KAMM
ITEM SPECIFICATIONS

ASSESSABLE INDICATORS FROM THE KANSAS MATHEMATICS STANDARDS

KSDE LAST REVIEWED: 7-23-2007
WESTED LAST REVIEWED: 7-23-2007

NOTE: Beginning September 2004, the representatives from the math committee suggested
that all indicators will have at least 4 items
and
that student reporting on the indicator level will reflect each assessed indicator.

Grade 3

THIRD GRADE

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 1: Number Sense – The student demonstrates number sense for whole numbers, fractions, decimals, and money using concrete objects in a variety of situations.

Assessable Indicator	Item Specification Notes
M.3.1.1.K2a compares and orders: a. ▲ ■ whole numbers from 0 through 10,000 with and without the use of concrete objects (2.4.K1a-b) **($)**.	• MC • For KAMM, limit data lists to three numbers (e.g. 434, 765, 333). • For KAMM, numbers should all contain the same number of digits. • For KAMM, when using base ten blocks as a representation, limit numbers to 500 or less. • **Explanation of Indicator:** Compare numbers as greater than or less than; order numbers from 0 through 10,000 from least to greatest and/or greatest to least
Sample Item Shells	
A list of numbers is shown below. 897 250 945 Which list shows the numbers ordered from LEAST to GREATEST? **A.** 945 250 897 **B.** 250 897 945 **C.** 250 945 897 **Correct Answer:** B	**Category 2: Perform Procedures: 2a.** Use numbers to count, order, or denote **Category 3: Demonstrate Understanding of Mathematical Ideas: 3b.** Use representations to model mathematical ideas

Grade 3 (cont'd)

THIRD GRADE

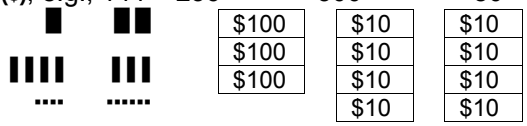
Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 1: Number Sense – The student demonstrates number sense for whole numbers, fractions, decimals, and money using concrete objects in a variety of situations.

Assessable Indicator

M.3.1.1.K3a-c

▲ knows, explains, and uses equivalent representations including the use of mathematical models for:

a. addition and subtraction of whole numbers from 0 through 1,000 (2.4.K1a-b) **($)**, e.g., 144 + 236 = 300 + 80



b. multiplication using the basic facts through the 5s and the multiplication facts of the 10s (2.4.K1a), e.g., 3 x 2 can be represented as 4 + 2 or as an array, X X X
X X X;

c. addition and subtraction of money (2.4.K1d) **($)**, e.g., three half dollars equals 50¢ x 3 or 50¢ + 100¢.

Sample Item Shells

An array is shown below.

Which number phrase does the array show?

A. $5+2$

B. 5×2

C. $5-5$

Correct Answer: B

Item Specification Notes

- MC
- For KAMM, when using base ten blocks as a representation, limit numbers to 500 or less.
- For KAMM, limit money values to $50 or less.
- **Explanation of Indicator:**
  a. For example, 5 dimes and 3 pennies, plus 11 dimes and 9 pennies is a representation of 53 + 119.
  b. For example, a student recognizes that the ceramic tile in the format of four rows by three columns is a representation for 4 x 3.

Category 2: Perform Procedures: 2b. Do computational procedures or algorithms

Category 3: Demonstrate Understanding of Mathematical Ideas: 3e. Show and/or explain relationships between models, diagrams, and/or other representations

Grade 3 (cont'd)

THIRD GRADE

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 1: Number Sense – The student demonstrates number sense for whole numbers, fractions, decimals, and money using concrete objects in a variety of situations.

Assessable Indicator	Item Specification Notes
M.3.1.1.K4 ▲ **N** determines the value of mixed coins and bills with a total value of $50 or less (2.1.K1d) **($)**.	• MC • For KAMM, provide visual representations of money: items written to skill category 2b will have a stem graphic, items written to skill category 3b will have answer choice graphics. • For KAMM, when answer choices are graphics, limit money to 4 types (e.g., 1 type of bill and 3 types of coins or 2 types of bills and 2 types of coins). • For KAMM, display bills and coins in descending order. • For KAMM, limit types of money so no regrouping (borrowing or carrying) is required. **Category 2: Perform Procedures: 2b.** Do computational procedures or algorithms **Category 3: Demonstrate Understanding of Mathematical Ideas: 3b.** Use representations to model mathematical ideas
Sample Item Shells	
Sam has the bills and coins shown in the picture below. What is the TOTAL value of the bills and coins? **A.** $11.27 **B.** $11.45 **C.** $15.27 **Correct Answer:** A	

Grade 3 (cont'd)

THIRD GRADE

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 4: Computation – The student models, performs, and explains computation with whole numbers and money including the use of concrete objects in a variety of situations.

Assessable Indicator	Item Specification Notes
M.3.1.4.A1a-b ▲ **N** solves one-step real-world addition or subtraction problems with **($)**: a. whole numbers from 0 through 10,000 (2.4.A1a-b), e.g., for the food drive, the school collected 564 cans (cylinders) and 297 boxes (rectangular prisms). How many items did they collect in all? This problem could be solved with base 10 models; by adding 500 + 200 (700), 60 + 90 (150), and 4 + 7 (11), so 700+ 150 + 11= 861; by adding 564 + 300 (864) and 297 is 3 less than 300, so 864 – 3 = 861; or by using the traditional algorithm; b. monetary amounts using dollar and cents notation through $500.00 (2.4.A1a-b,d) **($)**, e.g., you are shopping for a new bicycle; at The Bike Store, the bike you want is $189.69 and at Sports for All it is $162.89. How much will you save by buying the bike at Sports for All?	• MC • For KAMM, limit regrouping to the least place value only (note: example in indicator no longer applies for KAMM). Regrouping is defined as borrowing or carrying. **Category 2: Perform Procedures: 2d.** Solve equations, formulas, or routine word problems
Sample Item Shells	
On Friday night, 356 people saw a movie. On Saturday night, 1,527 people saw the same movie. What is the TOTAL number of people who saw the movie on Friday and Saturday nights? **A.** 883 people **B.** 1,231 people **C.** 1,883 people **Correct Answer:** C	

Grade 3 (cont'd)

THIRD GRADE

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 4: Computation – The student models, performs, and explains computation with whole numbers and money including the use of concrete objects in a variety of situations.

Assessable Indicator	Item Specification Notes
M.3.1.4.K7 ▲ ■ **N** identifies multiplication and division fact families through the 5s and the multiplication and division fact families of the 10s (2.4.K1a), e.g., when given 6 x □ = 18, the student recognizes the remaining members of the fact family.	• MC • For KAMM, when the stem gives a number fact and answer choices are the 3 remaining members of the fact family, none of the facts in the distracters should be part of the correct answer. • For KAMM, fact family members should always be equations, not expressions. **Category 1: Memorize Facts/Definitions/Formulas: 1a.** Recite or recall basic mathematics facts **Category 2: Perform Procedures: 2b.** Do computational procedures or algorithms **Category 3: Demonstrate Understanding of Mathematical Ideas: 3b.** Use representations to model mathematical ideas
Sample Item Shells	
Part of a fact family is shown below. $7 \times 3 = 21$ $21 \div 7 = 3$ $3 \times 7 = 21$ Which number fact is in the same fact family? **A.** $7 - 3 = 4$ **B.** $7 + 3 = 10$ **C.** $21 \div 3 = 7$ **Correct Answer:** C	

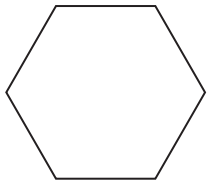
Grade 3 (cont'd)

Standard 2: Algebra – The student uses algebraic concepts and procedures in a variety of situations.
Benchmark 1: Patterns – The student recognizes, describes, extends, develops, and explains relationships in patterns using concrete objects in a variety of situations.

