



THE SCHOOL DISTRICT OF  
PHILADELPHIA

# Star Math Curriculum Based Measures (CBM) Participation and Performance: 2021-22

*Curriculum Based Measures (CBMs) are tests of targeted skills that align to the teaching curriculum for a particular grade and subject. Unlike computer adaptive tests (CATs), CBMs do not change based on student responses. This report complements other reports we have published that summarize participation and performance on the Star Math and Reading CATs in the School District of Philadelphia (SDP).*

## Key Findings Include:

- Between 81%-92% of SDP students in grades K-3 took the Star Math CBMs in each testing window. Students in grades K-2 had higher average participation than students in grade 3.
- In Winter 2, more than 60% of kindergarten students scored At/Above Benchmark across all Star Math CBMs, an increase of 27-30 percentage points from the Fall.
- In Spring, more than 50% of first-grade students scored At/Above Benchmark across all Star Math CBMs, an increase of 30-42 percentage points from the Fall.
- In Winter 2, more than 45% of second-grade students scored At/Above Benchmark across all Star Math CBMs, an increase of 22-35 percentage points from the Fall.
- In Winter 2, more than 50% of third-grade students scored At/Above Benchmark in the *Mixed Addition and Subtraction* and *Multiplication to 100* Star Math CBMs, an increase of 25-30 percentage points from the Fall.

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October 2022

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### **Acknowledgements**

The authors would like to acknowledge the hard work and contributions of our colleagues in the School District of Philadelphia’s Office of Assessment, Planning and Evidence-based Supports Office (PESO), and District Performance Office (DPO) in preparing the data, providing resources, and describing the measures and results. We also want to thank Joy Lesnick, Jenny Hoedeman-Eiteljorg, and Hannah Barton in the Office of Research and Evaluation for their support in writing and editing.

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## Background

In the 2021-22 school year, the School District of Philadelphia (SDP) transitioned to Star Assessments as the District-wide universal screener for reading and math for all students in grades K-12. SDP uses universal screening tools to track District-wide performance, monitor academic growth, and inform instructional planning. These assessments are administered four times throughout the school year within designated screening windows. Unlike end-of-year standardized assessments that provide a summative description of student performance, within-year assessments administered multiple times in a school year provide real-time information about students' knowledge of reading and math skills that teachers and school administrators use to inform instructional decisions and monitor student progress. The data collected also serves to track progress towards the Board Goals and Guardrails, which set annual targets for the percentage of students scoring proficient or advanced on summative state assessments through August 2026. Information on the Reading CBMs can be found in the [Star Reading Curriculum Based Measures \(CBM\) Participation and Performance: 2021-22](#) report.

## Star Assessments

Star assessments, developed by Renaissance, are a collection of tests that can be organized into two categories: computer-adaptive tests (CATs) and curriculum-based measures (CBMs). Beginning in the 2021-22 school year, all grades were administered the Star CATs to assess reading and math skills with the exception of K-2 math.<sup>1</sup> Star Reading CBMs are administered to students in grades K-5, and Star Math CBMs are administered to students in grades K-3.<sup>2</sup> Information from the Star assessments is used to inform instruction and help support student progress towards meeting grade-level standards.

Star CBMs are probes designed to measure proficiency on foundational skills in reading or math. Unlike computer adaptive tests (CATs), CBMs are aligned to the grade level curriculum, and do not change based on student responses. CBMs take about 1 minute to administer, and scores provide information on how students are progressing on the skills measured. For example, in kindergarten, reading CBMs include *Letter Naming* and *Letter Sounds* and math CBMs include *Numerical Recognition* and *Quantity Comparison*. As grade level increases, the CBMs shift to other skill areas: for example, second- and third-grade reading CBMs include *Expressive Nonsense Words* and *Passage Oral Reading*, and math CBMs include *Subtraction from 10* and *Multiplication to 100*.

After each within-year administration of the tests, student performance is categorized according to scoring thresholds that are specific to each grade and testing window. Students are assigned a score called the correct per minute (CPM) score. The CPM score indicates the number of items that students answer correctly while accounting for the length of the testing session. Based on the CPM score, students are categorized into one of three performance groups: At/Above Benchmark (i.e., students scored at or above grade level), On Watch (i.e., students scored below grade level, but students do not appear to require intensive support), or Intervention (i.e., students require

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<sup>1</sup> For more information about the CATs visit <https://www.philasd.org/era/assessment/star-information/>

<sup>2</sup> Star CBMs have their own set of instructional tier levels but they are not used for District-Wide tracking.

strategic or intensive intervention to improve performance). The score thresholds that define each performance group vary depending on grade, testing window, and the CBM taken.

This report examines student participation in and performance on the Star Math CBM assessments in the four testing windows during the 2021-22 school year.

## Research Questions

The following research questions guided the analyses and findings presented in this report:

1. What percentage of the SDP K-3 student population participated in the Star Math CBMs in 2021-22?
2. What percentage of the SDP K-3 student population performed in the At or Above Benchmark performance group on the Star Math CBMs in 2021-22?

