

## Relating Star Reading® and Star Math® to the Illinois Assessment of Readiness (IAR)



# Contents

3	Introduction
3	Main Findings
3	Study
6	Results
7	Appendix A: About Star Reading and Star Math
7	Appendix B: IAR achievement levels
8	References

## Figures

4	Figure 1. Star Reading and Star Math highly correlate with IAR scores
---	---

## Tables

5	Table 1. Star Reading and Star Math score equivalents at time of state test for each IAR achievement level range
6	Table 2. Proficiency forecasting using Star Reading and Star Math scores yields accurate results
7	Table B1. IAR achievement level score ranges

Initial publication June 15, 2020

# Introduction

At Renaissance we know that as an educator, chief among your responsibilities is making decisions about how to allocate limited resources to best serve diverse student needs. A good assessment system supports your efforts, by providing timely, relevant information to help address key questions about which students are on track to meet important standards and who may need additional assistance.

Assessments that identify early any students at risk of missing academic standards are especially useful, as they inform instructional decisions to improve student performance and reduce gaps in achievement. Assessments that do this while taking little time away from instruction are particularly valuable. *Interim assessments*, one of three broad categories of educational assessment,<sup>1</sup> indicate which students are on track to meet later expectations (Perie et al., 2007).

This linking study applied results from two interim assessments, Renaissance Star Reading® and Renaissance Star Math®, to help you predict whether individual students are on track or need more assistance to succeed on the year-end summative Illinois Assessment of Readiness in English Language Arts (ELA) and mathematics in grades 3 through 8.<sup>2</sup>

Assessments that identify early any students at risk of missing academic standards are especially useful.

## Main Findings

Results from the linking analysis revealed that Star Reading and Star Math are accurate predictors of the IAR tests, meaning as an educator you can use Star scores to:

1. Identify early in the year students likely to miss reading and math yearly progress goals in time to make meaningful adjustments to instruction well before the year-end test.
2. Forecast the percent of students at each IAR performance level to serve as an early warning system for building and district administrators and allow redirection of resources as needed.

## Study

To determine if Star Reading and Star Math can predict student achievement on the IAR tests in ELA and mathematics, we began by linking the score scales for each assessment.

---

<sup>1</sup> **Formative assessments** are short and frequent processes, embedded in instruction, that support learning and provide specific feedback on what students know and can do versus where gaps in knowledge exist. **Summative assessments** evaluate whether students have met a set of standards, and serve most commonly as year-end state-mandated tests. **Interim assessments** represent the middle ground, in terms of duration and frequency and can serve purposes including informing instruction, evaluating curriculum and student responsiveness to intervention, and forecasting performance on high-stakes summative year-end tests.

<sup>2</sup> Technical manuals are available for Star Reading and Star Math by request to [research@renaissance.com](mailto:research@renaissance.com).

## Data collection

Using a secure data-matching procedure compliant with the federal Family Educational Rights and Privacy Act (FERPA), staff from 6 districts provided Renaissance with IAR test scores for students who had taken Star Reading or Star Math during the 2018–2019 school year. Each record included a student’s IAR scores and was matched with all Star scores for that year.