Assessable Indicator	Item Specification Notes
M.3.2.1.A2 ▲ recognizes multiple representations of the same pattern (2.4.A1a) e.g., the ABC pattern could be represented by clap, snap, stomp, …; red, green, yellow, …; tricycle, bicycle, unicycle, …; or 3, 2, 1, …	• MC • *Item Specification Note:* For assessment purposes, items for this indicator should focus only on numeric, visual, or written pattern formats. • For KAMM, limit patterns of shapes to 3 different types of shapes. • For KAMM, do not use shape patterns in both the stem and answer choices (use shapes and letters, or words and shapes, etc.). • For KAMM, do not use "X" or "Y" in patterns of letters. **Category 3: Demonstrate Understanding of Mathematical ideas: 3e.** Show and/or explain relationships between models, diagrams, and/or other representations **Category 4: Conjecture/Generalize/Prove: 4c.** Recognize, generate, or continue patterns, **4d.** Find a mathematical rule to generate a pattern or number sequence **Category 5: Solve Non-routine Problems/Make Connections: 5c.** Analyze data or recognize patterns
Sample Item Shells	
The shapes below follow a pattern. Which pattern of letters follows the same pattern as the shapes? **A.** A B A B A B A B A B A B **B.** A A B B A A B B A A B B **C.** A B B A A B B A A B B A **Correct Answer:** C	

Grade 3 (cont'd)

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.
Benchmark 1: Geometric Figures and Their Properties – The student recognizes geometric shapes and investigates their properties using concrete objects in a variety of situations.

Assessable Indicator	Item Specification Notes
M.3.3.1.K4 ▲ ■ recognizes and describes the square, triangle, rhombus, hexagon, parallelogram, and trapezoid from a pattern block set (2.4.K1f).	• MC • For KAMM, limit figures to 3 types of shapes and a total of 3 shapes in a pattern block set. **Category 1: Memorize Facts/Definitions/Formulas: 1b.** Recall or recognize mathematical terms, definitions, or concepts **Category 3: Demonstrate Understanding of Mathematical Ideas: 3b.** Use representations to model mathematical ideas
Sample Item Shells	
The shape of a pattern block is shown below.  What is the shape of the pattern block? **A.** hexagon **B.** rhombus **C.** trapezoid **Correct Answer:** A	

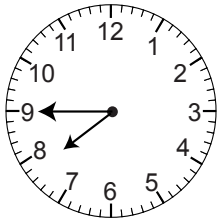
Grade 3 (cont'd)

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.
Benchmark 2: Measurement and Estimation – The student estimates and measures using standard and nonstandard units of measure using concrete objects in a variety of situations.

Assessable Indicator	Item Specification Notes
M.3.3.2.A1a,b,e solves real-world problems by applying appropriate measurements: a. ▲ length to the nearest inch, foot, or yard, e.g., Jill has a piece of rope that is 36 inches long and Bob has a piece that is 15 inches long. If they put their pieces together, how long would the piece of rope be? b. ▲ length to the nearest centimeter or meter, e.g., a new pencil is about how many centimeters long? e. ▲ number of days in a week, e.g., if school started 37 weeks ago, how many days of school have passed?	• MC • For KAMM, students will be asked to read an embedded graphic ruler to measure length. • For KAMM, measurement items written to skill category 2d will have a stem graphic; measurement items written to skill category 3b will have answer choice graphics. • For KAMM, number lines must show equal intervals, and each number line within an item must show the same intervals.
Sample Item Shells	
Marty's birthday is in exactly 4 WEEKS. How many DAYS are there until Marty's birthday? **A.** 24 days **B.** 28 days **C.** 32 days **Correct Answer:** B	**Category 2: Performs Procedures: 2d.** Solve equations, formulas, or routine word problems **Category 3: Demonstrate Understanding of Mathematical Ideas: 3b.** Use representations to model mathematical ideas **Category 5: Solve Non-routine Problems/Make Connections: 5b.** Apply mathematics in contexts outside of mathematics (whenever possible, include diagrams/visuals)

Grade 3 (cont'd)

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.
Benchmark 2: Measurement and Estimation – The student estimates and measures using standard and nonstandard units of measure using concrete objects in a variety of situations.

Assessable Indicator	Item Specification Notes
M.3.3.2.K2 ▲ reads and tells time to the minute using analog and digital clocks (2.4.K1a).	• MC • For KAMM, limit reading/telling time to hour, half hour, quarter hour, and nearest 5 minutes. • For KAMM, items written to skill category 1c will have a stem graphic; items written to skill category 3b will have answer choice graphics. **Category 1: Memorize Facts/Definitions/Formulas: 1c.** Recall formulas or computational procedures **Category 3: Demonstrate Understanding of Mathematical Ideas: 3b.** Use representations to model mathematical ideas
Sample Item Shells	
A picture of a clock is shown below.  What time is shown on the clock? **A.** 7:09 **B.** 7:45 **C.** 9:08 **Correct Answer:** B	

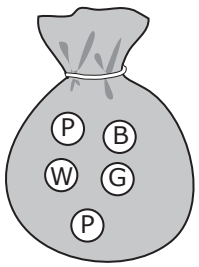
Grade 3 (cont'd)

Standard 4: Data – The student uses concepts and procedures of data analysis in a variety of situations.
Benchmark 1: Probability – The student applies the concepts of probability to draw conclusions and to make predictions and decisions including the use of concrete objects in a variety of situations.

Assessable Indicator	Item Specification Notes
M.3.4.1.K2 ▲ ■ lists some of the possible outcomes of a simple event in an experiment or simulation including the use of concrete objects (2.4.K1g-h).	• MC • For KAMM, limit the number of items (e.g., marbles in a bag, etc.) to 15 or fewer. • For KAMM, unless color of an object is a variable, all objects in a graphic must be the same color (shade). **Category 2: Perform Procedures: 2e.** Organize or display data **Category 3: Demonstrate Understanding of Mathematical Ideas: 3b.** Use representations to model mathematical ideas

Sample Item Shells

There are 5 colored marbles in a bag, as shown in the picture below.



Key
P = pink
W = white
B = blue
G = green

Dana will choose one marble from the bag without looking. Which color of marble could Dana choose?

A. black

B. purple

C. green

Correct Answer: C

Grade 4

FOURTH GRADE

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 2: Number Systems and Their Properties – The student demonstrates an understanding of whole numbers with a special emphasis on place value; recognizes, uses, and explains the concepts of properties as they relate to whole numbers; and extends these properties to fractions (including mixed numbers), decimals, and money.

Assessable Indicator	Item Specification Notes
M.4.1.2.K5a-d **uses** the **concepts** of these properties with the whole number system and demonstrates their meaning including the use of concrete objects (2.4.K1a) **($)**: a. ▲ commutative properties of addition and multiplication, e.g., 12 + 18 = 18 + 12 and 8 x 9 = 9 x 8; b. ▲ zero property of addition (additive identity) and property of one for multiplication (multiplicative identity), e.g., 24 + 0 = 24 and 75 x 1 = 75; c. ▲ associative properties of addition and multiplication, e.g., 4 + (2 + 3) = (4 + 2) + 3 and 2 x (3 x 4) = (2 x 3) x 4; d. ▲ symmetric property of equality applied to addition and multiplication, e.g., 100 = 20 + 80 is the same as 20 + 80 = 100 and 21 = 7 x 3 is the same as 3 x 7 = 21.	• MC **Category 3: Demonstrate Understanding of Mathematical Ideas:** **3b.** Use representations to model mathematical ideas
Sample Item Shells	
The figure below shows a number property. ✳ ✳ ✳ ✳ ✳ ✳ ✳ ✳ = ✳ ✳ ✳ ✳ ✳ ✳ ✳ ✳ ✳ ✳ ✳ ✳ ✳ Which math fact shows the SAME number property? **A.** $8 \times 3 = 3 \times 8$ **B.** $4 + 4 = 6 + 2$ **C.** $5 \times 2 = 5 + 5$ **Correct Answer:** A	

Grade 4 (cont'd)

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 4: Computation – The student models, performs, and explains computation with whole numbers, fractions, and money including the use of concrete objects in a variety of situations.

Assessable Indicator	Item Specification Notes
M.4.1.4.A1a-e ▲**N** solves one- and two-step real-world problems with one or two operations using these computational procedures **($)**: a. adds and subtracts whole numbers from 0 through 10,000 and when used as monetary amounts (2.4.A1a-b,d) , e.g., Lee buys a bicycle for $139, a helmet for $29, and a reflector for $6. He paid for it with a $200 check from his grandparents. How much will he have left from the $200 check? b. multiplies through a two-digit whole number by a two-digit whole number (2.4.A1a-b), e.g., at school, there are 22 students in each classroom. If there are 24 classes, how many students are in the classrooms? c. multiplies whole dollar monetary amounts (up through three-digit) by a one- or two-digit whole number (2.4.A1a-b,d), e.g., 112 third and fourth graders are planning a field trip. The cost per student is $9.00. How much will the trip cost? d. multiplies monetary amounts less than $100 by whole numbers less than ten (2.4.A1a-d) , e.g., at the book fair, a student buys 8 books on animals for $2.69 each. How much did the student pay for the books? e. figures correct change through $20.00 (2.4.A1a-d) , e.g., buying a 65¢ drink, paying for it with a $1 bill, and then figuring the amount of change.	• MC • For KAMM, limit regrouping to the least place value only. Regrouping is defined as borrowing or carrying. • For KAMM, limit monetary amounts to $50 or less when multiplying. **Category 2: Perform Procedures: 2d.** Solve equations, formulas, or routine word problems
Sample Item Shells	
A school will buy 34 new desks for each of its 12 classrooms. What is the TOTAL number of desks that the school will buy? **A.** 102 desks **B.** 306 desks **C.** 408 desks **Correct Answer:** C	

Grade 4 (cont'd)

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 4: Computation – The student models, performs, and explains computation with whole numbers, fractions, and money including the use of concrete objects in a variety of situations.

