

KeyMath³

KeyMath–3 DA Publication Summary Form

PRODUCT DESCRIPTION	
Product name	<i>KeyMathTM–3 Diagnostic Assessment</i>
Product acronym	KeyMath TM –3 DA
Author	Austin J. Connolly
Copyright date	1971, 1976, 1988, 1998, 2007
Brief description of product	<p>The KeyMath–3 DA is a comprehensive, norm-referenced measure of essential mathematical concepts and skills. This untimed, individually administered assessment covers the complete range of math concepts and skills, from early experiences with rote and rational counting through experiences with factoring polynomials and solving linear equations. The KeyMath–3 DA can be used with individuals aged 4 years 6 months through 21 years who are functioning at some level within this instructional range.</p> <p>The assessment is available in two parallel forms, designated as Form A and Form B, each of which contains 372 full-color test items grouped into 10 subtests that represent three general math content areas: Basic Concepts, Operations, and Applications. Eight subtests are administered with a flip easel, and two subtests are administered with a Written Computation Examinee Booklet.</p> <p>The content of this math achievement measure reflects the content and process standards described in the National Council of Teachers of Mathematics’s (NCTM’s) <i>Principles and Standards for School Mathematics</i> (NCTM, 2000). It is also linked with the content of the <i>KeyMathTM–3 Essential Resources</i> (KeyMath–3 ER), a companion instructional program. The KeyMath–3 DA ASSISTTM Scoring and Reporting System (KeyMath–3 DA ASSIST software) for the KeyMath–3 DA is designed to score and produce reports for Form A and Form B of the assessment.</p>
Primary use/purpose	<p>The KeyMath–3 DA provides extensive, in-depth coverage across a broad range of mathematical concepts and skills. It has four main uses:</p> <ul style="list-style-type: none"> • Measures math proficiency by providing comprehensive coverage of the concepts and skills that are taught in regular math instruction • Measures student progress by providing highly reliable scores and by providing the Progress Report, a feature of the KeyMath–3 DA ASSIST software • Supports instructional development by providing accurate information regarding the specific concepts and skills within the examinee’s functional range and by linking each KeyMath–3 DA item to an appropriate lesson in the companion KeyMath–3 ER instructional program • Supports educational placement by providing a variety of normative scores, which can be used to identify with accuracy the grade level at which the examinee is functioning

Age range covered	Ages 4 years 6 months through 21 years
Administration time	The administration is untimed but duration varies depending on the grade or age of the examinee. Examinees in lower elementary take approximately 30 to 40 minutes, and older examinees take 75 to 90 minutes.
Individual vs. group	Individual
User qualifications	The KeyMath–3 DA may be administered by individuals who, at a minimum, have completed a bachelor’s degree program that included (a) coursework in principles of measurement and in the interpretation of tests and (b) formal training in mathematics. Examiners may include, but are not limited to, educational diagnosticians, school psychologists, and special-education professionals. Qualified examiners have training in and understanding of the principles of test administration, including establishing and maintaining rapport, following standardized testing procedures, and applying the statistical concepts related to scoring and interpreting test results.
CONTENT DESCRIPTION	
Domains	The test content covers the full spectrum of math concepts and skills, ranging from early experiences with rote and rational counting through experiences with factoring polynomials and solving linear equations.
Test names	One test is available for administration with one of two parallel forms (A and B).
Composite names	Basic Concepts, Operations, Applications
Forms	The parallel test forms (Form A and Form B) each have 372 items divided into 10 subtests.
Materials included in the kit	The KeyMath–3 DA kit includes a manual, two free-standing easels for either Form A or Form B, and 25 record forms with detachable Written Computation Examinee Booklets.

ITEM INFORMATION	
	<p>Item content is organized into 10 subtests:</p> <ul style="list-style-type: none"> • Numeration • Algebra • Geometry • Measurement • Data Analysis and Probability • Mental Computation and Estimation • Addition and Subtraction • Multiplication and Division • Foundations of Problem Solving • Applied Problem Solving <p>Subtests are grouped into three areas: Basic Concepts (conceptual knowledge), Operations, (computational skills), and Applications (problem solving). Item content reflects the content and process standards described in the National Council of Teachers of Mathematics’s (NCTM’s) <i>Principles and Standards for School Mathematics</i> (NCTM, 2000). The KeyMath–3 DA includes more algebraic content than its predecessors to better reflect the NCTM’s math standards. Subtest reliability was evaluated by grade. Items were added at the lowest grade range to ensure better measurement at that range. Some items were dropped at the upper grade range to reduce testing time without degrading measurement precision. A sensitivity review also was conducted to evaluate each item for fairness and appropriateness with respect to sex, race/ethnicity, cultural background, and geographic region.</p>
SCORING INFORMATION	
Scoring options	The test can be scored by hand or by computer entry, using the KeyMath–3 DA ASSIST™ Scoring and Reporting System.
Derived scores available	<ul style="list-style-type: none"> • Relative-standing scores: scale scores, standard scores, and percentile ranks • Developmental scores: grade equivalents, age equivalents, and growth scale values (GSV)
Norm groups available	Age, Grade: Fall, and Grade: Spring

