# Appendix E

## Descriptions of Mathematics Items at Each Benchmark

MATHEMATICS
Grade 8

**Exhibit E.1: Descriptions of Mathematics Items at Each International Benchmark**

## Items at Low International Benchmark (400)

### Number

| | |
|---|---|
| M05_02* | Solves a word problem by adding numbers with up to three decimal places. |
| M06_07* | Multiplies a two-place decimal by a three-place decimal. |
| M06_11 | Solves a word problem involving a proportion with unit ratio. |
| M06_11* | Solves a word problem involving a proportion with unit ratio. |
| M13_08 | Selects two-place decimal closest to a given whole number. |

### Measurement

| | |
|---|---|
| M10_06 | Selects the most appropriate metric unit to measure a large area. |

### Data

| | |
|---|---|
| M12_13A | Selects the appropriate line on a graph and reads information from it. |

## Items at Intermediate International Benchmark (475)

### Number

| | |
|---|---|
| M03_04 | Arranges four given digits in descending and ascending order and finds the difference between those two numbers. |
| M04_05 | Solves a word problem involving subtraction of a two-place decimal number from another. |
| M04_06 | Writes a fraction less than a given fraction. |
| M05_01 | Identifies a circular model of a fraction that best approximates a given rectangular model of the same fraction. |
| M05_02 | Solves a word problem by adding numbers with up to three decimal places. |
| M05_06 | Selects the approximate quantity remaining after an amount is decreased by a given percent. |
| M06_03 | Selects the smallest fraction from a set of familiar fractions. |
| M06_12* | Solves a word problem about distance and time by finding the missing term in a proportion. |
| M10_01 | Solves a word problem involving addition and multiplication of two-digit whole numbers. |
| M11_01 | Identifies the decimal number that is equivalent to the sum of two fractions whose denominators are powers of ten. |
| M13_01 | Uses knowledge of exponential notation to select approximations to two squared whole numbers. |
| M14_01 | Rounds two-place decimals to whole numbers. |

### Algebra

| | |
|---|---|
| M01_02 | Using properties of a balance, reasons to find an unknown weight (mass). |
| M01_10 | Solves equation for missing number in a proportion. |
| M02_12 | Selects the formula satisfied by the given values of the variables. |
| M03_01 | Solves problem by interpreting information from a graph of two intersecting lines. |

* Denotes with calculator available.

Exhibit E.1: **Descriptions of Mathematics Items at Each International Benchmark** (Continued...)

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## Items at Intermediate International Benchmark (475) – *Continued*

### Algebra – *Continued*

| | |
|---|---|
| M08_04 | Selects the rule expressed in words that generates successive terms in a given number pattern. |
| M08_05 | Solves a linear equation in one variable. |
| M08_13A | Identifies the straight line graph modeling a situation described in words. |
| M08_13B | Interprets two straight line graphs and uses their intersection to solve a problem. |
| M12_04 | Knows the meaning of a simple algebraic expression involving multiplication and addition. |
| M12_05 | Identifies the algebraic expression that represents a situation, involving addition and multiplication. |
| M14_03 | Extends number patterns derived from a sequence of geometric shapes. |

### Measurement

| | |
|---|---|
| M01_08 | Identifies an unlabeled midway point on a number line marked in tenths. |
| M04_11A | Finds a fraction of a given area of an irregular figure composed of squares of equal sides. |
| M06_01 | Reads the value indicated by an unlabeled tick mark on a circular scale. |
| M07_05 | Solves a word problem by comparing distances on a map drawn to scale with a given distance. |

### Geometry

| | |
|---|---|
| M02_03 | Identifies corresponding parts of congruent trapezoids. |
| M05_03 | Identifies the diagrammatic representation of a three-dimensional object after rotation. |
| M08_10 | Uses properties of an isosceles triangle to identify the coordinates of a point on a grid. |
| M09_10 | Divides an isosceles triangle in to two congruent triangles. |
| M09_12 | Recognizes a net of a triangular prism. |
| M09_13 | Locates a point with given coordinates in the Cartesian plane. |
| M11_11 | Given a net of three-dimensional object, completes a two-dimensional drawing of it from a specific viewpoint. |
| M13_04 | Uses a concept of line symmetry to complete a tiling pattern. |