Please note that this report compares overall student participation and performance in each testing window during the 2021-22 school year and does not reflect individual student growth. When it comes to performance, we are only focusing on the percentage of students with scores in each performance group during each testing window.

## Assessment Data Used for this Analysis

This report focuses on students' participation in, and performance on, the Curriculum Based Measures (CBMs).

### Curriculum Based Measures (CBMs)

Star CBMs are 1-minute probes that measure foundational skills in reading or math. Unlike Star computer adaptive tests (CATs), which estimate student proficiency and skill levels across a number of domains, CBMs are administered on a 1:1 basis and are designed to directly measure performance on a specific skill. Kindergarteners and first graders take two CBMs per testing window, and second and third graders take three CBMs per testing window (see Table 1 for the CBMs students take by grade level). CBMs were administered during four testing windows in 2021-22: Fall, Winter 1, Winter 2, and Spring.

Table 1: Star Math CBMs for students in Grades K-3

Math CBM	Description	K	1	2	3
Numeral Recognition (NR)	How many numbers between 0-100 students can identify when presented in a random order.	X			
Quantity Comparison (QC)	How many times students can identify the larger number (0-30) in a given pair.	X	X		
Addition to 10 (A10)	The number of addition problems students can solve correctly.		X	X	
Addition to 20 (A20)	The number of addition problems students can solve correctly.			X	
Subtraction from 10 (S10)	The number of subtraction problems students can solve correctly.			X	X
Mixed Addition and Subtraction (MAS)	The number of addition and subtraction problems using numerals between 0 and 20 students can solve correctly.				X
Multiplication to 100 (M100)	The number of correct responses to multiplication problems using numerals between 0 and 10.				X

**Note:** This report summarizes participation and performance on CBMs administered during all four windows. Numerical Recognition is also administered to first graders only in the Fall.

## Key Outcome Data Points

In response to the research questions outlined above, this report examines two sets of data: student participation and performance in the Star Math CBMs during the 2021-22 school year.

### Participation

Student participation is calculated as the percentage of eligible students in grades K-3 that completed the CBM in each testing window.

### Performance Groups

Student performance on CBMs is based on their correct per minute (CPM) score for each of the CBMs. CPM scores correspond to a national percentile ranking that is used to place students into one of three performance groups:

- 1<sup>st</sup> to 19<sup>th</sup> percentile: Intervention
- 20<sup>th</sup> to 39<sup>th</sup> percentile: On Watch
- 40<sup>th</sup> to 99<sup>th</sup> percentile: At/Above Benchmark

Each performance group has different definitions that represent the percentiles: At/Above Benchmark (i.e., students scored at or above grade level), On Watch (i.e., students scored below

grade level, but students do not appear to require intensive support), or Intervention (i.e., students require strategic or intensive intervention to improve performance).

## Student Sample

The analyses described in this report use data for all students who were eligible to take Star Math CBMs during the four 2021-22 testing windows. While some students are included in the data for all windows, students only needed to have data for at least one testing window to be included in this report.

Between about 8,400 and 9,100 students in each grade level were eligible to take the Star Math CBMs in 2021-22 in each testing window (Table 2).

Table 2. The number of students eligible to take the Star Math CBMs in 2021-22 by grade level

Grade Level	Fall	Winter 1	Winter 2	Spring
Kindergarten	8,429	8,707	8,789	8,793
1st Grade	8,465	8,594	8,678	8,684
2nd Grade	8,867	8,899	8,921	8,924
3rd Grade	9,056	9,091	9,086	9,082

Source: Qlik Academic Screeners App – Participation Details, Data Accessed June 16, 2022