Interpretive features	<p>Quantitative analysis using the following derived scores:</p> <ul style="list-style-type: none"> • subtest scale scores • area and Total Test standard scores • percentile ranks • grade/age equivalents • growth scale values (GSVs) <p>Qualitative analysis using the following item content and examinee performance tools:</p> <ul style="list-style-type: none"> • item and functional-range analysis • focus items • item behavioral objectives • behavioral observations of the examinee
Computerized scoring	<p>The KeyMath–3 DA ASSIST software may be used for the following:</p> <ul style="list-style-type: none"> • Entering item responses or raw scores for conversion to derived scores • Previewing, printing, and/or saving individual score summary and progress reports • Determining item and functional-range analysis • Creating a Progress Report, which charts an examinee’s progress and provides analysis of growth across several KeyMath–3 DA administrations • Producing a narrative report that provides a description of an examinee’s KeyMath–3 DA subtest, area, and Total Test scores • Exporting the derived scores (for use in statistical analysis) into a tab-delimited text file that can be viewed or edited by the Microsoft Excel® application • Generating a parent/caregiver letter that communicates test results to the examinee’s parent or caregiver
TECHNICAL INFORMATION	
Sample Information	
Standardization description	<p>The KeyMath–3 DA was developed for these purposes:</p> <ul style="list-style-type: none"> • retain and enhance the features that have worked well, including parallel forms, an adaptive administration format, and comprehensive math content • update item content • align content with current state and national math standards <p>The norm samples consist of U.S. citizens, aged 4 years 6 months through 21 years 11 months, who are proficient in English, have adequate vision (or vision that is correctable with a vision aid), and have adequate hearing (or hearing that is correctable with a hearing aid). The norm sample was selected carefully to ensure that it accurately reflected the U.S. population in terms of the demographic characteristics of sex, race/ethnicity, parent’s education, and geographic region. Demographic targets for the norm sample were based on the <i>Current Population Survey, 2004</i>, from the U.S. Bureau of the Census.</p>
Date	March 2006 through December 2006
Size	<p>272 test sites in 45 states</p> <ul style="list-style-type: none"> • 3,630 examinees aged 4 years 6 months through 21 years 11 months • 3,105 of the 3,630 examinees used for the grade norm subsample

Age and Grade	<p>Age norm sample: 4 years 6 months through 21 years 11 months</p> <p>Grade norm sample: kindergarten through Grade 12</p>
Sex	<p>Age norm sample:</p> <ul style="list-style-type: none"> • Female: 1,813 • Male: 1,817 <p>Grade norm sample:</p> <ul style="list-style-type: none"> • Female: 1,553 • Male: 1,552
Race/ethnicity	<p>Age norm sample:</p> <ul style="list-style-type: none"> • African American: 595 • Hispanic: 582 • White: 2,230 • Other: 223* <p>Grade norm sample:</p> <ul style="list-style-type: none"> • African American: 513 • Hispanic: 493 • White: 1,908 • Other: 191* <p>* Includes American Indians, Alaska Natives, Asian Americans, Pacific Islanders, and all other groups not classified as African American, Hispanic, or White.</p>
Geographic region	<p>Age norm sample:</p> <ul style="list-style-type: none"> • Northeast: 672 • North Central: 835 • South: 1,285 • West: 838 <p>Grade norm sample:</p> <ul style="list-style-type: none"> • Northeast: 580 • North Central: 720 • South: 1,095 • West: 710