### Data

| | |
|---|---|
| M01_06 | Calculates and compares the averages of two sets of data. |
| M02_02 | Reads and interprets information from a pie graph. |
| M02_09 | Solves a comparison problem by associating elements of a bar graph with a verbal description. |
| M06_02 | Recognizes that the probability of an outcome of a single event is inversely related to the number of elements in the population of events. |
| M06_08 | Given a table of values for two variables, selects the graph that could represent the given data. |
| M11_13 | Constructs and labels a pie chart representing a given situation. |

Exhibit E.1: **Descriptions of Mathematics Items at Each International Benchmark** (...Continued)
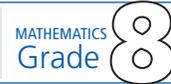
MATHEMATICS
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## Items at High International Benchmark (550)

### Number

| | |
|---|---|
| M01_01 | Finds 4/5 of a region divided into 10 equal parts. |
| M01_04 | Solves a word problem by finding the missing term in a proportion. |
| M01_11 | Selects a fraction representing the comparison of part to whole, given each of two parts in a word-problem setting. |
| M01_13 | Identifies a percent equivalent to a given fraction with a denominator that is a factor of 100. |
| M01_14 | Demonstrates understanding of the effect of operations involving a negative integer by identifying the largest number produced. |
| M02_10 | Selects the statement that describes the effect of adding the same amount to both terms of a ratio. |
| M02_11 | Estimates the product of a multiple of 1000 and a two-digit number in a word problem involving knowledge of units of time. |
| M03_03 | Identifies the fraction of an hour representing a time interval. |
| M03_10 | Rounds a four-place decimal to the nearest hundredth. |
| M03_15 | Solves a one-step word problem involving division of a whole number by a unit fraction. |
| M04_02 | Solves a multi-step word problem involving multiplication of whole numbers by fractions. |
| M05_09 | Adds three fractions with denominators less than 10. |
| M06_07 | Multiplies a two-place decimal by a three-place decimal. |
| M06_12 | Solves a word problem about distance and time by finding the missing term in a proportion. |
| M06_13 | Identifies the number that gives a specified result when divided by a given negative integer. |
| M06_13* | Identifies the number that gives a specified result when divided by a given negative integer. |
| M08_01 | Solves a word problem by determining a number between two given numbers that is divisible by only one of two other given numbers. |
| M09_03 | Calculates the new price of an item given the percent increase in price. |
| M09_08 | Solves a word problem with decimals involving a proportion. |
| M12_01 | Solves a word problem by using the patterns in a two-column table to determine the number in the second column that would corresponds to a number midway between two entries in the first column. |
| M13_03 | Identifies proportional share of an amount divided into three unequal parts. |
| M13_09 | Determines the simplified ratio of shaded to unshaded parts of a shape. |
| M14_07 | Identifies the prime factor of a given number. |

### Algebra

| | |
|---|---|
| M01_12 | Finds the value of an algebraic expression involving multiplication of negative integers. |
| M02_05 | Finds a specified term in a sequence given the first three terms pictorially. |
| M02_07 | Subtracts algebraic fractions with the same numeric denominator. |
| M03_05 | Identifies the linear relationship between the first and second terms in a set of ordered pairs. |
| M03_13 | Solves a linear equation involving parentheses. |
| M04_10A | Given a sequence of diagrams growing in two dimensions and a partially completed table, finds the next two terms in the table. |

* Denotes with calculator available.

Exhibit E.1:   **Descriptions of Mathematics Items at Each International Benchmark** *(Continued...)*

## Items at High International Benchmark (550) – *Continued*

### Algebra – *Continued*

| | |
|---|---|
| M07_02 | Recognizes the product of two algebraic terms in one variable that involve exponents. |
| M07_10 | Identifies the linear equation represented by a set of ordered pairs given in a table. |
| M10_04 | Solves a simultaneous linear equations. |
| M11_05 | Identifies the algebraic expression that represents a situation involving the sum of a constant term and a product. |
| M11_06 | Uses a formula to determine the value of one variable given the value of the other. |
| M12_12 | Identifies the quantity that satisfies two inequalities represented by balances. |
| M13_05 | Extends a geometric tiling pattern to identify the orientation of a tile. |
| M13_10 | Simplifies an algebraic expression combining like terms. |
| M13_11 | Solves a pair of simultaneous linear equations. |
| M14_09 | Given an interval containing a number, determines the interval containing the sum of that number and a whole number. |

