yes	0.72	55	224	224	Yes	0.73
	60	222	224	Yes	0.81	60	226	224	Yes	0.85
	65	224	224	Yes	0.88	65	228	224	Yes	0.93
	70	226	224	Yes	0.93	70	230	224	Yes	0.97
	75	228	224	Yes	0.96	75	233	224	Yes	0.99
	80	231	224	Yes	0.99	80	236	224	Yes	>0.99
	85	234	224	Yes	0.99	85	239	224	Yes	>0.99
90	238	224	Yes	>0.99	90	243	224	Yes	>0.99	
95	243	224	Yes	>0.99	95	248	224	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	232	No	<0.01	5	198	232	No	<0.01
	10	201	232	No	<0.01	10	204	232	No	<0.01
	15	205	232	No	<0.01	15	208	232	No	<0.01
	20	209	232	No	<0.01	20	212	232	No	<0.01
	25	211	232	No	0.01	25	215	232	No	<0.01
	30	214	232	No	0.03	30	217	232	No	<0.01
	35	216	232	No	0.06	35	220	232	No	0.02
	40	218	232	No	0.11	40	222	232	No	0.05
	45	221	232	No	0.22	45	224	232	No	0.10
	50	223	232	No	0.32	50	226	232	No	0.20
	55	225	232	No	0.44	55	228	232	No	0.34
	60	227	232	Yes	0.56	60	230	232	Yes	0.50
	65	229	232	Yes	0.68	65	233	232	Yes	0.74
	70	231	232	Yes	0.78	70	235	232	Yes	0.85
	75	234	232	Yes	0.89	75	238	232	Yes	0.95
	80	237	232	Yes	0.95	80	240	232	Yes	0.98
	85	240	232	Yes	0.98	85	244	232	Yes	>0.99
90	244	232	Yes	>0.99	90	248	232	Yes	>0.99	
95	250	232	Yes	>0.99	95	254	232	Yes	>0.99	
8	5	197	235	No	<0.01	5	199	235	No	<0.01
	10	203	235	No	<0.01	10	206	235	No	<0.01
	15	208	235	No	<0.01	15	210	235	No	<0.01
	20	211	235	No	0.01	20	214	235	No	<0.01
	25	214	235	No	0.02	25	217	235	No	<0.01
	30	217	235	No	0.04	30	220	235	No	<0.01
	35	219	235	No	0.08	35	222	235	No	0.01
	40	222	235	No	0.15	40	225	235	No	0.06
	45	224	235	No	0.22	45	227	235	No	0.12
	50	226	235	No	0.30	50	229	235	No	0.21
	55	229	235	No	0.45	55	231	235	No	0.35
	60	231	235	Yes	0.55	60	234	235	Yes	0.58
	65	233	235	Yes	0.65	65	236	235	Yes	0.72
	70	236	235	Yes	0.74	70	239	235	Yes	0.88
	75	238	235	Yes	0.82	75	241	235	Yes	0.94
	80	241	235	Yes	0.90	80	245	235	Yes	0.99
	85	245	235	Yes	0.97	85	248	235	Yes	>0.99
90	249	235	Yes	0.99	90	253	235	Yes	>0.99	
95	256	235	Yes	>0.99	95	259	235	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 Ohio state test performance level. By using matched score data from a sample of students from Ohio, 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 on Ohio state 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 Ohio state tests 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 11 school districts, which may limit the generalizability of the results to test takers who differ significantly from this sample. Finally, caution should be exercised if the concorded scores are used for a subpopulation. NWEA will continue to gather information about Ohio state test performance from other school districts in Ohio to enhance the quality and generalizability of the study.

References

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- 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 11 school districts in Ohio. The sample contained matched Ohio state test ELA and MAP reading scores from 28,713 students in Grades 3 to 8 and matched Ohio state test and MAP math scores from 27,210 students in Grades 3 to 8 who completed both Ohio state tests and MAP in the spring of 2016.

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 Ohio state test ELA scores range from 0.73 to 0.77, and the correlation coefficients between MAP and Ohio state test math scores range from 0.73 to 0.82. All these correlations indicate a strong relationship between MAP and Ohio state test scores.

TABLE A1. DESCRIPTIVE STATISTICS OF THE SAMPLE DATA

Subject	Grade	N	<i>r</i>	OHIO STATE TEST				MAP			
				Mean	SD	Min	Max	Mean	SD	Min	Max
ELA/ Reading	3	5421	0.73	696.90	50.03	545	862	197.87	16.23	140	252
	4	4991	0.77	700.70	47.47	575	846	204.99	16.09	140	249
	5	4642	0.76	704.33	46.92	566	848	211.69	15.47	140	255
	6	4636	0.76	696.58	46.67	571	851	213.14	16.07	139	256
	7	4450	0.77	695.68	42.81	584	833	217.00	16.57	143	261
	8	4573	0.74	692.20	33.04	599	805	220.31	16.18	144	261
Math	3	5189	0.77	699.40	55.48	588	818	201.10	14.08	135	250
	4	5035	0.78	708.98	51.58	605	835	210.60	15.22	142	260
	5	4388	0.80	706.74	39.30	624	804	220.54	15.48	166	280
	6	4418	0.80	695.07	42.42	616	790	221.68	16.27	146	264
	7	4376	0.82	692.96	42.58	605	806	226.83	18.27	148	281
	8	3804	0.73	689.74	30.37	633	774	228.92	16.42	147	285

Equipercentile Linking Procedure

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

To calculate consistency rate of classification, sample students were designated “Below Ohio state test cut” or “At or above Ohio state test cut” based on their actual Ohio state test 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 Ohio state test 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 Ohio state test 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 Ohio state test 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 Ohio state test cut scores. Students classified in the *false negative* (FN) category were those predicted to be Not Proficient based on the MAP cut scores but were classified as Proficient based on the Ohio state test 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 OHIO STATE TEST TO MAP
CONCORDANCE

		Ohio State Test Score	
		Below Ohio State Test Cut	At or Above Ohio State Test 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 Ohio state test 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 Ohio state test, 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, 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 Ohio state 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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