Assessable Indicator	Item Specification Notes
M.4.1.4.K6a-d ▲**N** shows the relationship between these operations with the basic fact families (addition facts with sums from 0 through 20 and corresponding subtraction facts, multiplication facts from 1 x 1 through 12 x 12 and corresponding division facts) including the use of mathematical models (2.4.K1a) **($)**: a. addition and subtraction, b. addition and multiplication, c. multiplication and division, d. subtraction and division.	• MC **Category 1: Memorize Facts/Definitions/Formulas: 1a.** Recite or recall basic mathematics facts **Category 3: Demonstrate Understanding of Mathematical Ideas: 3e.** Show and/or explain relationships between models, diagrams, and/or other representations
Sample Item Shells	
Which number sentence belongs to the same fact family as $3+12=15$? **A.** $9+3=12$ **B.** $12-3=9$ **C.** $15-3=12$ **Correct Answer:** C	

Grade 4 (cont'd)

Standard 2: Algebra – The student uses algebraic concepts and procedures in a variety of situations.
Benchmark 2: Variables, Equations, and Inequalities – The student uses variables, symbols, and whole numbers to solve equations including the use of concrete objects in a variety of situations.

Assessable Indicator	Item Specification Notes
M.4.2.2.K2a-c ▲ solves one-step equations using whole numbers with one variable and a whole number solution that: a. find the unknown in a multiplication or division equation based on the multiplication facts from 1 x 1 through 12 x 12 and corresponding division facts (2.4.K1a), e.g., 60 = 10 x n; b. find the unknown in a money equation using multiplication and division based upon the facts and addition and subtraction with values through $10 (2.4.K1d) **($)**, e.g., 8 quarters + 10 dimes = y dollars; c. find the unknown in a time equation involving whole minutes, hours, days, and weeks with values through 200 (2.4.K1a), e.g., 180 minutes = y hours.	• MC **Category 2: Perform Procedures: 2d.** Solve equations, formulas, or routine word problems
Sample Item Shells	
A money equation is shown below. 40 nickels = *d* dollars What value of *d* will make the equation true? **A.** 1 **B.** 2 **C.** 5 **Correct Answer:** B	

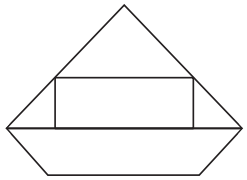
Grade 4 (cont'd)

Standard 2: Algebra – The student uses algebraic concepts and procedures in a variety of situations.
Benchmark 3: Functions – The student recognizes and describes whole number relationships including the use of concrete objects in a variety of situations.

Assessable Indicator	Item Specification Notes
M.4.2.3.A1 ▲ represents and describes mathematical relationships between whole numbers from 0 through 1,000 using concrete objects, pictures, written descriptions, symbols, equations, tables, and graphs (2.4.A1a) **($)**.	• MC • For KAMM, provide graphics whenever possible. **Category 3: Demonstrate Understanding of Mathematical Ideas:** **3e.** Show and/or explain relationships between models, diagrams, and/or other representations **Category 5: Solve Non-routine Problems/Make Connections:** **5b.** Apply mathematics in contexts outside of mathematics (whenever possible, include diagrams/visuals)
Sample Item Shells	
Patrick raked leaves in his front yard each week for 4 weeks. He earned $2 each week. Which equation models the TOTAL amount of money that Patrick earned over the 4 weeks (t)? **A.** $t = 4 + 2$ **B.** $t = 2 + 2 + 2 + 2$ **C.** $t = 4 + 4 + 4 + 4$ **Correct Answer:** B	

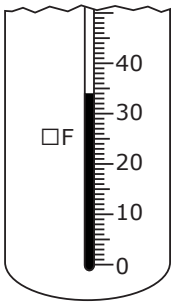
Grade 4 (cont'd)

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.
Benchmark 1: Geometric Figures and Their Properties – The student recognizes geometric shapes and investigates their properties including the use of concrete objects in a variety of situations.

Assessable Indicator	Item Specification Notes
M.4.3.1.A2 ▲ identifies the plane figures (circles, squares, rectangles, triangles, ellipses, rhombi, octagons, hexagons, pentagons, trapezoids) used to form a composite figure (2.4.A1f).	• MC • For KAMM, limit figures to 3 types of shapes and a total of 5 shapes. **Category 1: Memorize Facts/Definitions/Formulas: 1b.** Recall or recognize mathematical terms, definitions, or concepts **Category 3: Demonstrate Understanding of Mathematical Ideas: 3b.** Use representations to model mathematical ideas
Sample Item Shells	
A figure is shown below.  Which 5 shapes were used to make the figure? **A.** 1 rectangle, 3 triangles, 1 trapezoid **B.** 1 rectangle, 2 triangles, 2 trapezoids **C.** 1 square, 2 triangles, 2 trapezoids **Correct Answer:** A	

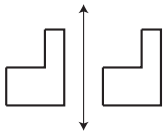
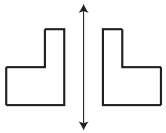
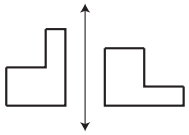
Grade 4 (cont'd)

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.
Benchmark 2: Measurement and Estimation – The student estimates and measures using standard and nonstandard units of measure including the use of concrete objects in a variety of situations.

Assessable Indicator	Item Specification Notes
M.4.3.2.K2a-e ▲ selects, explains the selection of, and uses measurement tools, units of measure, and degree of accuracy appropriate for a given situation to measure (2.4.K1a) **($)**: a. length, width, and height to the nearest fourth of an inch or to the nearest centimeter; b. volume to the nearest cup, pint, quart, or gallon; to the nearest liter; or to the nearest whole unit of a nonstandard unit; c. weight to the nearest ounce or pound or to the nearest whole unit of a nonstandard unit of measure; d. temperature to the nearest degree; e. time including elapsed time.	• MC **Category 3: Demonstrate Understanding of Mathematical Ideas:** **3b.** Use representations to model mathematical ideas
Sample Item Shells	
A picture of a thermometer is shown below.  What temperature is shown on the thermometer? **A.** 34ºF **B.** 44ºF **C.** 46ºF **Correct Answer:** A	

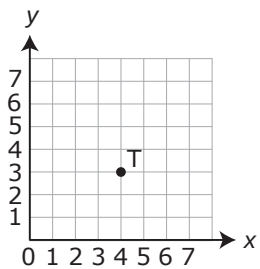
Grade 4 (cont'd)

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.
Benchmark 3: Transformational Geometry – The student recognizes and performs one transformation on simple shapes or concrete objects in a variety of situations.

Assessable Indicator	Item Specification Notes
M.4.3.3.K2 ▲ recognizes, performs, and describes one transformation (reflection/flip, rotation/turn, translation/slide) on a two-dimensional figure or concrete object (2.4.K1a).	• MC • *Item Specification Note:* Sometimes these should be on a grid, and students should be provided with cardinal or positional directions. • For KAMM, always use a graphic. • For KAMM, items written to skill category 1b may ask a question such as "On which graph is a reflection (flip) of a shape shown?" or "Which term describes the movement of the figure?" Items written to skill categories 2c or 3b may ask a question such as "A reflection (flip) will be performed on the shape shown below. Which picture shows a reflection (flip) of the shape across a line?"
Sample Item Shells	**Category 1: Memorize Facts/Definitions/Formulas: 1b.** Recall or recognize mathematical terms, definitions, or concepts **Category 2: Perform Procedures: 2c.** Follow procedures or instructions **Category 3: Demonstrate Understanding of Mathematical Ideas: 3b.** Use representations to model mathematical ideas
Which picture shows one reflection (flip) of a shape across a line? **A.**  **B.**  **C.**  **Correct Answer:** B	

Grade 4 (cont'd)

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.
Benchmark 4: Geometry from an Algebraic Perspective – The student relates geometric concepts to a number line and the first quadrant of a coordinate plane in a variety of situations.