## Sample characteristics

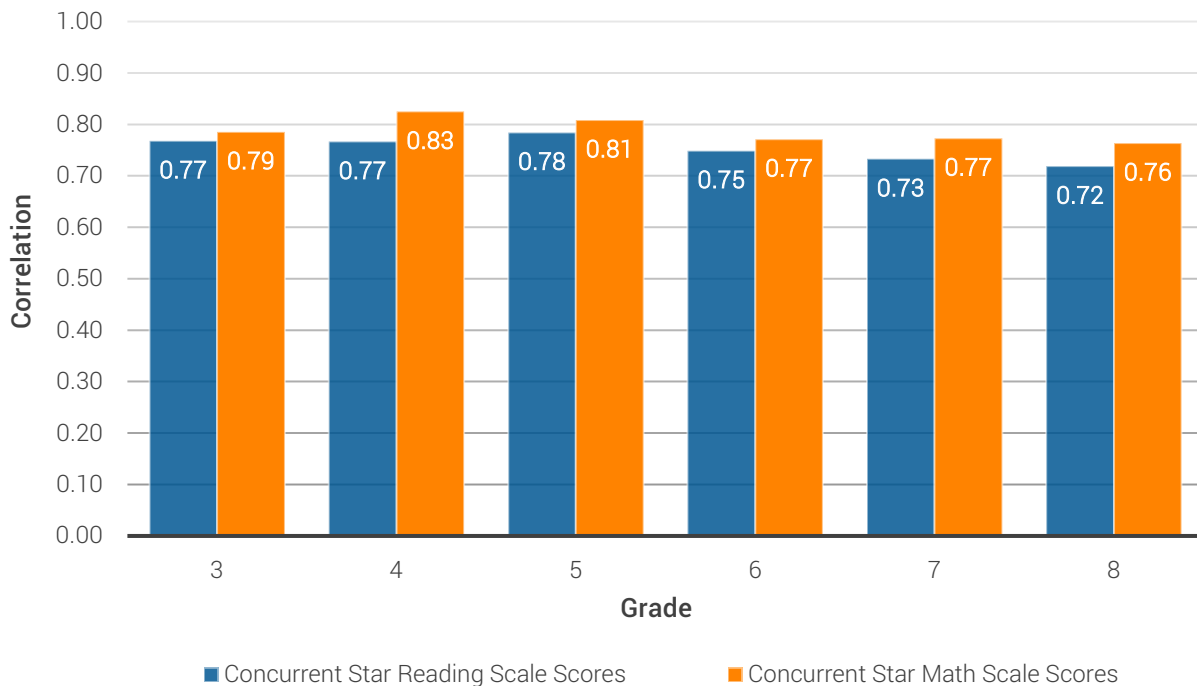
Renaissance divided the data into two samples. The **concurrent** sample included students’ scores for all Star tests taken within 45 days before or after the IAR administration. This sample numbered 14,065 records in grades 3–8 with matched IAR and Star Reading scores and 15,930 records in those grades with matched IAR and Star Math scores. In each grade, we then set aside scores from a subset of these students—10%—as a **holdout sample** to use only to evaluate the scale linkage.

The linking analysis revealed that Star Reading and Star Math are accurate predictors of the IAR tests.

## Correlations

Before linking Star tests with the IAR, we ensured there was a strong relationship between the test scales. As seen in figure 1, the correlations were strong, averaging .75 and .79 between IAR and Star Reading and Star Math, respectively.

Figure 1. Star Reading® and Star Math® scores highly correlate with IAR tests



## Scale linkage

Renaissance then linked the score scales for the Star Reading/Star Math and the IAR in ELA and mathematics by applying equipercntile linking analysis (Kolen & Brennan, 2004) in grades 3–8. The concurrent sample (sans the holdout sample) was used in the linking (scores from all Star tests taken within 45 days before or after the IAR administration date), and the result was a table of IAR scores for each possible Star score.

## IAR cut scores and corresponding Star score equivalents

IAR results are reported in scaled scores that describe each student’s location on an achievement continuum ranging from 650 to 850 and using five achievement levels: *Did Not Yet Meet Expectations*, *Partially Met Expectations*, *Approached Expectations*, *Met Expectations*, *Exceeded Expectations*. A main purpose in linking Star Reading and Star Math to the IAR was to identify Star scores at the time of the state test that are approximately equivalent to the cut-off scores that separate the IAR achievement levels. Table 1 displays these equivalent Star scores at the time of the state test for grades 3–8.<sup>3</sup> The corresponding IAR cut scores can be found in Appendix B.