### Measurement

| | |
|---|---|
| M01_03 | Given a length rounded to the nearest centimeter, identifies what the actual length could have been in centimeters to one decimal place. |
| M02_01 | Compares volume by visualizing and counting cubes. |
| M03_12 | Given the start time, and the duration of an event expressed as a fraction of an hour, determines the end time. |
| M04_07 | Finds the area between two rectangles when one is inside the other and their sides are parallel. |
| M04_11B | Finds the length of a side of a square, given that its area is a square number. |
| M05_05 | Finds the perimeter of a square given that its area is a square number less than 150. |
| M05_12 | Finds the area of a triangle, on the same base and with the same height as a square, when the length of a side of the square is known. |
| M07_04 | Calculates the volume of a rectangular prism by using appropriate measures from its net. |
| M08_08 | Calculates the area of an irregular figure formed by two rectangles. |
| M09_07A | Solves a word problem to find average speed given distance and time. |
| M09_09 | Given two touching circles of equal radius, finds the area of rectangle that encloses them. |
| M11_08 | Given the area of a square, finds its perimeter. |
| M11_09 | Determines the number of cubes needed to fill a hole in a given shape. |
| M13_12 | Identifies the appropriate unit measure for an area. |

### Geometry

| | |
|---|---|
| M01_05 | Identifies pairs of congruent triangles. |
| M01_09 | Solves a problem involving adjacent and vertical angles. |
| M03_02 | Uses properties of congruent triangles to find the measure of an angle. |

| Exhibit E.1: | **Descriptions of Mathematics Items at Each International Benchmark** (...Continued) |
|---|---|
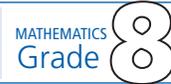
## Items at High International Benchmark (550) – *Continued*

### Geometry – *Continued*

| | |
|---|---|
| M03_09 | Given two parallel lines cut by a transversal, selects a pair of supplementary angles. |
| M03_14 | Selects the center of rotation when shown a diagram of a triangle and its image under a quarter turn. |
| M06_06 | Uses knowledge of a straight angle to find the measure of an angle. |
| M06_14 | Determines the measure of the missing angle in a right triangle. |
| M06_15 | Uses properties of angles to draw and label a figure. |
| M07_09 | Uses the properties of a triangle and regular hexagon to find the measure of an angle. |
| M09_11 | Identifies a triangle similar to a specific triangle given the lengths of all sides. |
| M11_12 | Identifies the transformations used to produce a sequence of figure. |
| M12_08 | Visualizes the unfolded shape of a figure shown on a folded piece of paper and uses property of triangles to identify the shape. |

### Data

| | |
|---|---|
| M01_07 | Reads data from a frequency table to solve a problem. |
| M03_11 | In a word problem, when given the possible number of outcomes and the probability of successful outcomes, solves for the number of successful outcomes. |
| M04_09 | Given the set of possible outcomes expressed as fractions of all outcomes, recognizes that probability is associated with the size of a fraction. |
| M05_07 | In a word problem, when given the possible number of outcomes and the probability of successful outcomes, solves for the number of successful outcomes. |
| M07_07C | Draws conclusions from data in a table. |
| M07_08 | Compares and integrates several sets of data to determine which meet given conditions. |
| M08_13C | Reads values from two straight line graphs to solve a problem. |
| M09_14 | Uses the size of a group with a given characteristic in a sample to estimate the size of group with that characteristic in a population. |
| M11_14 | Identifies the statement that best describes the relative likelihood of two events. |
| M12_13C | Selects the appropriate line on a graph and determines the interval where the greatest change occurs. |
| M14_08 | Uses percentages given in a pie chart to solve a problem. |

## Items at Advanced International Benchmark (625)

### Number

| | |
|---|---|
| M02_04 | Identifies the pair of numbers satisfying given conditions involving ordering integers, decimals, and common fractions. |
| M02_13 | Orders a set of decimals of up to three decimal places. |
| M02_14 | Multiplies and adds fractions with different denominators in the correct order. |
| M03_08 | Finds the percent change given the original and the new quantities. |
| M04_12 | Solves a word problem involving multiplication and subtraction of decimals. |

Exhibit E.1:   **Descriptions of Mathematics Items at Each International Benchmark** *(Continued...)*