Assessable Indicator	Item Specification Notes
M.4.3.4.K3 ▲ ■ identifies and plots points as whole number ordered pairs in the first quadrant of a coordinate plane (coordinate grid) (2.4.K1a).	• MC **Category 1: Memorize Facts/Definitions/Formulas: 1b.** Recall or recognize mathematical terms, definitions, or concepts **Category 2: Perform Procedures: 2c.** Follow procedures or instructions **Category 3: Demonstrate Understanding of Mathematical Ideas: 3a.** Communicate mathematical ideas or rules and/or explain the process
Sample Item Shells	
Point T is shown on the coordinate grid below.  What ordered pair describes the location of point T? **A.** (3, 4) **B.** (4, 3) **C.** (4, 4) **Correct Answer:** B	

Grade 4 (cont'd)

Standard 4: Data – The student uses concepts and procedures of data analysis in a variety of situations.
Benchmark 2: Statistics – The student collects, organizes, displays, explains, and interprets numerical (whole numbers) and non-numerical data sets including the use of concrete objects in a variety of situations.

Assessable Indicator

M.4.4.2.K1b-i

▲ organizes, displays, and reads numerical (quantitative) and non-numerical (qualitative) data in a clear, organized, and accurate manner including a title, labels, categories, and whole number intervals using these data displays (2.4.K1h) **($)**:

b. pictographs with a symbol or picture representing one, two, five, ten, twenty-five, or one-hundred including partial symbols when the symbol represents an even amount;
c. frequency tables (tally marks);
d. horizontal and vertical bar graphs;
e. Venn diagrams or other pictorial displays, e.g., glyphs;
f. line plots;
g. charts and tables;
h. line graphs;
i. circle graphs.

Sample Item Shells

The pictograph below shows the number of cans recycled by the students in a classroom during January, February, and March.

Recycling

Month	Number of Cans Recycled
January	
February	
March	

Key
= 10 cans

How many cans were recycled in March?

A. 5 cans

B. 30 cans

C. 50 cans

Correct Answer: C

Item Specification Notes

- MC
- For KAMM, pictographs should have no more than 3 rows of data.

Category 2: Perform Procedures: 2e. Organize or display data, **2f.** Read or produce graphs and tables

Category 3: Demonstrate Understanding of Mathematical Ideas: 3a. Communicate mathematical ideas or rules and/or explain the process

Grade 5

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 1: Number Sense – The student demonstrates number sense for integers, fractions, decimals, and money in a variety of situations.

Assessable Indicator	Item Specification Notes
M.5.1.1.K1a-c ▲ ■ knows, explains, and uses equivalent representations for **($)**: a. whole numbers from 0 through 1,000,000 (2.4.K1a-b); b. fractions greater than or equal to zero (including mixed numbers) (2.4.K1c); c. decimals greater than or equal to zero through hundredths place and when used as monetary amounts (2.4.K1c).	• MC • For KAMM, number lines must show equal intervals, and each number line within an item must show the same intervals. **Category 2: Perform Procedures: 2b.** Do computational procedures or algorithms **Category 3: Demonstrate Understanding of Mathematical Ideas: 3b.** Use representations to model mathematical ideas, **3e.** Show and/or explain relationships between models, diagrams, and/or other representations **Category 4: Conjecture/Generalize/Prove: 4a.** Determine the truth of a mathematical pattern, a mathematical statement, and/or proposition or make predictions
Sample Item Shells	
Which number phrase has the SAME value as 480,725? **A.** $480,000 + 7,000 + 200 + 5$ **B.** $400,000 + 8,000 + 700 + 20 + 5$ **C.** $400,000 + 80,000 + 700 + 20 + 5$ **Correct Answer:** C	

Grade 5 (cont'd)

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 3: Estimation – The student uses computational estimation with whole numbers, fractions, decimals, and money in a variety of situations.

Assessable Indicator	Item Specification Notes
M.5.1.3.A4 ▲ ■ determines if a real-world problem calls for an exact or approximate answer using whole numbers from 0 through 100,000 and performs the appropriate computation using various computational methods including mental math, paper and pencil, concrete materials, and appropriate technology (2.4.A1a) **($)**.	• MC • For KAMM, ask students to perform the correct computation. **Category 2: Perform Procedures: 2c.** Follow procedures and/or instructions **Category 5: Solve Non-routine Problems/Make Connections: 5a.** Apply and adapt a variety of appropriate strategies to solve non-routine problems
Sample Item Shells	
A parking garage has 180 parking spaces. There are vehicles parked in 76 of the parking spaces. The rest of the parking spaces are empty. Exactly how many of the parking spaces in the garage are empty? **A.** 104 parking spaces **B.** 116 parking spaces **C.** 256 parking spaces **Correct Answer:** A	

Grade 5 (cont'd)

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 4: Computation – The student models, performs, and explains computation with whole numbers, fractions including mixed numbers, and decimals including the use of concrete objects in a variety of situations.

Assessable Indicator	Item Specification Notes
M.5.1.4.A1a-f ▲ **N** solves one- and two-step real-world problems using these computational procedures **($)** (For the purpose of assessment, two-step problems can include any combination of a, b, c, d, e, or f.): a. adds and subtracts whole numbers from 0 through 100,000 (2.4.A1a-b); e.g., Lee buys a bike for $139, a helmet for $29 and a reflector for $6. How much of his $200 check from his grandparents will he have left? b. multiplies through a four-digit whole number by a two-digit whole number (2.4.A1a-b), e.g., At the amusement park, Monday's attendance was 4,414 people. Tuesday's attendance was 3,042 people. If the cost per person is $23, how much money was collected on those days? c. multiplies monetary amounts up to $1,000 by a one- or two-digit whole number (2.4.A1c), e.g., What is the cost of 4 items each priced at $3.49? d. divides whole numbers through a 2-digit divisor and a 4-digit dividend with the remainder as a whole number or a fraction (2.4.A1a-c); e. adds and subtracts decimals from thousands place through hundredths place when used as monetary amounts (2.4.A1a-c) (The set of decimal numbers includes whole numbers.), e.g., At the track meet, Peter ran the 100 meter dash in 12.3 seconds. Tanner ran the same race in 12.19 seconds. How much faster was Tanner? f. ▲ ■ multiplies and divides by 10; 100; and 1,000 and single digit multiples of each (10, 20, 30, …; 100, 200, 300, …; 1,000; 2,000; 3,000; …) (2.4.A1a-b), e.g., Matti has 1,590 stamps to place in her stamp album. 30 stamps fit on a page. What is the minimum number of pages she needs in her album?	• MC **Category 2: Perform Procedures: 2d.** Solve equations, formulas, or routine word problems
Sample Item Shells	
A book contains 32,000 lines of print. There are 40 lines of print on each page in the book. Exactly how many pages are in the book? **A.** 8 pages **B.** 80 pages **C.** 800 pages **Correct Answer:** C	

Grade 5 (cont'd)

Standard 2: Algebra – The student uses algebraic concepts and procedures in a variety of situations.
Benchmark 2: Variables, Equations, and Inequalities – The student uses variables, symbols, whole numbers, and algebraic expressions in one variable to solve linear equations in a variety of situations.

Assessable Indicator	Item Specification Notes
M.5.2.2.K2 ▲ **N** solves one-step linear equations with one variable and a whole number solution using addition and subtraction with whole numbers from 0 through 100 and multiplication with the basic facts (2.4.K1a,e) **($)**, e.g., 3y = 12, 45 = 17 + q, or r – 42 = 36.	• MC • For KAMM, all equations should be formatted as expression = answer. **Category 2: Perform Procedures: 2d.** Solve equations, formulas, or routine word problems
Sample Item Shells	
What value of x will make the equation $29 + x = 75$ true? **A.** 46 **B.** 56 **C.** 104 **Correct Answer:** A	

Grade 5 (cont'd)

Standard 2: Algebra – The student uses algebraic concepts and procedures in a variety of situations.
Benchmark 3: Functions – The student recognizes, describes, and examines whole number relationships in a variety of situations.

Assessable Indicator

M.5.2.3.K4
▲ ■ uses a function table (input/output machine, T-table) to identify, plot, and label whole number ordered pairs in the first quadrant of a coordinate plane (2.4.K1a,f).