**Table 1. Star Reading® and Star Math® score equivalents at time of state test for each IAR achievement level range**

Star Reading® cut-score equivalents					
Grade	Did Not Yet Meet Expectations	Partially Met Expectations	Approached Expectations	Met Expectations	Exceeded Expectations
3	<289	289–372	373–479	480–900	≥901
4	<342	342–458	459–586	587–901	≥902
5	<370	370–514	515–686	687–1178	≥1179
6	<371	371–524	525–770	771–1255	≥1256
7	<432	432–592	593–807	808–1256	≥1257
8	<520	520–656	657–900	901–1313	≥1314
Star Math® cut-score equivalents					
Grade	Did Not Yet Meet Expectations	Partially Met Expectations	Approached Expectations	Met Expectations	Exceeded Expectations
3	<504	504–574	575–640	641–747	≥748
4	<575	575–655	656–726	727–863	≥864
5	<598	598–712	713–796	797–883	≥884
6	<644	644–760	761–830	831–941	≥942
7	<645	645–761	762–848	849–942	≥943
8	<726	726–793	794–852	853–964	≥965

<sup>3</sup> The Star Reading and Star Math cut-score equivalents presented in Table 1 apply only to the time of the state test. Some Renaissance reports adjust the Star Reading and Star Math cut-score equivalents based on date.

# Results

## Accuracy of scale linkage confirmed

In evaluating the accuracy of the scale linkage, we used two methods to examine the differences between students' observed (actual) IAR scores and our Star equivalents: (1) computing the RMSEL (the root mean squared errors of linking) using the scores from the linking study, and (2) applying the holdout sample, consisting of the subset of concurrent scores not used in the linking, to the linking results. Results showed that our linking computation performed as intended.

## Star scores discriminate well between students who score proficient or not

Using the holdout sample, we were able to compare how concurrent Star scores aligned with the observed IAR scores. Table 2 displays classification diagnostics about whether students were correctly or incorrectly classified as proficient or not on the IAR using concurrent Star scores. On average, students were correctly classified (i.e., overall classification accuracy) 81% of the time for reading and 85% of the time for math.

For Area Under the ROC Curve (AUC), a summary measure of diagnostic accuracy, Star Reading averaged .89 and Star Math averaged .92 (also displayed in table 2). The AUCs exceed the .85 standard set by the National Center on Response to Intervention to indicate convincing evidence that an assessment can accurately predict another assessment result or outcome.

**Table 2. Proficiency forecasting using Star Reading® and Star Math® scores yields accurate results**

Star Reading®						
Measure	Grade					
	3	4	5	6	7	8
Overall classification accuracy (percentage of correct classifications)	84%	82%	80%	83%	77%	80%
Area Under the ROC Curve	0.91	0.91	0.89	0.91	0.86	0.86
Star Math®						
Measure	Grade					
	3	4	5	6	7	8
Overall classification accuracy (percentage of correct classifications)	81%	88%	87%	84%	88%	82%
Area Under the ROC Curve	0.89	0.94	0.94	0.90	0.93	0.90

Other diagnostic accuracy measures studied:

- ✓ **Sensitivity** represents the percentage of proficient students that were correctly forecasted, which for Star Reading averaged 75% and for Star Math averaged 75%.

- ✓ **Specificity** represents the percentage of not-proficient students that were correctly forecasted, which averaged 84% for Star Reading and 89% for Star Math.
- ✓ **Positive predictive values** indicate that when Star scores forecasted students to be proficient, they actually were proficient 75% of the time for Star Reading and 76% of the time for Star Math.
- ✓ **Negative predictive values** indicate that when Star scores forecasted students to miss proficiency, they actually weren't proficient 84% of the time for reading and 89% of the time for math.
- ✓ **Proficiency status projection error**, the difference between actual and projected proficiency rates, indicates how well scores accurately predict proficiency within each grade. Star Reading averaged 0% and Star Math averaged 0% (negative scores indicate under-prediction while positive scores show over-prediction).

## Appendix A: About Star Reading® and Star Math®

The computer-adaptive Star Reading and Star Math assessments serve multiple purposes including screening, progress monitoring, instructional planning, forecasting proficiency, standards mastery, and measuring growth. These highly reliable, valid, and efficient standards-based measures of student performance in reading and math provide valuable information regarding the acquisition of skills along a continuum of learning expectations. The assessments can be completed in about 20 minutes, and we recommend administering them two to five times a year for most purposes and more frequently when used for progress monitoring.