## Items at Advanced International Benchmark (625) – *Continued*

### Number – *Continued*

| | |
|---|---|
| M05_11B | Given the dimensions of two rectangles, expresses the ratio of their areas. |
| M06_05 | Given the total number and the ratio of the two parts, finds the value of one part. |
| M06_09 | Selects appropriate data to solve a problem involving operations with fractions that have unlike denominators. |
| M06_10 | Solves a word problem involving multiplication of a proper fraction with improper fraction. |
| M07_01 | Identifies equivalent ratios in a problem setting. |
| M08_02 | Identifies a procedure for subtracting fractions with unlike denominators. |
| M08_03 | Given the total number and the ratio of the two parts, finds the value of one part. |
| M08_12 | Given the original and reduced prices, finds the percentage reduction. |
| M09_01 | Solves a word problem involving inverse operations and decimal place value. |
| M09_02 | Solves a multi-step problem involving computing with whole numbers and rounding up. |
| M10_02 | Computes with integers using order of operations. |
| M11_03 | Solves a problem involving a fraction of a whole number of currency units. |
| M12_02 | Converts a mixed number to a decimal rounded to two places. |
| M13_02 | Uses the distributive property to recognize two different representations of a number. |
| M13_07 | Solves a multi-step non-routine problem involving percents. |

### Algebra

| | |
|---|---|
| M04_04 | Identifies numbers common to two different arithmetic sequences. |
| M04_10B | Knowing the first five terms of a sequence growing in one dimension, finds the seventh term. |
| M04_10C | Generalizing from the first several terms of a sequence growing in two dimensions, explains a way to find a specified term, e.g. the 50th. |
| M05_04 | Solves a linear inequality involving a fraction. |
| M08_06 | Identifies an algebraic expression to model a situation. |
| M09_04 | Identifies algebraic expression that represents a situation involving division. |
| M09_05 | Given a linear equation in which y is expressed in terms of x, solves for x. |
| M09_06 | Writes a pair of simultaneous equations in two unknowns to model a situation. |
| M10_03 | Evaluates an algebraic expression by using an equivalent form and substituting given values. |
| M10_05 | Evaluates an algebraic expression by using an equivalent form and substituting given values. |
| M11_04 | Identifies a diagram that models addition of two like algebraic terms. |
| M12_03 | Adds three simple algebraic rational expressions with unlike numerical denominators. |
| M12_09 | Identifies the sum of three consecutive whole numbers given the middle number in general terms. |

**Exhibit E.1: Descriptions of Mathematics Items at Each International Benchmark** *(...Continued)*
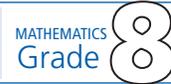
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## Items at Advanced International Benchmark (625) – *Continued*

### Algebra – *Continued*

| | |
|---|---|
| M14_04A | Extends number patterns in a table to identify the row whose entries solve the problem. |
| M14_04B | Extends number patterns in a table to identify the row whose entries solve the problem. |
| M14_04C | Extends number patterns in a table to identify the row whose entries solve the problem. |

### Measurement

| | |
|---|---|
| M02_08 | From a set of times expressed variously in days, hours, minutes, and seconds, determines which is least. |
| M03_06 | Identifies the length of a rectangle given its perimeter and width. |
| M04_03 | Applies knowledge of number of milliliters in a liter to solve a word problem. |
| M04_11C | Finds the perimeter of a figure made up of squares with known length of sides. |
| M05_11A | Uses computation with fractions to find the length and width of a rectangle and draws and labels that rectangle on a grid. |
| M09_07B | Solves a multi-step problem involving time, distance, and average speed. |
| M10_10 | Solves a non-routine problem involving the number of spheres that will fit in a rectangular box. |
| M11_07 | Uses information about the lengths of segments on a line to determine the distance between their midpoints. |
| M12_06 | Uses knowledge of time, clocks, and angles to solve a problem. |
| M12_07 | Determines the area of a trapezoid inscribed in a triangle. |

### Geometry

| | |
|---|---|
| M01_15 | Determines the exterior angle of a regular hexagon. |
| M02_15 | Solves a problem involving measures of overlapping angles. |
| M04_08 | Given only the coordinates of two points on the line, selects the coordinates of a third point on that line. |
| M05_08 | Uses properties of congruent triangles and the sum of the angles of a triangle to find the measure of an angle. |
| M06_04 | Identifies the image of a triangle under a rotation about a point in the plane. |
| M08_09 | Solves a problem involving angle bisectors and angles at a point on a straight line. |
| M10_11 | Recognizes that arcs of equal radius can generate an equilateral triangle. |
| M11_10 | Identifies the justification that a triangle is a right triangle using Pythagorean relationship. |
| M12_10 | Applies properties of interior and exterior angles of a triangle to find an unknown angle in overlapping triangles. |
| M14_06 | Uses knowledge of interior angles of a triangle to determine the angle sum of a given polygon, showing calculations. |