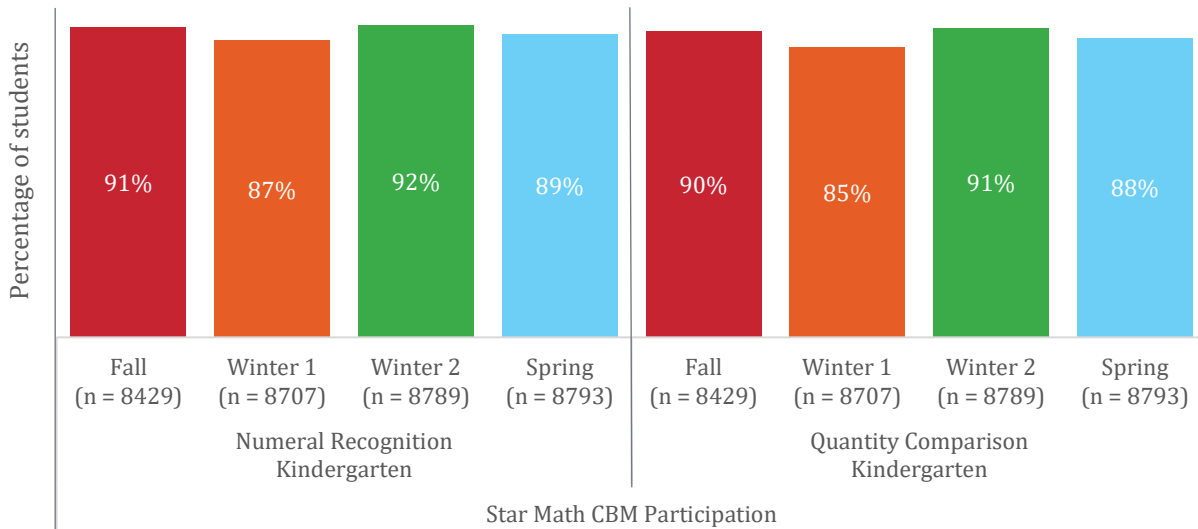
## Findings

### What percentage of the SDP K-3 student population participated in the Star Math CBMs in 2021-22?

**Between 81% to 92% of eligible students in K-3 took the Star Math CBMs in each testing window. Participation was generally highest in the Fall and Winter 2 testing windows, and students in grades K-2 had higher average participation than students in grade 3.**

Between 85% to 92% of kindergarten students took the *Numerical Recognition* and the *Quality Comparison* Star Math CBMs in each testing window in 2021-22 (Figure 1). Kindergarten participation declined by four to five percentage points from the Fall to Winter 1 windows, increased by five to six percentage points from the Winter 1 to Winter 2 windows, and declined by three percentage points from Winter 2 to the Spring testing windows.

Figure 1. Percentage of students in kindergarten who participated in Star Math CBMs in 2021-22

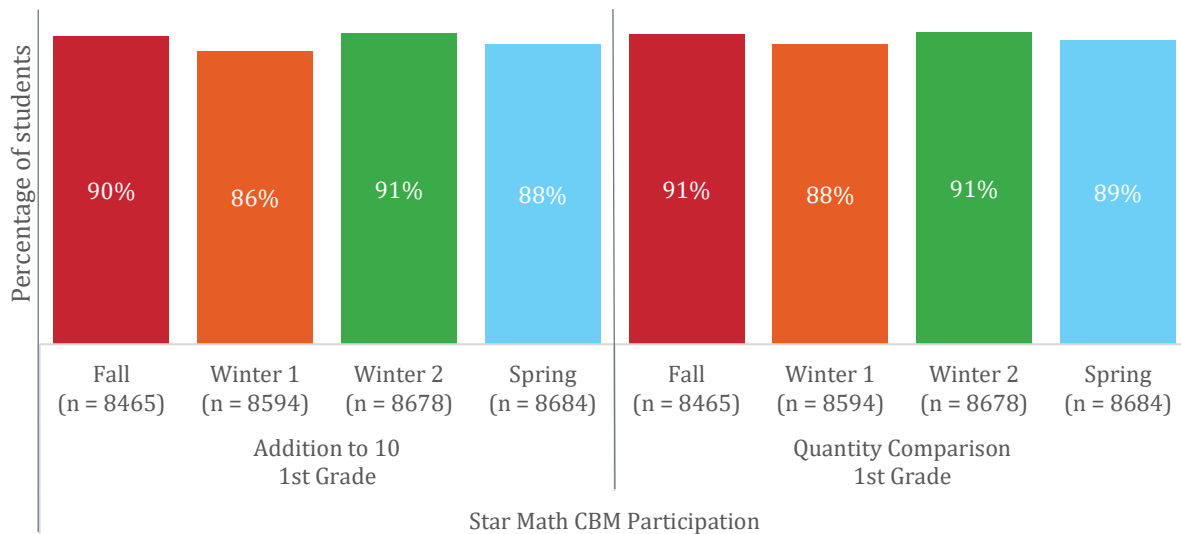


**Note:** The n count under the columns represents the number of students eligible to take the assessment in each window. To calculate the number of students who participated, multiple the n count by the percentage in the column.

**Source:** Qlik Academic Screeners App – Participation Details, Data Accessed June 16, 2022

Between 86% to 91% of first-grade students took the *Addition to 10* and the *Quality Comparison* Star Math CBMs in each testing window in 2021-22 (Figure 2). First-grade participation declined by three to four percentage points from the Fall to Winter 1 windows, increased by three to five percentage points from the Winter 1 to Winter 2 windows, and declined by two to three percentage points from Winter 2 to the Spring testing windows.

