

TIMSS 2011

Eighth Grade Mathematics Item Descriptions developed during the TIMSS 2011 Benchmarking

Items at Low International Benchmark (400)

Number

M02_02	Adds a two-place and a three-place decimal
M03_01	Given a three-place decimal, recognizes the equivalent fraction
M11_01	Knows whole number exponents

Algebra

M02_07	Evaluates a simple algebraic expression
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Geometry

None

Data and Chance

M07_13A	Selects the appropriate line on a graph and reads information from it
M08_14	Identifies the bar graph that matches the information shown in a table
M10_13	Identifies the table that matches the information shown in a pictograph

Items at Intermediate International Benchmark (475)

Number

M02_01	Identifies the decimal equivalent to a given fraction
M06_01	In a word problem, given a unit fraction of a measure identifies the whole measure
M08_01	Evaluates an expression involving negative whole numbers and parentheses
M09_01	Recognizes the power of 10 of the divisor in a division of decimals
M11_03	Uses knowledge of the whole being 100 percent to solve a simple word problem
M11_04A	Completes a table of equivalent proportions
M12_03	Solves a two-step word problem involving whole numbers
M12_04	Determines what fraction of a 10X10 grid is shaded
M14_02A	Solves a word problem involving addition of time

Algebra

M01_03	Extends number patterns derived from a sequence of geometric shapes
M06_05A	Finds the next term in a simple number pattern
M07_04	Knows the meaning of a simple algebraic expression involving multiplication and addition
M07_05	Identifies the algebraic expression that represents a situation involving addition and multiplication

M12_06	Knows the whole number exponents
M13_03	Recognizes the distributive property in evaluating an algebraic expression

Geometry

M04_11	Identifies a net of a rectangular solid
M05_11	Given a net of a three-dimensional object, completes a two-dimensional drawing of it from a specific viewpoint
M08_10	Determines the value of an angle involving properties of corresponding and supplementary angles

Data and Chance

M03_14	Determines which of a set of statements involving averages must be true
M03_15	Determines the probability of two of three possible outcomes
M05_13	Constructs and labels a pie chart representing a given situation
M06_11	Given a situation, judges the chance of an outcome as likely
M08_12	Finds and compares the unit prices of four objects
M09_15	Given a table of percentages, selects the pie chart that could represent the given data
M09_16	Interpolates from a line graph to provide an estimated value
M10_12A	Compares the chances of two different outcomes
M11_14	Given a situation, judges the chance of an outcome as unlikely
M12_12A	Reads data from a line graph
M12_12B	Compares data from two line graphs to solve a problem
M13_13	Uses information in a table to complete a bar graph
M14_12	Given the chance of an outcome, solves a problem

Items at High International Benchmark (550)

Number

M01_01	Rounds two-place decimals to whole numbers
M01_07	Identifies the prime factors of a given number
M01_08	Uses percentages given in a pie chart to solve a problem
M02_03	Solves a division word problem involving whole numbers and a remainder
M03_02	Selects the numerator of a fraction to make two fractions equivalent when one denominator is not a multiple of the other
M03_03	Continues a pattern of number sentences involving subtraction of negative integers
M03_04	Given the part and the whole, can express the part as a percentage, and given the whole and the percentage, can find the part
M04_01	Identifies the decimal number closest in size to a given fraction
M04_04	Orders decimals with different numbers of decimal places
M04_05	Solves a proportion problem involving decimals
M05_01	Identifies the decimal number that is equivalent to the sum of two fractions whose denominators are powers of ten
M06_02	Identifies the decimal number represented by a point between two consecutive whole numbers on a number line with only the whole numbers labeled
M06_03	Uses the law of exponents to express a product
M08_02	Solves a word problem involving subtraction of negative numbers
M08_04	Given the two parts of a whole in a word problem, identifies the fraction which represents one part
M08_05A	Solves a word problem involving multiplication and addition of whole numbers
M09_02	Recognizes the fraction equivalent to a percentage

M09_04	Identifies the larger of two fractions with different numerators and different denominators and explains why it is larger
M10_01	Uses the distributive law to identify an expression equivalent to a given one
M10_04	Determines fractions equivalent to a given fraction
M11_04B	Finds the unknown term in a proportion in a given situation
M12_01	Solves a word problem involving ratios
M12_02	Identifies a prime number
M13_01	Solves a word problem involving multiplication of a fraction and a decimal
M13_04	Identifies equivalent ratios
M13_06A	Selects and combines information from two sources to solve a multi-step word problem
M13_06B	Selects and combines information from two sources to solve a multi-step word problem
M14_01	Identifies the representation of a fraction equivalent to a given representation of a fraction
M14_03	Understands the properties of adding multiples
M14_04	Writes a decimal with three places as a fraction