SES/Parent's education	<p>Age norm sample:</p> <ul style="list-style-type: none"> • Grade 11 or Lower: 493 • Grade 12 or GED: 1,104 • 1–3 Years of College: 1,082 • 4+ Years of College: 951 <p>Grade norm sample:</p> <ul style="list-style-type: none"> • Grade 11 or Lower: 421 • Grade 12 or GED: 947 • 1–3 Years of College: 925 • 4+ Years of College: 812
Community size	Variable
Special populations included	<p>The age norm sample of ages 4 years 6 months through 18 years 11 months includes representative proportions of the following special populations:</p> <ul style="list-style-type: none"> • Specific Learning Disability • Speech/Language Impairment • Intellectual Disability • Emotional/Behavioral Disturbance • Developmental Delay • Other Impairment* <p>The grade norm samples of ages 5 through 18 years includes representative proportions of the following special populations:</p> <ul style="list-style-type: none"> • Specific Learning Disability • Speech/Language Impairment • Intellectual Disability • Emotional/Behavioral Disturbance • Developmental Delay • Other Impairment* <p>* Includes multiple disabilities, hearing impairments, orthopedic impairments, other health impairments, visual impairments, autism, deafness/blindness, and traumatic brain injury.</p>

Reliability					
Internal-consistency reliability	Mean Split-Half Reliability by Grade (Fall)				
	Grades	Basic Concepts Form A	Operations Form A	Applications Form A	Total Test Form A
	Kindergarten Through Grade 5	.92	.89	.85	.95
	Grades 6 Through 12	.96	.94	.89	.98
	Grades	Basic Concepts Form B	Operations Form B	Applications Form B	Total Test Form B
	Kindergarten Through Grade 5	.93	.90	.87	.96
Grades 6 Through 12	.95	.94	.89	.97	
Alternate-form reliability	By Grade: Pre-kindergarten Through Grade 12 <ul style="list-style-type: none"> • Basic Concepts: Adjusted $r = .94$ • Operations: Adjusted $r = .93$ • Applications: Adjusted $r = .88$ • Total Test: Adjusted $r = .96$ 				

Test–retest reliability	<p>By Grade:</p> <p>Pre-kindergarten Through Grade 12</p> <ul style="list-style-type: none"> • Basic Concepts: Adjusted $r = .95$ • Operations: Adjusted $r = .93$ • Applications: Adjusted $r = .93$ • Total Test: Adjusted $r = .97$
Validity	
Intercorrelation study	<p>The KeyMath–3 DA Total Test score with area scores</p> <p>Kindergarten Through Grade 2 ($N = 690$)</p> <ul style="list-style-type: none"> • Total Test and Basic Concepts: $r = .97$ • Total Test and Operations: $r = .84$ • Total Test and Applications: $r = .90$ <p>Grades 3 Through 5 ($N = 730$)</p> <ul style="list-style-type: none"> • Total Test and Basic Concepts: $r = .98$ • Total Test and Operations: $r = .92$ • Total Test and Applications: $r = .91$ <p>Grades 6 Through 12 ($N = 1,685$)</p> <ul style="list-style-type: none"> • Total Test and Basic Concepts: $r = .98$ • Total Test and Operations: $r = .94$ • Total Test and Applications: $r = .92$

Correlations

The KeyMath–3 DA with the *KeyMath Revised, Normative Update: A Diagnostic Inventory of Essential Mathematics* (KeyMath-R/NU)

Kindergarten Through Grade 5 ($N = 54$)

- Basic Concepts: Adjusted $r = .82$
- Operations: Adjusted $r = .88$
- Applications: Adjusted $r = .83$
- Total Test: Adjusted $r = .92$

Grades 6 Through 12 ($N = 45$)

- Basic Concepts: Adjusted $r = .74$
- Operations: Adjusted $r = .93$
- Applications: Adjusted $r = .80$
- Total Test: Adjusted $r = .91$

The KeyMath–3 DA with the *Kaufman Test of Educational Achievement, Second Edition* (KTEA-II)

Kindergarten Through Grade 5 ($N = 47$)

- Basic Concepts and Mathematics Composite: Adjusted $r = .79$
- Operations and Mathematics Composite: Adjusted $r = .82$
- Applications and Mathematics Composite: Adjusted $r = .68$
- Total Test and Mathematics Composite: Adjusted $r = .83$

Grades 6 Through 12 ($N = 57$)

- Basic Concepts and Mathematics Composite: Adjusted $r = .85$
- Operations and Mathematics Composite: Adjusted $r = .87$
- Applications and Mathematics Composite: Adjusted $r = .76$
- Total Test and Mathematics Composite: Adjusted $r = .88$

The KeyMath–3 DA and the *Iowa Tests of Basic Skills*® (ITBS®instrument)

Grades 1 Through 8 ($N = 78$)

- Basic Concepts and Total Test: Adjusted $r = .78$
- Operations and Total Test: Adjusted $r = .75$
- Applications and Total Test: Adjusted $r = .75$
- Total Test and Total Test: Adjusted $r = .79$

The KeyMath–3 DA and the Total Test score on the *Measures of Academic Progress* ($N = 36$)