Figure 2. Percentage of students in 1<sup>st</sup> grade who participated in Star Math CBMs in 2021-22



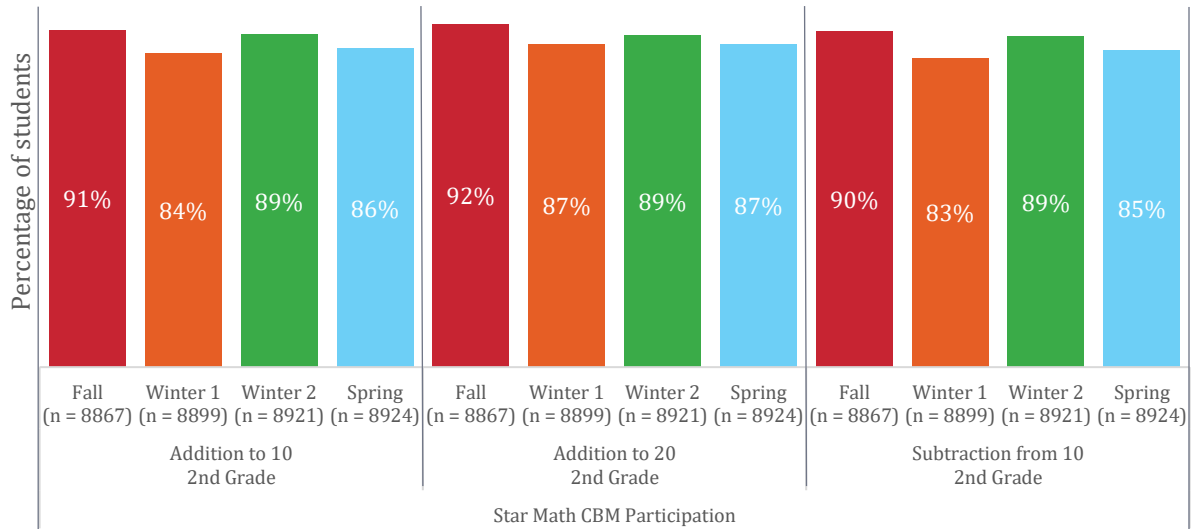
**Note:** The n count under the columns represents the number of students eligible to take the assessment in each window. To calculate the number of students who participated, multiple the n count by the percentage in the column.

**Source:** Qlik Academic Screeners App – Participation Details, Data Accessed June 16, 2022



Between 83% to 92% of second-grade students took the *Addition to 10*, *Addition to 20*, and *Subtraction to 10* Star Math CBMs in each testing window in 2021-22 (Figure 3). Second-grade participation declined by five to seven percentage points from the Fall to Winter 1 windows, increased by two to six percentage points from the Winter 1 to Winter 2 windows, and declined by two to four percentage points from Winter 2 to the Spring testing windows.

Figure 3. Percentage of students in 2<sup>nd</sup> grade who participated in Star Math CBMs in 2021-22

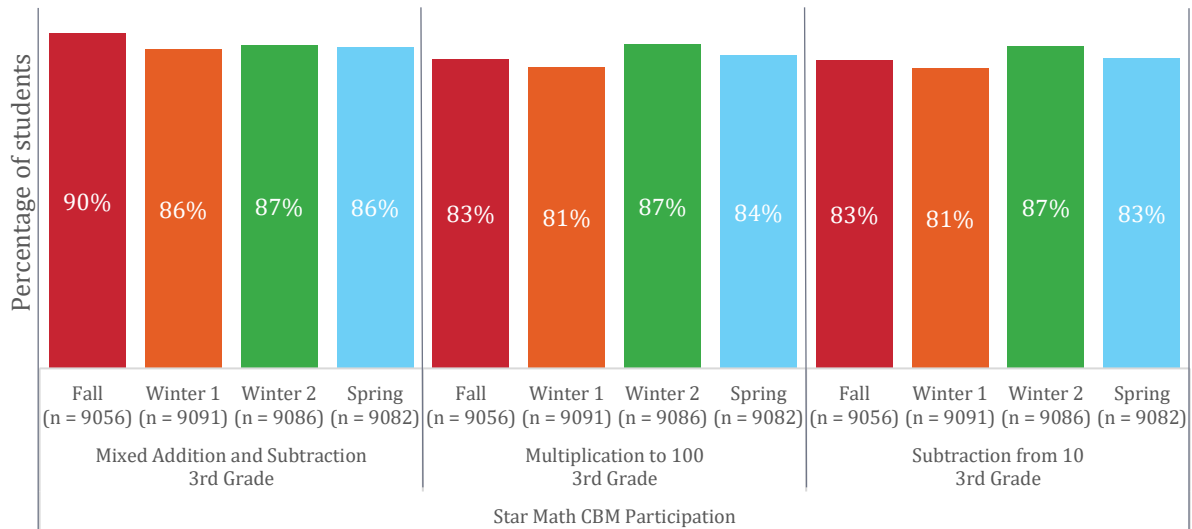


**Note:** The n count under the columns represents the number of students eligible to take the assessment in each window. To calculate the number of students who participated, multiple the n count by the percentage in the column.

**Source:** Qlik Academic Screeners App – Participation Details, Data Accessed June 16, 2022

Between 81% to 90% of third-grade students took the *Mixed Addition and Subtraction*, *Multiplication to 100*, and *Subtraction to 10* Star Math CBMs in each testing window in 2021-22 (Figure 4). Third-grade participation declined by two to four percentage points from the Fall to Winter 1 windows, increased by one to six percentage points from the Winter 1 to Winter 2 windows, and declined by one to four percentage points from Winter 2 to the Spring testing windows.