Algebra

M01_04A	Extends a number pattern presented geometrically and numerically to solve a problem
M01_09	Given an interval containing a number, determines the interval containing the sum of that number and a whole number
M03_05	Recognizes the collection of algebraic terms involving exponents
M03_06	Evaluates an algebraic expression in two unknowns
M03_09	Finds the missing term in a non-standard number pattern
M04_08	Identifies the solution to an equation involving a square root
M04_09	Identifies the formula that represents a situation involving area
M05_05	Identifies the algebraic expression that represents a situation involving the sum of a constant term and a product
M05_06	Uses a formula to determine the value of one variable given the value of the other
M06_05B	Finds a specific term in a simple number pattern
M06_06	Uses the distributive law to identify an algebraic expression equivalent to a given one
M06_07	Determines the solution to a pair of simultaneous equations
M07_01	Solves a word problem by using patterns in a two-column table to determine the number in the second column that would correspond to a number midway between two entries in the first column
M07_12	Identifies the quantity that satisfies two inequalities represented by balances in a problem situation
M08_07	Evaluates an algebraic expression involving fractions and integers
M08_08	Uses a given formula involving fractions to solve a word problem
M09_06	Solves a simple linear equation in one variable with a mixed number solution
M09_07	Finds a missing term in a non-arithmetic and non-geometric number sequence
M09_08	Identifies the linear equation satisfied by two given values
M09_09	Solves a proportion expressed algebraically
M09_11A	Adds two algebraic expressions and simplifies
M10_08A	Extends a pattern involving the area of squares
M11_08A	Finds a specific term in a pattern presented numerically and geometrically
M13_05	Identifies the algebraic expression that represents a fraction of a variable
M13_07	Identifies the ordered pair of numbers that satisfies a linear equation
M13_08	Identifies the equation that models a situation given in a word problem
M13_09	Identifies values of two variables, each satisfying a simple inequality



M14_06	Identifies the equivalent algebraic expression involving exponents and multiplication
M14_07A	Extends a given geometric pattern to find the value of the 10th term

Geometry

M02_09	Solves a problem involving angles in an isosceles triangle
M02_11	Given the perimeter of a square, finds its area
M03_11	Uses properties of triangles to draw a triangle of given dimensions on a grid
M03_12	Given the volume and two dimensions of a rectangular solid, finds the other dimension
M04_12	Solves a problem involving angles of a triangle and parallel lines
M05_08	Finds the perimeter of a square, given its area is a square number
M05_09	Determines the number of cubes needed to fill a hole in a given shape
M05_10	Identifies the justification that a triangle is a right triangle using the Pythagorean theorem
M05_12	Identifies the transformations used to produce a sequence of figures
M06_10	Given instructions, locates points on a polar grid and finds the measure of an angle with those points
M07_08	Visualizes the unfolded shape of a figure shown on a folded piece of paper and uses properties of triangles to identify the shape
M08_11	Draws an angle of a given measure on a square grid
M09_12	Identifies a true statement based on the properties of parallel and perpendicular lines
M09_13	Uses the angle properties of triangles and rectangles to find a missing angle
M10_09	Uses the Pythagorean theorem to solve a word problem
M10_10	Solves a problem involving angles of a triangle
M11_09	Draws a symmetrical shape given half of it and one of its lines of symmetry
M12_10	Solves a problem involving similar triangles
M13_11	Given a cube made of unit cubes, uses the properties of a cube to identify the number of remaining unit cubes
M14_11	Solves a problem involving angles of a triangle

Data and Chance

M02_13	Identifies the simple probability
M03_16	Uses data given as percentages to predict the outcome of a future event
M03_17	Constructs and labels a pie chart representing a given situation
M04_14	Interprets data in a pie chart to solve a word problem
M05_14	Identifies the statement that best describes the relative likelihood of two events
M06_12A	Calculates the mean of a set of numbers
M06_12B	Finds the median of a set of numbers
M07_13B	Interprets information from a line graph to determine an average
M07_13C	Selects the appropriate line on a graph and determines the interval where the greatest change occurs
M10_12B	Compares the chances of two different outcomes
M11_02	Reads the value indicated by a minor unlabeled tick mark on a circular scale when the previous major tick mark also is unlabeled
M11_12	Reads values from two line graphs to solve a problem
M12_13	Interprets data in a pictograph to solve a multi-step problem
M12_14	Justifies a conclusion resulting from comparing two distributions
M13_14	Explains why a conclusion drawn from a given bar graph is incorrect

Items at Advanced International Benchmark (625)

Number

M02_04	Recognizes an equivalent expression for subtraction of fractions
M02_05	Determines the truth of number sentences involving multiplication and division of fractions and percentages
M04_02	Solves a non-routine problem involving whole numbers
M04_03	Reasons about divisibility in an algebraic expression
M05_02	Given two points on a number line representing unspecified fractions, identifies the point that represents their product
M05_03	Solves a problem involving a fraction of a whole number of currency units
M06_04	Arranges four given digits to obtain the greatest product of two two-digit numbers
M07_02	Converts a mixed number to a decimal rounded to two places
M08_03	Solves a two-step word problem involving percentages
M08_05B	Solves a non-routine word problem involving whole numbers
M09_03	Approximates the sum of five three-digit numbers to the nearest hundred
M09_05	Writes a rule for a multiplicative number pattern involving negative numbers
M10_02	Solves a word problem involving comparison of fractions and percentages and explains answer
M10_03	Solves a non-routine word problem involving reasoning with whole numbers
M10_05	Reasons about fractional parts of a whole in a word problem and explains answer
M12_05	Determines the truth about percentages of given numbers
M13_02	Uses knowledge of decimal place value to express a sum
M14_02B	Solves a word problem involving percentages and elapsed time

