APPENDIX **D**

Descriptions of Mathematics Items at Each Benchmark

Lower Quarter Benchmark Items

Fractions and Number Sense

H09   Rounds to estimate the sum of two three-digit numbers.

R07   Subtracts a three-decimal-place number from another with
         multiple regrouping.

R13   Subtracts a four-digit number from another involving zeroes.

Data Representation, Analysis, and Probability

A06   Calculates and compares the averages of two sets of data.

P16   Reads a thermometer and locates the reading in a table.

Algebra

P09   Selects an expression in exponential notation for repeated multiplication.

Median Benchmark Items

Fractions and Number Sense

B08   Solves a word problem by finding the missing term in a proportion.

C06   Determines which is the most unreasonable estimate for two
         3-digit numbers.

D12   Estimates the value, to one decimal place, of a point on a number line
         marked at whole number intervals.

E04   Arranges four given digits in descending and ascending order and finds
         the difference between those two numbers.

H08   Selects a figure with shaded parts that represents a familiar fraction.

I05   Solves a word problem involving subtraction of a two-place
         decimal number from another.

K01   Identifies a circular model of a fraction that best approximates a given
         rectangular model of the same fraction.

Fractions and Number Sense continued

K02   Solves a word problem by adding numbers with up to three
        decimal places.

K06   Selects the approximate quantity remaining after an amount is
        decreased by a given percent.

L09   Given an object of one length, to one decimal place, estimates the
        length of a second object in a diagram.

L10   Identifies the numerical equivalent of a decimal number given in words.

M04   Selects the smallest fraction from a set of familiar fractions.

N11   Rounds a number less than 100,000 to the nearest hundred.

P13   In a word problem, uses rounding to identify the number
        sentence that gives the best estimate for the product.

Measurement

D11   Selects appropriate metric unit to measure weight (mass).

G02   Identifies an unlabeled midway point on a number line marked
        in tenths.

L13   Recognizes the inverse relation between length of nonstandard units
        and the number of those units required to cover a distance.

Data Representation, Analysis, and Probability

B07   Given two line graphs, identifies the relevant one and determines the
        interval showing the greatest increase.

C02   Reads and interprets information from a pie graph.

E01   Solves problem by interpreting information from a graph of two
        intersecting lines.

H07   Reads data from a bar graph to solve a word problem.

J13   Determines how many items are represented by one symbol in
        a pictogram.

M03   Recognizes that the probability of an outcome of a single event is
        inversely related to the number of elements in the population of events.

Data Representation, Analysis, and Probability continued

M09   Given a table of values for two variables, selects the graph that could represent the given data.

Q04   Solves a comparison problem by associating elements of a bar graph with a verbal description.

Geometry

C03   Identifies corresponding parts of congruent trapezoids.

J15   Selects the pair of similar triangles from a set of triangles.

J16   Locates the point on a grid with 5-unit divisions when the point lies between the grid lines.

K03   Identifies the diagrammatic representation of a three-dimensional object after rotation.

Algebra

A02   Using properties of a balance, reasons to find an unknown weight (mass).

B12   Identifies the linear equation corresponding to a given verbal statement involving a variable.

D08   Solves for missing number in a proportion.

G04   Solves equation for missing number in a proportion.

H12   Selects the expression that represents a situation involving multiplication.

J17   Finds a missing y value in a table relating x and y values.

V04A   Given a sequence of diagrams growing in one-dimension and a partially completed table, finds the next two terms in the table.

Upper Quarter Benchmark Items

Fractions and Number Sense

A01   Finds 4/5 of a region divided into 10 equal parts.

A04   Solves a word problem by finding the missing term in a proportion.

B09   Given two equivalent fractions, identifies the pictorial representation showing they are equivalent.

B10   Selects the smallest of a set of numbers with differing numbers of decimal places.

D09   Selects the smallest fraction from a set of familiar fractions.

E03   Identifies the fraction of an hour representing a time interval.

F09   Identifies a decimal number given in thousandths between two decimal numbers given in hundredths.

F12   Identifies the interval containing the fraction that represents the shaded part of a circle.

G05   Selects a fraction representing the comparison of part to whole, given each of two parts in a word-problem setting.

I02   Solves a multi-step word problem involving multiplication of whole numbers by fractions.

I06   Writes a fraction less than a given fraction.