### Data

| | |
|---|---|
| M03_07 | On a given graph, interpolates to find a value between graduations on one axis matching a given value on the other axis. |
| M07_07A | Completes a table by interpreting several time tables to identify times that meet a given set of conditions. |

Exhibit E.1:   Descriptions of Mathematics Items at Each International Benchmark
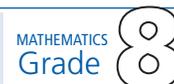
## Items at Advanced International Benchmark (625) – *Continued*

### Data – *Continued*

| | |
|---|---|
| M07_07B | Derives information from given timetables to complete a table for a specified journey and check that it meets given conditions. |
| M08_11 | Uses experimental data and an understanding of probability to draw the spinner that could have produced the data. |
| M10_07 | Interprets data from a table, draws and justifies conclusions. |
| M12_11 | Given a spinner, identifies the frequency of a particular outcome. |
| M12_13B | Interprets information from a graph to determine an average. |

## Items Above the Advanced International Benchmark (625)

### Number

| | |
|---|---|
| M07_06 | Calculates total costs for each of two groups given different unit costs and discounts. |
| M11_02 | Given two points on a number line representing unspecified fractions, identifies the point that represents their product. |

### Algebra

| | |
|---|---|
| M02_06 | Selects an algebraic expression to answer a question about a set of linked verbal statements. |
| M04_01 | Identifies what the variable represents in an equation for a given situation. |
| M07_03 | Generalizes a number sequence based on a geometric pattern to find the term which produces given sum of sequence and show calculations. |
| M14_05 | Finds the general term, express algebraically for related number patterns. |

### Measurement

| | |
|---|---|
| M05_10 | Estimates the total time in minutes for an event made up of a series of events, each given in minutes and seconds. |
| M08_07 | Uses knowledge of area of a circle and of average rate to solve a problem. |

### Geometry

| | |
|---|---|
| M13_06 | Completes a geometric tiling pattern with two given lines of symmetry using letters to represent the orientation of the tiles. |

### Data

| | |
|---|---|
| M10_08 | Interprets the data from a table to make calculations to solve a problem. |
| M10_09 | Interprets the data from a table to make calculations to solve a problem. |
| M14_02 | Solves a problem involving extrapolation of the data shown in a double bar graph. |

Exhibit E.2:   **Descriptions of Mathematics Items at Each International Benchmark**

## Items at Low International Benchmark (400)

### Number

| | |
|---|---|
| M01_06 | Recognizes the hundreds place in a four-digit number. |
| M01_11 | Translates between a numeric and verbal representation of a four-digit number. |
| M03_04 | Translates between standard and expanded notation of three-digit whole numbers. |
| M04_01 | Multiplies a two-digit by a one-digit whole number. |
| M08_01 | Identifies the difference between two fractions with the same denominator. |
| M11_01 | Adds a four-digit and three-digit whole number. |
| M14_05 | Solves a word problem involving addition of three-digit whole numbers. |

### Patterns and Relationships

| | |
|---|---|
| M12_04 | Finds the missing number in a number sentence involving multiplication of one-digit whole numbers. |

### Measurement

| | |
|---|---|
| M02_13 | Compares areas by counting squares. |
| M04_06 | Given the base, draws a triangle on a grid whose other two sides are each the same length. |

### Geometry

| | |
|---|---|
| M02_03 | Identifies two figures that have the same size and shape. |
| M02_10 | Knows that every triangle has three sides. |
| M05_09 | Identifies two triangles with the same size and shape in a complex figure. |
| M08_10 | Recognizes the triangles in a set of polygons. |
| M10_08B | Draws a line to divide one rectangle into two rectangles. |

### Data

| | |
|---|---|
| M01_01 | Reads information from a simple bar graph. |
| M02_01 | Reads information from a simple bar graph. |

## Items at Intermediate International Benchmark (475)

### Number

| | |
|---|---|
| M01_03 | Recognizes a familiar fraction represented by a figure with shaded parts (region model). |
| M01_04 | Recognizes multiplication as the appropriate operation in a one-step word problem (single-digit). |
| M02_04 | Subtracts two decimals involving hundredths with regrouping over 0. |
| M02_08 | Translates from a form of expanded notation to a standard notation for a five-digit number. |
| M02_11 | Solves a one-step word problem involving multiplication of a three-digit by a one-digit number requiring regrouping. |