RENAISSANCE  
**Star Reading®**

RENAISSANCE  
**Star Math®**

Star Reading and Star Math are highly rated for academic screening and academic progress monitoring by the National Center on Intensive Intervention.

National Center on  
**INTENSIVE INTERVENTION**

at American Institutes for Research ■

## Appendix B: IAR achievement levels

**Table B1. IAR achievement level score ranges**

IAR achievement level score ranges: ELA					
Grade	Did Not Yet Meet Expectations	Partially Met Expectations	Approached Expectations	Met Expectations	Exceeded Expectations
3	650–699	700–724	725–749	750–809	810–850
4	650–699	700–724	725–749	750–789	790–850
5	650–699	700–724	725–749	750–798	799–850
6	650–699	700–724	725–749	750–789	790–850
7	650–699	700–724	725–749	750–784	785–850
8	650–699	700–724	725–749	750–793	794–850
IAR achievement level score ranges: Mathematics					
Grade	Did Not Yet Meet Expectations	Partially Met Expectations	Approached Expectations	Met Expectations	Exceeded Expectations
3	650–699	700–724	725–749	750–789	790–850
4	650–699	700–724	725–749	750–795	796–850
5	650–699	700–724	725–749	750–789	790–850
6	650–699	700–724	725–749	750–787	788–850
7	650–699	700–724	725–749	750–785	786–850
8	650–699	700–724	725–749	750–800	801–850



# References

Kolen, M. J., & Brennan, R. R. (2004). *Test equating scaling and linking: Methods and practices*. Springer Science+Business Media.

Perie, M., Marion, S., Gong, B., & Wurtzel, J. (2007). *The role of interim assessments in a comprehensive assessment system*. Aspen Institute.

Renaissance Learning. (2019a). *Star Math technical manual*. Available by request to [research@renaissance.com](mailto:research@renaissance.com)

Renaissance Learning. (2019b). *Star Reading technical manual*. Available by request to [research@renaissance.com](mailto:research@renaissance.com)

## Independent technical reviews of Star Reading® and Star Math®

U.S. Department of Education: National Center on Intensive Intervention. (2018a). *Review of academic progress monitoring tools* [Review of Star Math]. <https://charts.intensiveintervention.org/aprogressmonitoring>

U.S. Department of Education: National Center on Intensive Intervention. (2018b). *Review of academic progress monitoring tools* [Review of Star Reading]. <https://charts.intensiveintervention.org/aprogressmonitoring>

U.S. Department of Education: National Center on Intensive Intervention. (2019a). *Review of academic screening tools* [Review of Star Math]. <https://charts.intensiveintervention.org/ascreening>

U.S. Department of Education: National Center on Intensive Intervention. (2019b). *Review of academic screening tools* [Review of Star Reading]. <https://charts.intensiveintervention.org/ascreening>

U.S. Department of Education: National Center on Response to Intervention. (2010a). *Review of progress monitoring tools* [Review of STAR Math]. <https://web.archive.org/web/20120813035500/http://www.rti4success.org/pdf/progressMonitoringGOM.pdf>

U.S. Department of Education: National Center on Response to Intervention. (2010b). *Review of progress monitoring tools* [Review of STAR Reading]. <https://web.archive.org/web/20120813035500/http://www.rti4success.org/pdf/progressMonitoringGOM.pdf>

U.S. Department of Education: National Center on Response to Intervention. (2011a). *Review of screening tools* [Review of STAR Math]. <https://web.archive.org/web/20171027185735/http://www.rti4success.org:80/resources/tools-charts/screening-tools-chart>

U.S. Department of Education: National Center on Response to Intervention. (2011b). *Review of screening tools* [Review of STAR Reading]. <https://web.archive.org/web/20171027185735/http://www.rti4success.org:80/resources/tools-charts/screening-tools-chart>