Sample Item Shells

The table below shows some values of *x* and *y*.

x	*y*
6	9
12	15
18	21
24	27

What ordered pairs are shown in the table?

A. (6, 15) (12, 9) (18, 27) (24, 21)

B. (6, 9) (12, 15) (18, 21) (24, 27)

C. (6, 12) (18, 24) (9, 15) (21, 27)

Correct Answer: B

Item Specification Notes

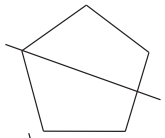
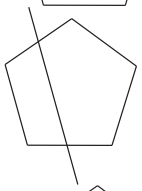
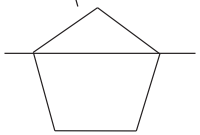
- MC
- For KAMM, limit tables to a maximum of four ordered pairs.
- For KAMM, functions should be linear, and ordered pairs shown in a table should represent a linear function.

Category 1: Memorize Facts/Definitions/Formulas: 1b. Recite or recall basic mathematics facts

Category 2: Perform Procedures: 2c. Follow procedures and/or instructions

Grade 5 (cont'd)

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.
Benchmark 1: Geometric Figures and Their Properties – The student recognizes geometric shapes and compares their properties in a variety of situations.

Assessable Indicator	Item Specification Notes
M.5.3.1.A1a solves real-world problems by applying the properties of (2.4.A1g): a. ▲ plane figures (circles, squares, rectangles, triangles, ellipses, rhombi, parallelograms, hexagons, pentagons) and the line(s) of symmetry; e.g., twins are having a birthday party. The rectangular birthday cake is to be cut into two pieces of equal size and with the same shape. How would the cake be cut? Would the cut be a line of symmetry? How would you know?	• MC • For KAMM, provide a visual representation of the lines of symmetry. **Category 2: Perform Procedures: 2d.** Solve equations, formulas, or routine word problems **Category 5: Solve Non-routine Problems/Make Connections: 5b.** Apply mathematics in contexts outside of mathematics (whenever possible, include diagrams/visuals)
Sample Item Shells	
A kite shaped like a regular pentagon must have a piece of wood placed along a line of symmetry for support. Which diagram shows where the piece of wood could be placed to be along a line of symmetry? **A.**  **B.**  **C.**  **Correct Answer:** A	

Grade 5 (cont'd)

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.
Benchmark 2: Measurement and Estimation – The student estimates, measures, and uses measurement formulas in a variety of situations.

Assessable Indicator	Item Specification Notes
M.5.3.2.A1a,c,f,g,h solves real-world problems by applying appropriate measurements and measurement formulas **($)**: a. ▲ length to the nearest eighth of an inch or to the nearest centimeter (2.4.A1a), e.g., in science, we are studying butterflies. What is the wingspan of each of the butterflies studied to the nearest eighth of an inch? c. ▲ weight to the nearest whole unit (pounds, grams, nonstandard units) (2.4.A1a), e.g., if you bought 200 bricks (each one weighed 5 pounds), how much would the whole load of bricks weigh? f. ▲ months in a year and minutes in an hour (2.4.A1a), e.g., it took Susan 180 minutes to complete her homework assignment. How many hours did she spend doing homework? g. ▲ perimeter of squares, rectangles, and triangles (2.4.A1g), e.g., Mark wants to put up a fence in his rectangle-shaped back yard. If his yard measures 18 feet by 36 feet, how many feet of fence will he need to go around his yard? h. ▲ area of squares and rectangles (2.4.A1g), e.g., a farmer's square-shaped field is 35 feet on each side. How many square feet does he have to plow?	• MC • For KAMM, provide labeled measurement formulas when appropriate, such as: Perimeter = length + width + length + width **Category 2: Perform Procedures: 2d.** Solve equations, formulas, or routine word problems **Category 3: Demonstrate Understanding of Mathematical Ideas: 3a.** Communicate mathematical ideas or rules and/or explain the process
Sample Item Shells	
Robin's brother was born 3 YEARS ago. How many MONTHS ago was Robin's brother born? **A.** 21 months **B.** 30 months **C.** 36 months **Correct Answer:** C	

Grade 5 (cont'd)

FIFTH GRADE

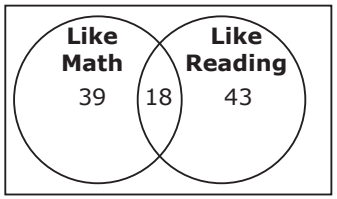
Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.
Benchmark 2: Measurement and Estimation – The student estimates, measures, and uses measurement formulas in a variety of situations.

Assessable Indicator	Item Specification Notes
M.5.3.2.K4a converts (2.4.K1a): ▲ ■ within the customary system: inches and feet, feet and yards, inches and yards, cups and pints, pints and quarts, quarts and gallons, pounds and ounces.	• MC • For KAMM, always provide a conversion equation (or a graphic when appropriate). **Category 2: Perform Procedures: 2b.** Do computational procedures or algorithms
Sample Item Shells	
Janet has 8 FEET of ribbon. Exactly how many INCHES of ribbon does Janet have? (1 foot = 12 inches) **A.** 72 inches **B.** 80 inches **C.** 96 inches **Correct Answer:** C	

Grade 5 (cont'd)

FIFTH GRADE

Standard 4: Data – The student uses concepts and procedures of data analysis in a variety of situations.
Benchmark 2: Statistics – The student collects, organizes, displays, explains, and interprets numerical (rational numbers) and non-numerical data sets in a variety of situations with a special emphasis on measures of central tendency.

Assessable Indicator	Item Specification Notes
M.5.4.2.A1b-h ▲ interprets and uses data to make reasonable inferences, predictions, and decisions, and to develop convincing arguments from these data displays (2.4.A1k) **($)**: b. pictographs, c. frequency tables, d. bar and line graphs, e. Venn diagrams and other pictorial displays, f. line plots, g. charts and tables, h. circle graphs.	• MC **Category 2: Perform Procedures: 2f.** Read or produce graphs and tables **Category 4: Conjecture/Generalize/Prove: 4a.** Determine the truth of a mathematical pattern, a mathematical statement, and/or proposition or make predictions **Category 5: Solve Non-routine Problems/Make Connections: 5c.** Analyze data or recognize patterns
Sample Item Shells	
Gerard asked 100 students whether they like math, reading, or both math and reading. He displayed the results in the Venn diagram shown below. **Math and Reading Preferences**  What is the TOTAL number of students who said they like math? **A.** 43 students **B.** 57 students **C.** 61 students **Correct Answer:** B	

Grade 5 (cont'd)

FIFTH GRADE

Standard 4: Data – The student uses concepts and procedures of data analysis in a variety of situations.
Benchmark 2: Statistics – The student collects, organizes, displays, explains, and interprets numerical (rational numbers) and non-numerical data sets in a variety of situations with a special emphasis on measures of central tendency.

Assessable Indicator	Item Specification Notes
M.5.4.2.K3a-e ▲ identifies, explains, and calculates or finds these statistical measures of a whole number data set of up to twenty whole number data points from 0 through 1,000 (2.4.K1a) **($)**: a. minimum and maximum values, b. range, c. mode (no-, uni-, bi-), d. median (including answers expressed as a decimal or a fraction without reducing to simplest form), e. mean (including answers expressed as a decimal or a fraction without reducing to simplest form).	• MC • For KAMM, limit data sets to a maximum of 7 values. • For KAMM, list data in increasing order. • For KAMM, use an odd number of data when determining median. **Category 2: Perform Procedures: 2c.** Follow procedures and/or instructions
Sample Item Shells	
A data set is shown below. 10 12 16 20 26 What is the MEDIAN of the data set? **A.** 16 **B.** 20 **C.** 26 **Correct Answer:** A	

Grade 6

SIXTH GRADE

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 1: Number Sense – The student demonstrates number sense for rational numbers and simple algebraic expressions in one variable in a variety of situations.

Assessable Indicator	Item Specification Notes
M.6.1.1.K4 ▲ **N** knows and explains numerical relationships between percents, decimals, and fractions between 0 and 1 (2.4.K1a,c), e.g., recognizing that percent means out of a 100, so 60% means 60 out of 100, 60% as a decimal is .60, and 60% as a fraction is 60/100.	• MC **Category 1: Memorize Facts/Definitions/Formulas: 1b.** Recall or recognize mathematical terms, definitions, or concepts **Category 3: Demonstrate Understanding of Mathematical Ideas: 3a.** Communicate mathematical ideas or rules and/or explain the process
Sample Item Shells	
Which decimal number is equivalent to 70%? **A.** 0.07 **B.** 0.70 **C.** 7.00 **Correct Answer:** B	

Grade 6 (cont'd)

SIXTH GRADE

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 3: Estimation – The student uses computational estimation with rational numbers and the irrational number pi in a variety of situations.