Exhibit E.2:   **Descriptions of Mathematics Items at Each International Benchmark** *(Continued...)*

MATHEMATICS
Grade 4

## Items at Intermediate International Benchmark (475) – *Continued*

### Number – *Continued*

| | |
|---|---|
| M02_12 | Recognizes a pictorial representation of ones, tens, and hundreds and can identify the standard numeral. |
| M03_05 | Adds decimal numbers involving tenths. |
| M03_06 | Recognizes one-half of a set of objects. |
| M03_10 | Recognizes inequality symbols and can choose the largest of two three-digit numbers. |
| M04_02 | Identifies the appropriate operation to solve a word problem involving division. |
| M07_01 | Identifies the appropriate operation to solve a word problem involving multiplication. |
| M09_01 | Labels a point associated with a whole number on a number line. |
| M09_02 | Uses knowledge of whole number place value to solve a word problem involving addition of a three-digit and a four-digit number. |
| M09_03 | Identifies the fraction that represents a given part-whole situation. |
| M10_01 | Divides a three digit by a one-digit whole number. |
| M10_04 | Solves a word problem involving multiplication of a two-digit by a one-digit whole number. |
| M13_03 | Solves a word problem involving finding a missing three-digit addend. |
| M14_01A | Selects appropriate information and uses it to solve a simple proportion problem. |

### Patterns and Relationships

| | |
|---|---|
| M03_11 | Identifies next terms in an alternating number pattern involving counting forward and backward by ones. |
| M04_04 | Identifies the value that extends a pattern of time. |
| M04_05 | Identifies a number sentence that represents a situation involving subtraction. |
| M11_05 | Selects the expression that represents a situation involving addition. |
| M12_03 | Generalizes from the first several terms of a numeric sequence to select another number that is also in the sequence. |
| M12_06B | Extends a numeric sequence based on a geometric pattern. |

### Measurement

| | |
|---|---|
| M01_05 | Counts weeks forward from a given date on a calendar. |
| M01_10 | Selects a reasonable metric weight (mass) for an adult. |
| M05_08 | Solves a measurement word problem involving subtraction of two-digit numbers. |
| M08_06 | Recognizes that area does not change when the parts of a figure are rearranged. |
| M08_09 | Recognizes the inverse relationship between size of a unit shown in the figure and the number of units require to cover an area. |

Exhibit E.2: **Descriptions of Mathematics Items at Each International Benchmark** (...Continued)

MATHEMATICS
Grade 4

## Items at Intermediate International Benchmark (475) – *Continued*

### Geometry

| | |
|---|---|
| M04_08 | Draws a line parallel to a given line on a grid. |
| M04_09 | Identifies and names common geometric shapes in a picture. |
| M10_08A | Draws a line to divide one rectangle into two triangles. |
| M11_11 | Identifies a pattern generated by quarter turns clockwise. |
| M12_10 | Locates a point on an informal coordinate grid and identifies the moves to get there. |
| M14_06 | Identifies a three-dimensional object given the pictorial representation of its faces. |

### Data

| | |
|---|---|
| M02_06 | Locates data in a two-way table. |
| M03_01 | Solves a comparison problem by associating elements of a bar graph with a verbal description. |
| M04_10 | Completes a bar graph based on the solution of a word problem. |
| M05_11 | Identifies the pie chart that matches the information shown in a table. |
| M06_10 | Completes a two-by-two table to summarize information. |
| M07_09 | Uses information to identify the number of symbols needed to complete a pictograph when the symbol represents more than one. |
| M08_12 | Identifies the pie chart that matches a given bar graph. |
| M11_12 | Completes a bar graph that represents a table of data. |

## Items at High International Benchmark (550)

### Number

| | |
|---|---|
| M01_07 | Rounds a three-digit whole number to the nearest hundred. |
| M02_05 | Recognizes the figure that illustrates a simple ratio. |
| M02_07 | Solves word problem involving 1/2 and 1/4. |
| M03_03 | Selects the number sentence that provides the best estimate of which is closest to the actual product of two two-digit numbers. |
| M03_07 | Solves two-step word problem using doubling and adding. |
| M03_12 | Understands tens place value and can translate between verbal and numeric representations. |
| M04_03 | Solves a word problem by finding a fractional part of a collection of objects. |
| M05_01 | Solves a word problem involving division of a three digit by a one-digit whole number. |
| M05_02 | Determines the missing digit to give a specified difference in a three-digit subtraction problem. |
| M07_02 | Solves a word problem involving division of a three-digit by a one-digit whole number. |
| M07_07 | Solves a multi-step word problem involving addition and multiplication of whole numbers. |
| M08_03 | Selects two-place decimal closest to a given whole number. |

Exhibit E.2: **Descriptions of Mathematics Items at Each International Benchmark** *(Continued...)*

## Items at High International Benchmark (550) – *Continued*

### Number – *Continued*

M10_02     Solves a word problem involving simple proportional reasoning.