Algebra

M01_04B	Extends a number pattern presented geometrically and numerically to solve a problem
M01_04C	Extends a number pattern presented geometrically and numerically to solve a problem
M03_08	Uses the value of a given algebraic expression to find the value of a related algebraic expression
M03_10	Identifies the linear equation that is satisfied by two ordered pairs
M04_06	Evaluates an algebraic expression involving a fraction
M04_07	Writes an expression for the area of part of a geometric figure
M05_04	Identifies a diagram that models addition of two like algebraic terms
M06_05C	Expresses the general term algebraically in a simple number pattern
M06_08	Given the length of the sides of a rectangle in terms of a variable, identifies the algebraic expression for its area
M07_03	Adds three simple algebraic rational expressions with different numerical denominators
M07_09	Identifies the sum of three consecutive whole numbers given the middle number represented algebraically
M08_06	Identifies an equivalent algebraic expression
M08_09	Demonstrates an understanding of slope by relating graphs and their equations
M09_10	Constructs and uses the solution of a linear equation to solve a word problem
M09_11B	Subtracts one algebraic expression from another and simplifies
M10_06	Identifies an equivalent expression
M10_07	Identifies a pair of simultaneous linear equations that model a given situation
M11_05	Identifies the equation of a line that passes through points shown on a graph
M11_06	Identifies the equation that models a situation involving distance, speed, and time
M11_07	Finds the value of an algebraic expression involving parentheses and negative terms
M11_08B	Explains how to find a specific term in a pattern presented numerically and geometrically

M11_08C	Expresses the general term algebraically in a pattern presented numerically and geometrically
M12_07	Identifies an algebraic expression involving parentheses and negative terms
M12_08	Solves a pair of simultaneous linear equations
M13_10	Uses a given formula to solve a word problem
M14_05	Identifies an algebraic expression that represents the area of a given rectangle
M14_07B	Gives a rule for the n th term of a geometric pattern

Geometry

M01_06	Uses knowledge of interior angles of a triangle to determine the angle sum of a given polygon
M02_10	Determines the value of an angle involving properties of corresponding angles and angles of a triangle
M02_12	Solves a word problem involving filling a three-dimensional shape with rectangular solids
M03_13	Identifies the image of a triangle under a rotation about a point in the plane
M04_10	Solves a word problem using properties of similar triangles
M05_07	Uses information about the lengths of segments on a line to determine the distance between their midpoints
M06_09	Identifies the polygon that has a line of symmetry
M07_06	Uses knowledge of time, clocks, and angles to solve a problem
M07_07	Determines the area of a trapezoid inscribed in a rectangle
M07_10	Applies properties of interior and exterior angles of a triangle to find an unknown angle in overlapping triangles
M10_11	Identifies the point equidistant from two given points in the Cartesian plane
M11_10	Uses the Pythagorean theorem in finding the perimeter of a trapezoid
M11_11	Identifies two shapes that make a square
M12_09	Draws all lines of symmetry on a regular polygon
M12_11	Solves a multi-step word problem involving ratios between volumes
M13_12	Uses the Pythagorean theorem in finding the area of a triangle
M14_10	Determines the surface area of a prism given its net

Data and Chance

M01_02	Solves a problem involving extrapolation of the data shown in a double bar graph
M04_13	Explains why a data representation could be misleading
M04_15	Uses understanding of mean and range to solve a problem
M07_11	Given a spinner, identifies the expected frequency of a particular outcome
M11_13	Identifies a possible word representation for a part of a speed-time graph
M13_15	Uses understanding of average to solve a problem
M14_13A	Uses and interprets data sets in pie charts to solve a problem involving percentages
M14_13B	Uses and interprets data sets in pie charts to solve a problem involving percentages

Items Above Advanced International Benchmark (625)

Number

M13_06C	Compares results derived from two sources and provides a justification for the conclusion
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Algebra

M01_05	Expresses the general term algebraically for two related number patterns
M02_06	Determines an algebraic expression for an area in a multi-step word problem
M02_08	Constructs and uses the solution of a linear equation to solve a word problem

M03_07	Solves a linear inequality
M10_08B	Writes the algebraic expression for the nth term in a series
M14_08	Identifies the graph of a linear equation

Geometry

M09_14	Uses properties of similar triangles to identify equal angles
M14_09	Identifies the image of a shape after rotation and reflection

Data and Chance

M02_14A	Compares and interprets data from two unfamiliar graphical representations
M02_14B	Compares and interprets data from two unfamiliar graphical representations
M06_12C	Uses understanding of median and mean to solve a word problem
M08_13	Explains why a data representation could be misleading