Figure 4. Percentage of students in 3<sup>rd</sup> grade who participated in Star Math CBMs in 2021-22



**Note:** The n count under the columns represents the number of students eligible to take the assessment in each window. To calculate the number of students who participated, multiply the n count by the percentage in the column.

**Source:** Qlik Academic Screeners App – Participation Details, Data Accessed June 16, 2022

### What percentage of the SDP K-3 student population performed in the At or Above Benchmark performance group on the Star Math CBMs in 2021-22?

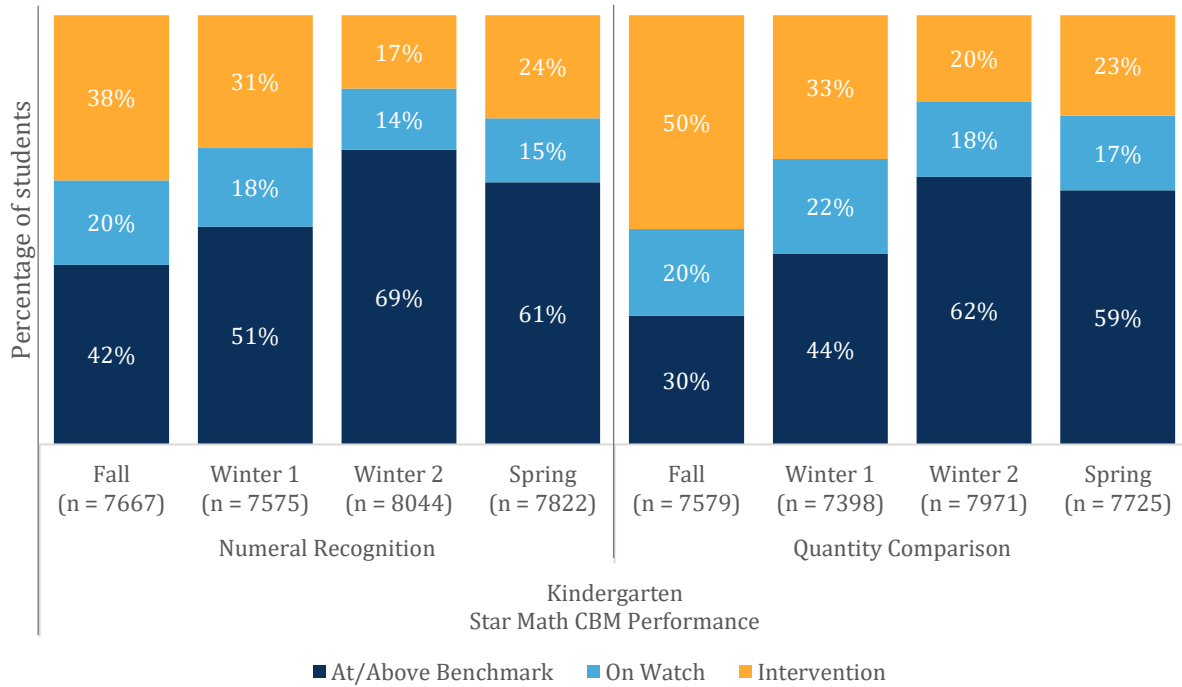
In Fall, between 30% to 42% of kindergarten students scored in the At/Above Benchmark performance group on the Star Math CBMs; by Winter 2, more than 60% of students scored At/Above Benchmark—an increase of 27 to 30 percentage points from Fall to Winter 2 on all kindergarten CBMs.

Between 30% to 69% of kindergarten students scored in the At/Above Benchmark performance group in each testing window in 2021-22 on the *Numerical Recognition* and the *Quality Comparison* Star Math CBMs (Figure 5).

Kindergarten At/Above Benchmark performance for the *Numerical Recognition* Star Math CBM increased from 42% in the Fall testing window to 69% in the Winter 2 testing window, an increase of 27 percentage points, and declined by eight percentage points to 61% in the Spring testing window.

Kindergarten At/Above Benchmark performance for the *Quality Comparison* Star Math CBM increased from 30% in the Fall testing window to 62% in the Winter 2 testing window, an increase of 32 percentage points, and declined by three percentage points to 59% in the Spring testing window.

Figure 5. Percentage of students in kindergarten who scored At or Above Benchmark on Star Math CBMs in 2021-22



**Note:** The n count under the columns represents the number of students who took the assessment in each window. To calculate the number of students who scored in each performance group, multiple the n count by the percentage in the block in the column.