Assessable Indicator	Item Specification Notes
M.6.1.3.A2 ▲ **N** estimates to check whether or not the result of a real-world problem using rational numbers and/or the irrational number pi is reasonable and makes predictions based on the information (2.4.A1a) **($)**, e.g., a class of 28 students has a goal of reading 1,000 books during the school year. If each student reads 13 books each month, will the class reach their goal?	• MC • For KAMM, do not assess pi (π). **Category 4: Conjecture/Generalize/Prove: 4a.** Determine the truth of a mathematical pattern, a mathematical statement, and/or proposition or make predictions **Category 5: Solve Non-routine Problems/Make Connections: 5b.** Apply mathematics in contexts outside of mathematics (whenever possible, include diagrams/visuals)
Sample Item Shells	
Michael is buying 9 sandwiches. Each sandwich costs $5.29. Which is the best ESTIMATE of the total cost of the 9 sandwiches? **A.** $25.00 **B.** $50.00 **C.** $60.00 **Correct Answer:** B	

Grade 6 (cont'd)

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 4: Computation – The student models, performs, and explains computation with positive rational numbers and integers in a variety of situations.

Assessable Indicator	Item Specification Notes
M.6.1.4.A1b generates and/or solves one- and two-step real-world problems with rational numbers using these computational procedures **($)**: b. ▲ ■ addition, subtraction, multiplication, and division of decimals through hundredths place (2.4.A1a-c), e.g., On a recent trip, Marion drove 25.8 miles from Allen to Barber, then 15.2 miles from Barber to Chase, then 14.9 miles from Chase to Douglas. When Marion had completed half of her drive from Allen to Douglas, how many miles had she driven?	• MC • For KAMM, the dividend, divisor, and quotient should all be limited to the hundredths place. **Category 2: Perform Procedures: 2d.** Solve equations, formulas, or routine word problems **Category 5: Solve Non-routine Problems/Make Connections: 5b.** Apply mathematics in contexts outside of mathematics (whenever possible, include diagrams/visuals)
Sample Item Shells	
Britney needs 2.5 cups of flour to bake cookies. Her measuring cup will hold 0.5 cup of flour when full. How many times must Britney fill the measuring cup to measure 2.5 cups of flour? **A.** 2.25 **B.** 3.75 **C.** 5.00 **Correct Answer:** C	

Grade 6 (cont'd)

Standard 2: Algebra – The student uses algebraic concepts and procedures in a variety of situations.
Benchmark 1: Patterns – The student recognizes, describes, extends, develops, and explains the general rule of a pattern in a variety of situations.

Assessable Indicator	Item Specification Notes
M.6.2.1.K4 ▲ states the rule to find the next number of a pattern with one operational change (addition, subtraction, multiplication, division) to move between consecutive terms (2.4.K1a), e.g., given 4, 8, and 16, double the number to get the next term, multiply the term by 2 to get the next term, or add the number to itself for the next term.	• MC **Category 4: Conjecture/Generalize/Prove: 4d.** Find a mathematical rule to generate a pattern or number sequence
Sample Item Shells	
The numbers shown below follow a pattern. 79 68 57 46 The pattern continues. Which rule could be used to find the next number in the pattern? **A.** subtract 11 from the previous number **B.** add 11 to the previous number **C.** subtract 10 from the previous number **Correct Answer:** A	

Grade 6 (cont'd)

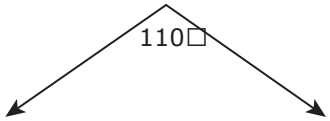
Standard 2: Algebra – The student uses algebraic concepts and procedures in a variety of situations.
Benchmark 2: Variables, Equations, and Inequalities – The student uses variables, symbols, positive rational numbers, and algebraic expressions in one variable to solve linear equations and inequalities in a variety of situations.

Assessable Indicator	Item Specification Notes
M.6.2.2.A1b represents real-world problems using variables and symbols to (2.4.A1a,e) **($)**: b. ▲ ■ write and/or solve one-step equations (addition, subtraction, multiplication, and division), e.g., a player scored three more points today than yesterday. Today, the player scored 17 points. How many points were scored yesterday? Write an equation to represent this problem. The equation would be written as y + 3 = 17. The answer is y = 14.	• MC • For KAMM, avoid the expression "*best* represents." • For KAMM, all equations should be formatted as expression = answer. **Category 2: Perform Procedures: 2d.** Solve equations, formulas, or routine word problems **Category 3: Demonstrate Understanding of Mathematical Ideas: 3d.** Develop and/or explain relationships between concepts **Category 5: Solve Non-routine Problems/Make Connections: 5b.** Apply mathematics in contexts outside of mathematics (whenever possible, include diagrams/visuals)
Sample Item Shells	
Carol read $\frac{1}{2}$ as many pages of a book as Jake read. Carol read 10 pages and Jake read *p* pages. Which equation represents this situation? **A.** $p + 2 = 10$ **B.** $p \bullet \frac{1}{2} = 10$ **C.** $p - \frac{1}{2} = 10$ **Correct Answer:** B	

Grade 6 (cont'd)

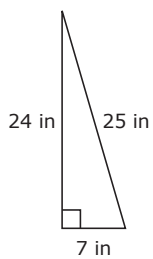
SIXTH GRADE

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.
Benchmark 1: Geometric Figures and Their Properties – The student recognizes geometric figures and compares their properties in a variety of situations.

Assessable Indicator	Item Specification Notes
M.6.3.1.K7a-b ▲ classifies (2.4.K1g): a. angles as right, obtuse, acute, or straight; b. triangles as right, obtuse, acute, scalene, isosceles, or equilateral.	• MC **Category 1: Memorize Facts/Definitions/Formulas: 1b.** Recall or recognize mathematical terms, definitions, or concepts
Sample Item Shells	
An angle is shown below.  What type of angle is shown? **A.** right **B.** obtuse **C.** straight **Correct Answer:** B	

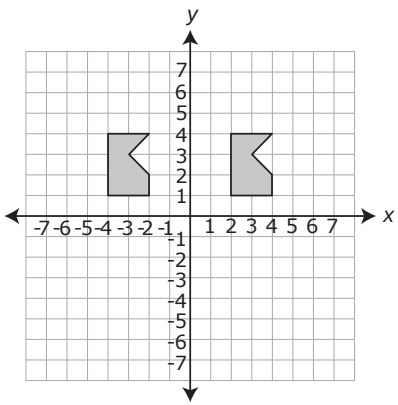
Grade 6 (cont'd)

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.
Benchmark 2: Measurement and Estimation – The student estimates, measures, and uses measurement formulas in a variety of situations.

Assessable Indicator	Item Specification Notes
M.6.3.2.A1a-b solves real-world problems by applying these measurement formulas **($)**: a. ▲ perimeter of polygons using the same unit of measurement (2.4.A1a,g), e.g., measures the length of the fence around a yard; b. ▲ ■ area of squares, rectangles, and triangles using the same unit of measurement (2.4.A1g), e.g., finds the area of a room for carpeting;	• MC • For KAMM, provide labeled measurement formulas, such as: Perimeter of a Triangle: $(P = \text{side} + \text{side} + \text{side})$ Area of a Triangle: $\left(A = \frac{1}{2} \times \text{base} \times \text{height}\right)$
Sample Item Shells	**Category 2: Perform Procedures: 2d.** Solve equations, formulas, or routine word problems **Category 5: Solve Non-routine Problems/Make Connections: 5b.** Apply mathematics in contexts outside of mathematics (whenever possible, include diagrams/visuals)
Terry put a triangle-shaped window in the side of his tree house. The dimensions of the window are shown below.  Terry will put trim around the perimeter of the window. Exactly how many inches of trim will he need? Perimeter of a Triangle: $(P = \text{side} + \text{side} + \text{side})$ **A.** 28 in **B.** 56 in **C.** 168 in **Correct Answer:** B	

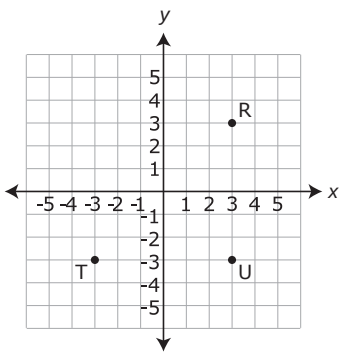
Grade 6 (cont'd)

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.
Benchmark 3: Transformational Geometry – The student recognizes and performs transformations on two- and three-dimensional geometric figures in a variety of situations.