M10_03     Solves a word problem involving multiplication of a three-digit number by a one-digit number.

M11_09     Identifies the appropriate operation to solve a word problem involving division.

M12_02     Solves a multi-step word problem involving halving, doubling, and adding.

M13_01A     Uses knowledge of place value to arrange three given digits to create a sum closest to a given two-digit number.

M13_01B     Uses knowledge of place value to arrange three given digits to create a sum closest to a given two-digit number.

M13_01C     Uses knowledge of place value to arrange three given digits to create a given sum in two different ways.

M13_02A     Uses knowledge of place value to arrange three given digits to create the largest sum of a two-digit and one-digit number.

M13_02B     Uses knowledge of place value to arrange three given digits to create the largest difference between a two-digit and a one-digit number.

M14_08     Solves a word problem involving measures and proportional reasoning.

### Patterns and Relationships

M01_12     Selects the expression that represents a situation involving multiplication.

M06_06     Identifies a number that satisfies a number sentence involving division.

M07_04A     Extends entries in two tables according to numerical rules described in a situation.

M08_04     Identifies the next term in a sequence of whole numbers formed by doubling.

M08_05     Identifies a number sentence that represents a situation involving division.

M09_07     Identifies the result of a specified sequence of operations on a given number.

M10_05     Identifies the missing number in a square whose rows and columns have the same sum.

M12_06C     Generalizes from the first several terms of a numeric sequence to find the tenth term.

### Measurement

M01_02     Calculates the volume of a rectangular solid given the volume of one layer and the number of layers.

M02_02     Finds the increase in temperature from a negative to a positive temperature on a thermometer.

M02_09     Selects appropriate metric unit to measure weight (mass).

M05_05     Solves a multi-step word problem involving time and temperature.

M05_06     Solves a multi-step word problem involving duration of time.

M06_07     Determines the number of non-standard units of area needed to cover a figure.

M06_08B     On a map drawn to scale, positions a building within a range of distance from a specified point.

Exhibit E.2:   Descriptions of Mathematics Items at Each International Benchmark *(...Continued)*

MATHEMATICS
Grade **4**

## Items at High International Benchmark (550) – *Continued*

### Measurement – *Continued*

| | |
|---|---|
| M08_07 | Identifies the value of an unlabelled mark on a circular scale. |
| M10_07 | Selects the attribute that can be measured with a given metric unit. |
| M11_07 | Identifies the value of an unlabelled mark on a circular scale. |
| M12_08 | Solves a word problem involving conversion between hours and minutes. |

### Geometry

| | |
|---|---|
| M03_02 | Recognizes flat and curved surfaces on solids. |
| M06_09 | Given a figure and the line of symmetry on a grid, draws the reflection. |
| M07_08 | Uses properties of a rectangles and triangles to solve a problem. |
| M08_11 | Recognizes the net of a triangular prism. |
| M09_05A | Makes and draws one large triangle from two triangle tiles (square tiles divided diagonally into one white and one black triangle). |
| M09_05B | Makes and draws one square from four triangle tiles (square tiles divided diagonally into one white and one black triangle). |
| M10_08C | Draws two lines to divide a rectangle into one rectangle and two triangles. |
| M10_09 | Identifies two triangles that have the same shape but different sizes in a complex figure. |
| M11_10 | Orders four angles by size. |
| M12_11 | Identifies the figure in which a line of symmetry is shown. |

### Data

| | |
|---|---|
| M04_11 | Uses data from a tally chart to solve a problem. |
| M07_04B | Reads and interprets data from two tables to answer a question. |
| M07_04C | Draws conclusions from data in two tables. |
| M10_10 | Identifies the label for a column in a bar graph that corresponds to data in a tally chart. |
| M12_12 | Interprets data from a bar graph to solve a problem. |