**Source:** Qlik Academic Screeners App – Performance Details, Data Accessed June 16, 2022

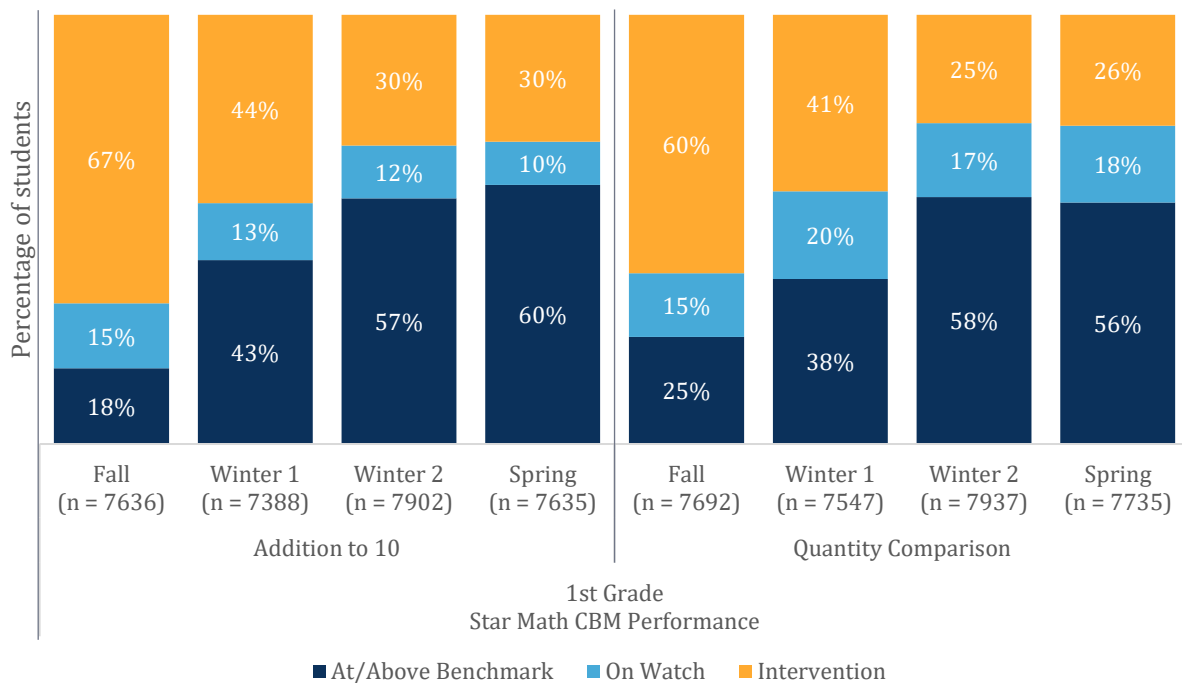
**From Fall to Spring, the first-grade At/Above Benchmark performance group increased by 33 to 42 percentage points on all first-grade CBMs.**

Between 18% to 60% of first-grade students scored in the At/Above Benchmark performance group in each testing window in 2021-22 on the *Addition to 10* and the *Quality Comparison* Star Math CBMs (Figure 6).

First-grade At/Above Benchmark performance for the *Addition to 10* Star Math CBM increased from 18% in the Fall testing window to 60% in the Spring testing window, an increase of 42 percentage points.

First-grade At/Above Benchmark performance for the *Quality Comparison* Star Math CBM increased from 25% in the Fall testing window to 58% in the Winter 2 testing window, an increase of 33 percentage points, and declined by two percentage points to 56% in the Spring testing window.

Figure 6. Percentage of students in 1<sup>st</sup> grade who scored in At or Above Benchmark on Star Math CBMs in 2021-22



**Note:** The n count under the columns represents the number of students who took the assessment in each window. To calculate the number of students who scored in each performance group, multiple the n count by the percentage in the block in the column.

**Source:** Qlik Academic Screeners App – Performance Details, Data Accessed June 16, 2022

**From Fall to Winter 2, the second-grade At/Above Benchmark performance group increased by 22 to 35 percentage points on all second-grade CBMs.**