Grades 1 Through 5

- Total Test: $r = .82$

Grades 6 Through 12

- Total Test: $r = .88$

The KeyMath–3 DA and the *Group Mathematics Assessment and Diagnostic Evaluation* (GMADE)

Kindergarten Through Grade 5 ($N = 43$)

- Basic Concepts and Total Test: Adjusted $r = .83$
- Operations and Total Test: Adjusted $r = .63$
- Applications and Total Test: Adjusted $r = .75$
- Total Test and Total Test: Adjusted $r = .82$

Grades 6 Through 12 ($N = 41$)

- Basic Concepts and Total Test: Adjusted $r = .83$
- Operations and Total Test: Adjusted $r = .84$
- Applications and Total Test: Adjusted $r = .74$
- Total Test and Total Test: Adjusted $r = .85$

Construct validity	KeyMath–3 DA scores were correlated with the scores on the <i>KeyMath Revised, Normative Update: A Diagnostic Inventory of Essential Mathematics</i> ; the <i>Kaufman Test of Educational Achievement, Second Edition</i> ; <i>Iowa Tests of Basic Skills</i> instrument; the <i>Measures of Academic Progress</i> ; and the <i>Group Mathematics Assessment and Diagnostic Evaluation</i> .
Content validity	<ul style="list-style-type: none"> • A review was conducted of state math standards and National Council of Teachers of Mathematics publications. Subsequently, a comprehensive blueprint reflecting essential mathematics content, existing curricular priorities, and national math standards was created. Content was organized and the sequence was aligned with curricular frameworks and instructional development. • Items underwent qualitative and data-based evaluations. The test author, publisher’s development staff with expertise in math item development, consultants, and item bias reviewers examined the items.
Clinical samples	<p>Average KeyMath–3 DA Standard Score Difference Between Special Populations and the General Population</p> <p>Attention-Deficit/Hyperactivity Disorder:</p> <ul style="list-style-type: none"> • Total Test ($N = 69$): -1.1 <p>Giftedness:</p> <ul style="list-style-type: none"> • Total Test ($N = 83$): 16.6 <p>Learning Disability (Math Only):</p> <ul style="list-style-type: none"> • Total Test ($N = 49$): -15.6 <p>Learning Disability (Reading Only):</p> <ul style="list-style-type: none"> • Total Test ($N = 77$): -12.5 <p>Learning Disability (Math and Reading):</p> <ul style="list-style-type: none"> • Total Test ($N = 60$): -22.2 <p>Mild Intellectual Disability:</p> <ul style="list-style-type: none"> • Total Test ($N = 61$): -34.0

OTHER INFORMATION	
Developmental history	Austin J. Connolly has authored three editions of the KeyMath tests: the <i>KeyMath Diagnostic Arithmetic Test</i> (with Natchtman & Pritchett, 1971, 1976), the <i>KeyMath Revised: A Diagnostic Inventory of Essential Mathematics</i> (1988), and the <i>KeyMath–3 Diagnostic Assessment</i> . A manual with updated norms, <i>KeyMath Revised, Normative Update manual</i> , was published in 1998.
Special features	<p>The KeyMath–3 DA includes the following features:</p> <ul style="list-style-type: none"> • Item content reflecting content and process standards published by the National Council of Teachers of Mathematics (NCTM) • Growth scale values (GSVs), which enable users to measure progress accurately across the full range of math concepts and skills • Link to the KeyMath–3 ER instructional program. Each KeyMath–3 DA item is linked to an appropriate KeyMath–3 ER lesson • Greater emphasis on algebra, including a new Algebra subtest • Area comparisons, which enable the practitioners or researchers to determine whether an examinee’s performance differs significantly across KeyMath–3 DA content areas • Focus items that provide a tool for identifying items that may require particular attention on the part of the practitioner • Item and functional-range analysis identifies items that fall within an individual’s functional range
Adaptation of special needs	<p>Features that address special needs include:</p> <ul style="list-style-type: none"> • Individual administration • Untimed administration • Simplified language used in items <p>Also, the American Printing House for the Blind reviewed the administration easels for color vision and low vision considerations.</p>
Sensitivity to other cultures	A sensitivity review was conducted to evaluate each item for fairness and appropriateness with respect to sex, race/ethnicity, cultural background, and geographic region. Reviewers of various cultural backgrounds and from different areas of the United States participated in the review and made recommendations. Reviewers’ recommendations were considered when making decisions to modify or drop items.
Training options available	Some professional development options include inservicing and content presentations. Pearson also offers live (MC-led, trainer-led, or author-led) options and Webinar options.