J12   Divides one fraction by another with unlike denominator.

J18   Uses a map scale to find the approximate distance between two towns.

K09   Adds three fractions with denominators less than 10.

L18   Subtracts fractions with unlike denominators.

N14   Selects a set of equivalent fractions.

N19   Shades squares in a rectangular grid to represent a given fraction.

O04   Rounds a four-place decimal to the nearest hundredth.

O09   Solves a one-step word problem involving division of a whole number by a unit fraction.

Fractions and Number Sense continued

P14 Estimates the product of two whole numbers in a word problem.

Q05 Selects the statement that describes the effect of adding the same amount to both terms of a ratio.

Q06 Estimates the product of a multiple of 1000 and a two-digit number in a word problem involving knowledge of units of time.

Q09 Multiplies and adds fractions with different denominators in the correct order.

R15 Solves a multi-step word problem that involves dividing a quantity in a given ratio.

T04 Solves a word problem that involves multiplying a decimal in thousandth by a multiple of a hundred.

V01 Provides an example of a measure that would round to a given value.

V03 Determines the ratio of part to total in a word problem.

Measurement

A03 Given a length rounded to the nearest centimeter, identifies what the actual length could have been in centimeters to one decimal place.

C01 Compares volume by visualizing and counting cubes.

I07 Finds the area between two rectangles when one is inside the other and their sides are parallel.

M01 Reads the value indicated by an unlabeled tick mark on a circular scale.

N15 Identifies an angle of a given size in a diagram.

O06 Given the start time, and the duration of an event expressed as a fraction of an hour, determines the end time.

S02A Finds a fraction of a given area of an irregular figure composed of squares of equal sides.

T03 Finds the area of a rectangle contained in a parallelogram of given dimensions.

Data Representation, Analysis, and Probability

F08   Understands independence in a probability setting.

H11   In a word problem, finds the missing number in a proportion.

I09   Given the set of possible outcomes expressed as fractions of all
        outcomes, recognizes that probability is associated with the size of
        a fraction.

K07   In a word problem, when given the possible number of outcomes
        and the probability of successful outcomes, solves for the number of
        successful outcomes.

L11   Determines the number of values on the horizontal axis of a line graph
        that correspond with a given value on the vertical axis.

N18   Identifies the number of successful outcomes of a simple experiment
        and calculates the probability of success.

O01   On a given graph, interpolates to find a value between graduations on
        one axis matching a given value on the other axis.

O05   In a word problem, when given the possible number of outcomes
        and the probability of successful outcomes, solves for the number of
        successful outcomes.

R09   Solves a word problem by extrapolating a graph of a non-linear
        relationship.

Geometry

A05   Identifies pairs of congruent triangles.

B11   Visualizes the arrangement of the faces of a cube given its net.

D07   Applies knowledge of symmetry to select the measure of an angle.

E02   Uses properties of congruent triangles to find the measure of an angle.

G03   Solves a problem involving adjacent and vertical angles.

J11   Identifies a false statement about the properties of rectangles.

M07   Uses knowledge of a straight angle to find the measure of an angle.

O03   Given two parallel lines cut by a transversal, selects a pair of supple-
        mentary angles.

O08   Selects the center of rotation when shown a diagram of a triangle and
        its image under a quarter turn.

R11   Determines the number of triangles of given dimensions needed to cover a given rectangle.

Algebra

C05   Finds a specified term in a sequence given the first three terms pictorially.

D10   Identifies algebraic equation (formula) corresponding to a verbal description involving a constant and two variables.

E05   Identifies the linear relationship between the first and second terms in a set of ordered pairs.

F11   Solves a two-step problem involving multiplication and division of whole numbers and fractions.

G06   Finds the value of an algebraic expression involving multiplication of negative integers.

H10   Identifies the linear equation that describes the relationship between two variables given a table of values.

L12   Translates a word problem into a short finite arithmetic sequence and sum the sequence.

L14   Identifies the linear equation that describes the relationship between two variables given a table of values.

L17   Solves a linear equation involving transposing.

N13   Evaluates a rational expression in one variable for a given value of the variable.

O07   Solves a linear equation involving parentheses.

P11   Selects a multiplicative expression for repeated addition.

Q02   Subtracts algebraic fractions with the same numeric denominator.