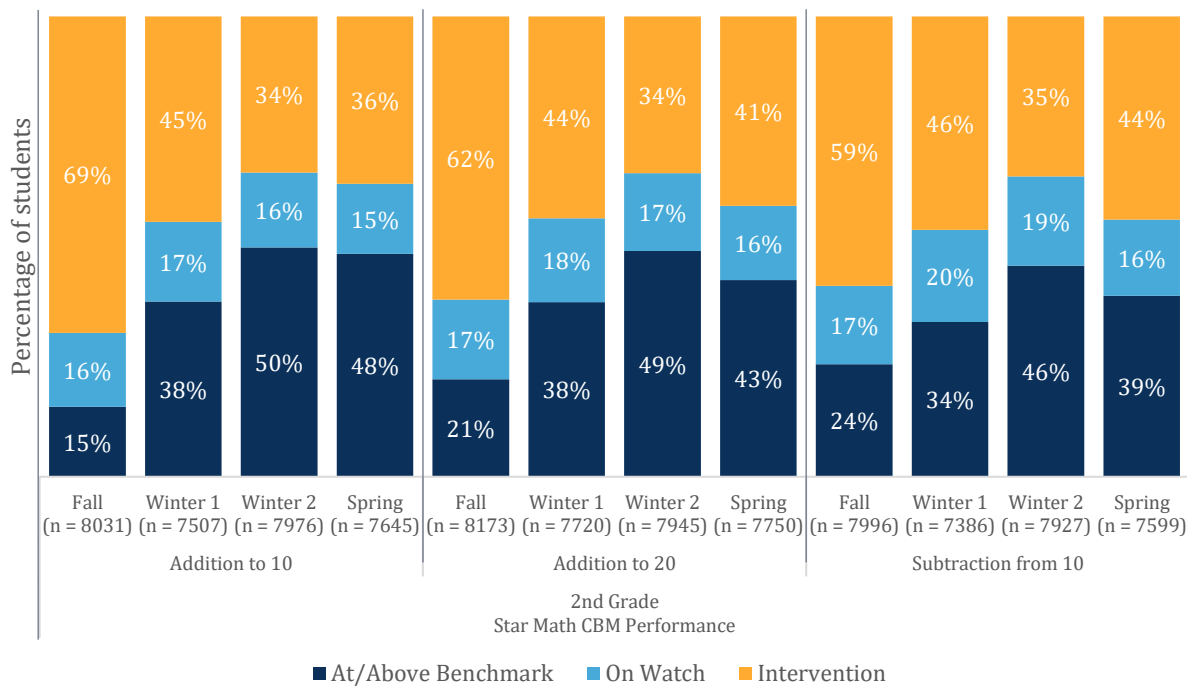
Between 15% to 50% of second-grade students scored in the At/Above Benchmark performance group in each testing window in 2021-22 on the *Addition to 10*, *Addition to 20*, and *Subtraction to 10* Star Math CBMs (Figure 7).

Second-grade At/Above Benchmark performance for the *Addition to 10* Star Math CBM increased from 15% in the Fall testing window to 50% in the Winter 2 testing window, an increase of 35 percentage points, and declined by two percentage points to 48% in the Spring testing window.

Second-grade At/Above Benchmark performance for the *Addition to 20* Star Math CBM increased from 21% in the Fall testing window to 49% in the Winter 2 testing window, an increase of 28 percentage points, and declined by six percentage points to 43% in the Spring testing window.

Second-grade At/Above Benchmark performance for the *Subtraction to 10* Star Math CBM increased from 24% in the Fall testing window to 46% in the Winter 2 testing window, an increase of 22 percentage points, and declined by seven percentage points to 39% in the Spring testing window.

Figure 7. Percentage of students in 2<sup>nd</sup> grade who scored At or Above Benchmark on Star Math CBMs in 2021-22



**Note:** The n count under the columns represents the number of students who took the assessment in each window. To calculate the number of students who scored in each performance group, multiple the n count by the percentage in the block in the column.

**Source:** Qlik Academic Screeners App – Performance Details, Data Accessed June 16, 2022

**From Fall to Winter 2, the third-grade At/Above Benchmark performance group increased by 21 to 30 percentage points on *Mixed Addition and Subtraction, Subtraction to 10, and Multiplication to 100* Star Math CBMs.**

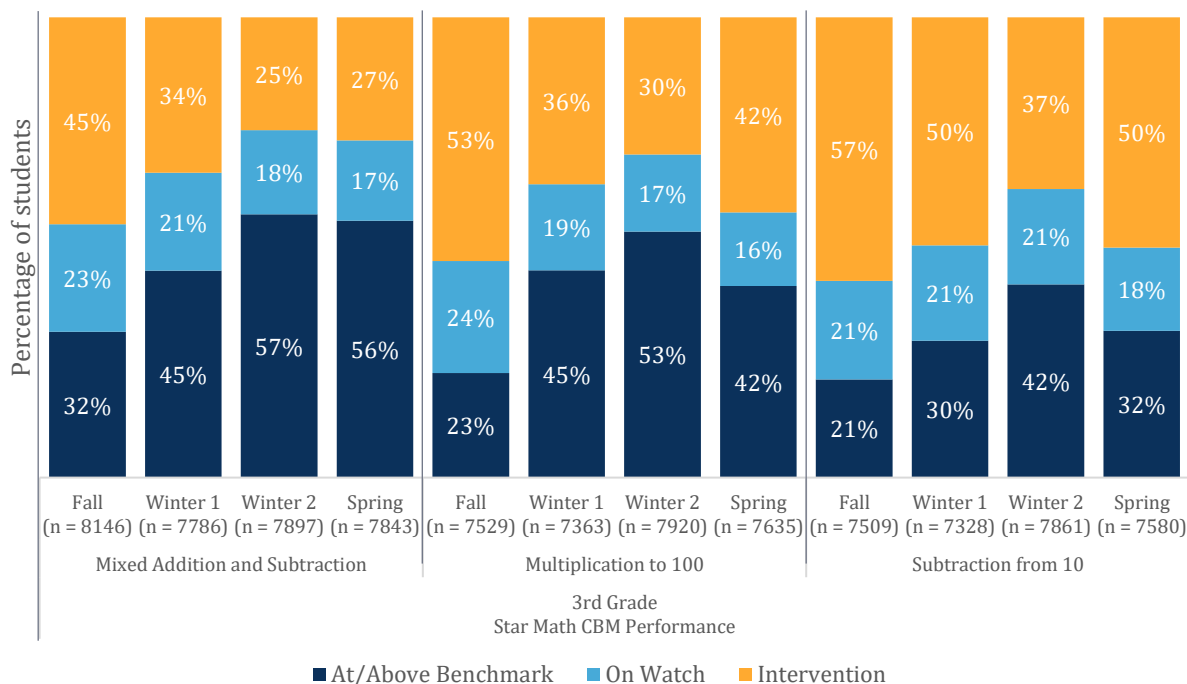
Between 21% to 57% of third-grade students scored in the At/Above Benchmark performance group in each testing window in 2021-22 on the *Mixed Addition and Subtraction* Star, *Multiplication to 100*, and *Subtraction to 10* Star Math CBMs (Figure 8).