Assessable Indicator	Item Specification Notes
M.6.3.3.K1 ▲ ■ identifies, describes, and performs one or two transformations (reflection, rotation, translation) on a two-dimensional figure (2.4.K1a).	• MC • For KAMM, items written to skill category 1b may ask a question such as "On which graph is a reflection (flip) of a shape shown?" or "Which term describes the movement of the figure?" Items written to skill category 2c may ask a question such as "A reflection (flip) will be performed on the shape shown below. Which picture shows a reflection (flip) of the shape across a line?" Items written to skill category 3a may ask a question such as "Which statement describes the movement of the figure?" **Category 1: Memorize Facts/Definitions/Formulas: 1b.** Recall or recognize mathematical terms, definitions, or concepts **Category 2: Perform Procedures: 2c**. Follow procedures or instructions **Category 3: Demonstrate Understanding of Mathematical Ideas: 3a.** Communicate mathematical ideas or rules and/or explain the process
Sample Item Shells	
The diagram below shows a figure before and after it is moved on a coordinate plane.  Which term describes the movement of the figure? **A.** reflection (flip) **B.** rotation (turn) **C.** translation (slide) **Correct Answer:** C	

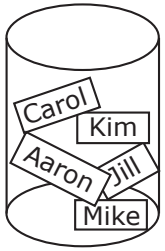
Grade 6 (cont'd)

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.
Benchmark 4: Geometry from an Algebraic Perspective – The student relates geometric concepts to a number line and a coordinate plane in a variety of situations.

Assessable Indicator	Item Specification Notes
M.6.3.4.K3a-b ▲ uses all four quadrants of the coordinate plane (2.4.K1a) to: a. identify the ordered pairs of integer values on a given graph; b. plot the ordered pairs of integer values.	• MC **Category 1: Memorize Facts/Definitions/Formulas: 1b.** Recall or recognize mathematical terms, definitions, or concepts **Category 3: Demonstrate Understanding of Mathematical Ideas: 3b.** Use representations to model mathematical ideas
Sample Item Shells	
Three points are shown on the coordinate plane below.  Which point is located at (3, -3)? **A.** point R **B.** point T **C.** point U **Correct Answer:** C	

Grade 6 (cont'd)

Standard 4: Data – The student uses concepts and procedures of data analysis in a variety of situations.
Benchmark 1: Probability – The student applies the concepts of probability to draw conclusions and to make predictions and decisions including the use of concrete objects in a variety of situations.

Assessable Indicator	Item Specification Notes
M.6.4.1.K4 ▲ represents the probability of a simple event in an experiment or simulation using fractions and decimals (2.4.K1c,i), e.g., The probability of rolling an even number on a single number cube is represented by ½ or .5.	• MC • For KAMM, provide a graphic for each item. • For KAMM, limit number of outcomes to a maximum of 24. • For KAMM, answer choices may be fractions or decimals, but do not use both in the same item. • For KAMM, items may require reduction of easily recognizable fractions only (i.e. $\frac{1}{4}, \frac{1}{2}$).
Sample Item Shells	**Category 1: Memorize Facts/Definitions/Formulas: 1b.** Recall or recognize mathematical terms, definitions, or concepts **Category 2: Perform Procedures: 2b.** Do computational procedures or algorithms
Saul wrote the names of 5 students on separate pieces of paper and put them in a can, as shown below.  One piece of paper will be randomly selected from the can. What is the probability the piece of paper will have Mike's name written on it? **A.** 0.1 **B.** 0.2 **C.** 0.5 **Correct Answer:** B	

Grade 7

SEVENTH GRADE

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 1: Number Sense – The student demonstrates number sense for rational numbers, the irrational number pi, and simple algebraic expressions in one variable in a variety of situations.

Assessable Indicator	Item Specification Notes
M.7.1.1.A1a generates and/or solves real-world problems using (2.4.A1a) **($)**: a. ▲ equivalent representations of rational numbers and simple algebraic expressions, e.g., you are in the mountains. Wilson Mountain has an altitude of 5.28×10^3 feet. Rush Mountain is 4,300 feet tall. How much higher is Wilson Mountain than Rush Mountain?	• MC • For KAMM, provide graphics when appropriate. **Category 3: Demonstrate Understanding of Mathematical Ideas:** **3b.** Use representations to model mathematical ideas **Category 5: Solve Non-routine Problems/Make Connections:** **5b.** Apply mathematics in contexts outside of mathematics (whenever possible, include diagrams/visuals)
Sample Item Shells	
During basketball practice, Bill spent $\frac{1}{5}$ of the time practicing free throws, 10% of the time practicing dribbling, and 15% of the time practicing passing. He spent the rest of the time playing a game. What percent of Bill's basketball practice was spent playing a game? **A.** 55% **B.** 60% **C.** 70% **Correct Answer:** A	

Grade 7 (cont'd)

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 4: Computation – The student models, performs, and explains computation with rational numbers, the irrational number pi, and first-degree algebraic expressions in one variable in a variety of situations.

Assessable Indicator	Item Specification Notes
M.7.1.4.K2a-d performs and explains these computational procedures (2.4.K1a): a. ▲**N** adds and subtracts decimals from ten millions place through hundred thousandths place; b. ▲**N** multiplies and divides a four-digit number by a two-digit number using numbers from thousands place through thousandths place; c. ▲**N** multiplies and divides using numbers from thousands place through thousandths place by 10; 100; 1,000; .1; .01; .001; or single-digit multiples of each; e.g., 54.2 ÷ .002 or 54.3 x 300; d. ▲**N** adds, subtracts, multiplies, and divides fractions and expresses answers in simplest form.	• MC **Category 2: Perform Procedures: 2b.** Do computational procedures or algorithms **Category 3: Demonstrate Understanding of Mathematical Ideas: 3a.** Communicate mathematical ideas or rules and/or explain the process
Sample Item Shells	
Alan hiked 0.7 kilometers (km) on Monday, 2.089 km on Tuesday, and 1.02 km on Wednesday. What is the total number of kilometers that Alan hiked on all three days? **A.** 2.188 km **B.** 2.198 km **C.** 3.809 km **Correct Answer:** C	

Grade 7 (cont'd)

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 4: Computation – The student models, performs, and explains computation with rational numbers, the irrational number pi, and first-degree algebraic expressions in one variable in a variety of situations.

Assessable Indicator	Item Specification Notes
M.7.1.4.K5 ▲ finds percentages of rational numbers (2.4.K1a,c) **($)**, e.g., 12.5% x $40.25 = n or 150% of 90 is what number? (For the purposes of assessment, percents will not be between 0 and 1.)	• MC **Category 2: Perform Procedures: 2b.** Do computational procedures or algorithms
Sample Item Shells	
What is 200% of 78? **A.** 15.6 **B.** 93.6 **C.** 156.0 **Correct Answer:** C	

Grade 7 (cont'd)

Standard 2: Algebra – The student uses algebraic concepts and procedures in a variety of situations.
Benchmark 1: Patterns – The student recognizes, describes, extends, develops, and explains the general rule of a pattern in a variety of situations.

Assessable Indicator	Item Specification Notes
M.7.2.1.K1a-b identifies, states, and continues a pattern presented in various formats including numeric (list or table), algebraic (symbolic notation), visual (picture, table, or graph), verbal (oral description), kinesthetic (action), and written using these **attributes**: a. ▲ counting numbers including perfect squares, cubes, and factors and multiples (number theory) (2.4.K1a); b. ▲ positive rational numbers including arithmetic and geometric sequences (arithmetic: sequence of numbers in which the difference of two consecutive numbers is the same, geometric: a sequence of numbers in which each succeeding term is obtained by multiplying the preceding term by the same number) (2.4.K1a), e.g., 2, 1/2, 3, 1/3, 4, 1/4, ….	• MC • *Item Specification Note:* For state assessment purposes, patterns presented in all formats EXCEPT kinesthetic and verbal may be assessed. **Category 4: Conjecture/Generalize/Prove: 4c.** Recognize, generate, or continue patterns

Sample Item Shells

The table below shows the growth of bacteria in a bacteria colony over a 4-day period.

Bacteria Growth

Day	Number of Bacteria
1	4
2	32
3	256
4	2,048
5	?

The number of bacteria follows a pattern. Based on the pattern, what will be the number of bacteria in the bacteria colony on day 5?