Q07   Selects the formula satisfied by the given values of the variables.

R12   Selects a simple, multiplicative expression in one variable that is positive for all negative values of that variable.

S01A   Given a sequence of diagrams growing in two dimensions and a partially completed table, finds the next two terms in the table.

V04B   Knowing the first five terms of a sequence growing in one dimension, finds the seventh term.

Top 10% Benchmark Items

Fractions and Number Sense

C04   Identifies the pair of numbers satisfying given conditions involving ordering integers, decimals, and common fractions.

F07   Solves a time-distance-rate problem that involves division of decimals and conversion of minutes to seconds.

J14   Identifies the correct position for the decimal point in the quotient in a division of a decimal written in hundredths by a decimal written in thousandths.

M06   Given the total number and the ratio of the two parts, finds the value of one part.

M08   Multiplies a two-place decimal by a three-place decimal.

N16   Solves multi-step problem with fractions requiring analysis of the verbal relations described.

N17   Solves a word problem involving multiplication of two-digit one-place decimals and subtraction of decimals.

O02   Finds the percent change given the original and the new quantities.

P15   Solves a word problem involving both addition and subtraction of familiar fractions.

P17   Writes a decimal expressed in hundredths as a fraction in lowest terms.

Q08   Orders a set of decimals of up to three decimal places.

R08   In a word problem, finds an average by dividing a decimal by a multiple of 100.

R14   Solves a two-step problem involving multiplication of a whole number by a fraction.

T02A   In a multi-step word problem, finds how many of each of two groups of different sizes are required to produce a given number.

Measurement

E06   Identifies the length of a rectangle given its perimeter and width.

F10   Recognizes that precision of measurement is related to the size of the unit of measurement.

I03   Applies knowledge of number of milliliters in a liter to solve a word problem.

J10   Finds the area between two rectangles when one is inside the other and their sides are parallel.

K05   Finds the perimeter of a square given that its area is a square number less than 150.

P12   Estimates the length of a curved piece of string adjacent to a ruler.

Q03   From a set of times expressed variously in days, hours, minutes, and seconds, determines which is least.

S02B   Finds the length of a side of a square, given that its area is a square number.

U02A   Uses computation with fractions to find the length and width of a rectangle and draws and labels that rectangle on a grid.

U02B   Given the dimensions of two rectangles, expresses the ratio of their areas.

U03   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.

Data Representation, Analysis, and Probability

G01   Reads data from a frequency table to solve a problem.

Geometry

I08   Given only the coordinates of two points on the line, selects the coordinates of a third point on that line.

K08   Uses properties of congruent triangles and the sum of the angles of a triangle to find the measure of an angle.

L16   Identifies the measure of an angle of a quadrilateral given the measures of the other three angles.

Geometry continued

M05   Identifies the image of a triangle under a rotation about a point in the plane.

N12   Locates a point on a number line given its distance from two given points.

P10   Uses properties of similar triangles to find the length of a corresponding side.

Q10   Solves a problem involving measures of overlapping angles.

Algebra

K04   Solves a linear inequality involving a fraction.

L15   Uses proportion to find missing values in a table.

R10   Recognizes properties of operations on real numbers represented in symbolic form.

S01B   Knowing the first five terms of a sequence growing in one dimension, finds the seventh term.

T01   Solves a multi-step word problem in which there are two unknowns and displays the method of solution.

V04C   Given the initial terms in a sequence and, for example, the 50th term of that sequence, generalizes to find the next term.

Items Above the Top 10% Benchmark

Fractions and Number Sense

S03   Solves a word problem involving multiplication and subtraction of decimals.

T02B   Uses information in a word problem to determine numerator and denominator and writes the relevant common fraction.

U01   Estimates the total time in minutes for an event made up of a series of events, each given in minutes and seconds.

Measurement

P08   Finds the ratio of width to perimeter for a rectangle when given the ratio of length to width of a rectangle.

S02C   Finds the perimeter of a figure made up of squares with known length of sides.

Data Representation, Analysis, and Probability

V02   Selects relevant information from two advertisements to solve a complex word problem involving decimals.

Algebra

I01   Identifies what the variable represents in an equation for a given situation.

I04   Identifies numbers common to two different arithmetic sequences.

Q01   Selects an algebraic expression to answer a question about a set of linked verbal statements.

S01C   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.