Third-grade At/Above Benchmark performance for the *Mixed Addition and Subtraction* Star Math CBM increased from 32% in the Fall testing window to 57% in the Winter 2 testing window, an increase of 25 percentage points, and declined by one percentage point to 56% in the Spring testing window.

Third-grade At/Above Benchmark performance for the *Multiplication to 100* Star Math CBM increased from 23% in the Fall testing window to 53% in the Winter 2 testing window, an increase of 30 percentage points, and declined by 11 percentage points to 42% in the Spring testing window.

Third-grade At/Above Benchmark performance for the *Subtraction to 10* Star Math CBM increased from 21% in the Fall testing window to 42% in the Winter 2 testing window, an increase of 21 percentage points, and declined by 10 percentage points to 32% in the Spring testing window.

Figure 8. Percentage of students in 3<sup>rd</sup> grade who scored At or Above Benchmark on Star Math CBMs in 2021-22



**Note:** The n count under the columns represents the number of students who took the assessment in each window. To calculate the number of students who scored in each performance group, multiple the n count by the percentage in the block in the column.

**Source:** Qlik Academic Screeners App – Performance Details, Data Accessed June 16, 2022

## Conclusions

In the 2021-22 school year, the School District of Philadelphia (SDP) transitioned to Star Assessments as the District-wide universal screener for reading and math for all students in grades K-12. SDP uses universal screening tools to track District-wide performance, monitor academic growth, and inform instructional planning. These assessments are administered four times throughout the school year within designated screening windows. Star assessments, developed by Renaissance, are a collection of tests that can be organized into two categories: computer-adaptive tests (CATs) and curriculum-based measures (CBMs). Beginning in the 2021-22 school year, all grades were administered the Star CATs to assess reading and math skills with the exception of K-2 math.<sup>3</sup> Star Reading CBMs are administered to students in grades K-5 and Star Math CBMs are administered to students in grades K-3.<sup>4</sup> Information from the Star assessments is used to inform instruction and help support student progress towards meeting grade-level standards.

In terms of Star Math CBM participation, 81%-92% of students in K-3 took the Star Math CBMs in each testing window—this is just a bit shy of the District goal of 100% student participation. Additionally, students in K-2 had higher average participation than students in third grade, and participation was generally highest in the Fall and Winter 2 testing windows, which is expected as the Winter 1 window overlapped with the COVID-19 Omicron surge in the 2021-22 year, and Spring participation is typically lower than in other windows.<sup>5</sup>

Across all grade levels, At/Above Benchmark performance on the Star Math CBMs increased from 21 to 42 percentage points from Fall to Winter 2 or Spring. For some CBMs, At/Above Benchmark performance was greater in Winter 2 than in Spring. There was also variability in the percentage of students who scored in the At/Above Benchmark performance group in Fall by CBMs. For example, only 15% of second graders scored in the At/Above Benchmark performance group in Fall on *Addition to 10*; in comparison, 42% of kindergarteners scored in the At/Above Benchmark performance group in Fall on *Numeric Recognition*. This demonstrates the importance of the CBMs and how each test captures very different skills.

Patterns slightly differed for the [Reading CBMs](#); both performance and participation on the Reading and Math CBMs should continue to be explored.

### Correction

This report originally included a reference to “Box 1” in the *Curriculum Based Measures (CBMs)* section on p. 5, but there is no corresponding Box 1 in the report. The reference has been removed.

<sup>3</sup> For more information about the CATs visit <https://www.philasd.org/era/assessment/star-information/>

<sup>4</sup> Star CBMs have their own set of instructional tier levels but they are not used for District-Wide tracking.

<sup>5</sup> For more information on Star participation by assessment window visit:

<https://dashboards.philasd.org/extensions/goals-and-guardrails/index.html#/goal2/winter>