## Items at Advanced International Benchmark (625)

### Number

| | |
|---|---|
| M01_08 | Identifies the decimal representation for a fraction with a denominator of 10. |
| M05_03 | Selects the appropriate information to solve a multi-step word problem involving whole numbers. |
| M06_01 | Solves a multi-step word problem involving divisibility. |
| M06_02 | Solves a problem involving proportional reasons. |
| M09_05C | Determines the fraction of a figure that is shaded. |
| M09_06A | Uses appropriate tiles to represent one-half. |

## Items at Advanced International Benchmark (625) – *Continued*

### Number – *Continued*

| | |
|---|---|
| M11_02 | Identifies all the numbers in a given interval ending in a given string of digits. |
| M11_03 | Halves the amounts in a recipe involving whole numbers and fractions. |
| M12_01 | Given a fraction, identifies a larger fraction with a different denominator. |
| M14_01B | Selects appropriate information and uses it to solve a proportion problem. |
| M14_01C | Selects appropriate information and uses it to solve a multi-step problem involving proportions. |
| M14_02 | Selects appropriate information and uses it to solve a proportion problem. |

### Patterns and Relationships

| | |
|---|---|
| M06_04 | Writes a rule for a multiplicative relationship between first and second numbers in a set of ordered pairs of numbers. |
| M06_05 | Identifies the two-step rule used to describe the relationship between adjacent terms in a sequence of numbers. |
| M11_06 | Identifies the two-step rule for a linear relationship between first and second numbers in a set of ordered pairs of numbers. |
| M12_05 | Identifies the number that satisfies a number sentence involving addition of two terms on each side. |

### Measurement

| | |
|---|---|
| M01_09 | Estimates the distance on a map given scale (in cm = km). |
| M03_09 | Identifies the numerical expression that gives the distance around a rectangle, given its length and width. |
| M04_07 | Completes an irregular figure on a grid so that it has a given area. |
| M05_07 | Solves a word problem involving conversion of metric units of capacity. |
| M06_03 | Solves a multi-step measurement problem involving multiplication and subtraction. |
| M06_08A | On a map drawn to scale, positions a park at a given distance from a specified point. |
| M06_08C | On a map drawn to scale, positions a building half-way between two specified points. |
| M07_06 | Recognizes that the area does not change when a figure is cut into parts and rearranged. |
| M08_08 | Solves a multi-step problem involving conversion between hours and minutes. |
| M11_08 | Determines the area of a figure made up of squares and half squares on a grid. |
| M12_07 | Estimates the length of a curved line next to the middle of ruler. |
| M13_04 | Identifies the operation that solves a word problem involving distance, time, and speed. |
| M13_05 | Solves a multi-step problem involving conversion between hours and minutes. |

### Geometry

| | |
|---|---|
| M12_09 | Draws an angle greater than 90°. |
| M14_07 | Identifies the position of a shape after a half-turn rotation. |

**TIMSS2003**

Exhibit E.2: **Descriptions of Mathematics Items at Each International Benchmark** *(...Continued)*

MATHEMATICS
Grade **4**

## Items at Advanced International Benchmark (625) – *Continued*

### Data

| | |
|---|---|
| M05_10 | Organizes data and completes a tally chart to represent it. |
| M13_06 | Reads, relates, and interprets values from two sets of data from graph to solve a problem. |

## Items Above Advanced International Benchmark (625)

### Number

| | |
|---|---|
| M08_02 | Subtracts a one-place decimal from a two-place decimal presented horizontally. |
| M09_06B | Selects the appropriate tiles from a restricted set and uses them to represent a given fraction. |
| M13_02C | Uses knowledge of place value to arrange three given digits to create the largest product of a two-digit and one-digit number. |
| M14_03 | Selects appropriate information and uses it to solve a multi-step problem involving two proportions. |

### Patterns and Relationships

| | |
|---|---|
| M05_04 | Writes two-step rule for a linear relationship between pairs of numbers. |
| M07_03 | Identifies the number that satisfies a number sentence involving division of two terms on each side. |
| M07_05 | Solves a multi-step problem to find one of the two unknown values. |
| M09_04 | Uses understanding of equality to evaluate an expression. |

### Measurement

| | |
|---|---|
| M10_06 | Identifies a time in minutes in an interval given in hours and half hours. |

### Geometry

| | |
|---|---|
| M03_08 | Recognizes the equivalent of a three-dimensional figure when it is rotated to a different orientation. |