A. 2,076 bacteria

B. 16,384 bacteria

C. 131,072 bacteria

Correct Answer: B

Grade 7 (cont'd)

Standard 2: Algebra – The student uses algebraic concepts and procedures in a variety of situations.
Benchmark 2: Variable, Equations, and Inequalities – The student uses variables, symbols, rational numbers, and simple algebraic expressions in one variable to solve linear equations and inequalities in a variety of situations.

Assessable Indicator	Item Specification Notes
M.7.2.2.K7 ▲ knows the mathematical relationship between ratios, proportions, and percents and how to solve for a missing term in a proportion with positive rational number solutions and monomials (2.4.K1a,c) **($)**, e.g., $\frac{5}{6}=\frac{2}{x}$.	• MC • *Item Specification Note:* When writing items to this indicator (M.7.2.2.K7) for Math Skill Category **3a**, focus on the mathematical relationships (e.g.: 5 times *x* is equal to 6 times 2), **NOT** solving for a missing part. **Category 2: Perform Procedures: 2d.** Solve equations, formulas, or routine word problems **Category 3: Demonstrate Understanding of Mathematical Ideas: 3a.** Communicate mathematical ideas or rules and/or explain the process
Sample Item Shells	
A proportion is shown below. $\frac{3}{5}=\frac{r}{65}$ What is the value of *r* in the proportion? **A.** 13 **B.** 16 **C.** 39 **Correct Answer:** C	

Grade 7 (cont'd)

Standard 2: Algebra – The student uses algebraic concepts and procedures in a variety of situations.
Benchmark 2: Variable, Equations, and Inequalities – The student uses variables, symbols, rational numbers, and simple algebraic expressions in one variable to solve linear equations and inequalities in a variety of situations.

Assessable Indicator	Item Specification Notes
M.7.2.2.K8 ▲ evaluates simple algebraic expressions using positive rational numbers (2.4.K1c) **($)**, e.g., if x = 3/2, y = 2, then 5xy + 2 = 5(3/2)(2) + 2 = 17.	• MC **Category 2: Perform Procedures: 2b.** Do computational procedures or algorithms
Sample Item Shells	
An expression is shown below. $6x + xy$ What is the value of the expression when $x = 1$ and $y = 6$? **A.** 12 **B.** 36 **C.** 42 **Correct Answer:** A	

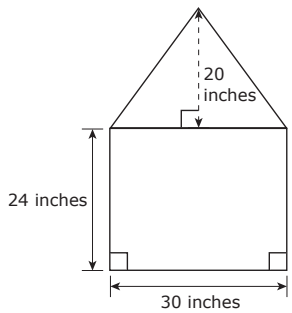
Grade 7 (cont'd)

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.
Benchmark 1: Geometric Figures and Their Properties – The student recognizes geometric figures and compares their properties in a variety of situations.

Assessable Indicator	Item Specification Notes
M.7.3.1.K3a-g ▲ identifies angle and side properties of triangles and quadrilaterals (2.4.K1h): a. sum of the interior angles of any triangle is 180°; b. sum of the interior angles of any quadrilateral is 360°; c. parallelograms have opposite sides that are parallel and congruent; d. rectangles have angles of 90°, opposite sides are congruent; e. rhombi have all sides the same length, opposite angles are congruent; f. squares have angles of 90°, all sides congruent; g. trapezoids have one pair of opposite sides parallel and the other pair of opposite sides are not parallel.	• MC **Category 1: Memorize Facts/Definitions/Formulas: 1b.** Recall or recognize mathematical terms, definitions, or concepts
Sample Item Shells	
A triangle is shown below. What is the sum of the measures of the interior angles in the triangle? **A.** 100° **B.** 180° **C.** 360° **Correct Answer:** B	

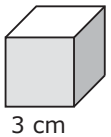
Grade 7 (cont'd)

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.
Benchmark 2: Measurement and Estimation – The student estimates, measures, and uses measurement formulas in a variety of situations.

Assessable Indicator	Item Specification Notes
M.7.3.2.A1c solves real-world problems by **($)**: c. ▲ finding perimeter and area of two-dimensional composite figures of squares, rectangles, and triangles (2.4.A1h), e.g., the front of a barn is rectangular in shape with a height of 10 feet and a width of 48 feet. Above the rectangle is a triangle that is 7 feet high with sides 25 feet long. What is the area of the front of the barn?	• MC • For KAMM, provide labeled area formulas, such as: Area of a Square: $\left(A = s^2\right)$ Area of a Triangle: $\left(A = \frac{1}{2}bh\right)$
Sample Item Shells	• For KAMM, provide a graphic for each item. • For KAMM, limit composite figures to 2 shapes. **Category 2: Perform Procedures: 2d.** Solve equations, formulas, or routine word problems **Category 5: Solve Non-routine Problems/Make Connections: 5b.** Apply mathematics in contexts outside of mathematics (whenever possible, include diagrams/visuals)
A window is composed of a rectangular piece of glass and a triangular piece of glass, as shown below.  What is the **total** area of glass used to make the window? Area of a Triangle: $\left(A = \frac{1}{2}bh\right)$ Area of a Rectangle: $\left(A = lw\right)$ **A.** 720 square inches **B.** 870 square inches **C.** 1,020 square inches **Correct Answer:** C	

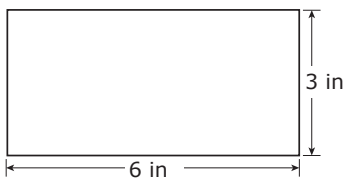
Grade 7 (cont'd)

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.
Benchmark 2: Measurement and Estimation – The student estimates, measures, and uses measurement formulas in a variety of situations.

Assessable Indicator	Item Specification Notes
M.7.3.2.K6a-b ▲ uses given measurement formulas to find (2.4.K1h): a. surface area of cubes, b. volume of rectangular prisms.	• MC • For KAMM, provide a graphic for each item. • For KAMM, provide labeled measurement formulas, such as: Surface Area of a Cube: $(SA = 6s^2)$ Volume of a Rectangular Prism: $(V = lwh)$ • For KAMM, limit measurements to whole numbers. **Category 2: Perform Procedures: 2d.** Solve equations, formulas, or routine word problems
Sample Item Shells	
A cube with sides 3 centimeters (cm) long is shown below.  3 cm What is the surface area of the cube? Surface Area of a Cube: $(SA = 6s^2)$ **A.** 18 cm^2 **B.** 36 cm^2 **C.** 54 cm^2 **Correct Answer:** C	

Grade 7 (cont'd)

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.
Benchmark 3: Transformational Geometry – The student recognizes and performs transformations on two- and three-dimensional geometric figures in a variety of situations.

Assessable Indicator	Item Specification Notes
M.7.3.3.A3 ▲ determines the actual dimensions and/or measurements of a two-dimensional figure represented in a scale drawing (2.4.A1i).	• MC • For KAMM, provide scale for all items. **Category 3: Demonstrate Understanding of Mathematical Ideas:** **3b.** Use representations to model mathematical ideas **Category 5: Solve Non-routine Problems/Make Connections:** **5b.** Apply mathematics in contexts outside of mathematics (whenever possible, include diagrams/visuals)
Sample Item Shells	
A scale drawing, in inches (in), of a rectangular garden is shown below.  **Scale** 1 in = 3 ft What are the dimensions of the actual garden, in feet (ft)? **A.** 5 ft by 2 ft **B.** 12 ft by 6 ft **C.** 18 ft by 9 ft **Correct Answer:** C	

Grade 7 (cont'd)

SEVENTH GRADE

Standard 4: Data – The student uses concepts and procedures of data analysis in a variety of situations.
Benchmark 2: Statistics – The student collects, organizes, displays, and explains numerical (rational numbers) and non-numerical data sets in a variety of situations with a special emphasis on measures of central tendency.

Assessable Indicator	Item Specification Notes
M.7.4.2.K1a-g ▲ organizes, displays, and reads quantitative (numerical) and qualitative (non-numerical) data in a clear, organized, and accurate manner including a title, labels, categories, and rational number intervals using these **data displays** (2.4.K1j) **($)**: a. frequency tables; b. bar, line, and circle graphs; c. Venn diagrams or other pictorial displays; d. charts and tables; e. stem-and-leaf plots (single); f. scatter plots; g. box-and-whiskers plots.	• MC **Category 2: Perform Procedures: 2e.** Organize or display data

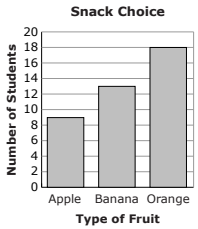
Sample Item Shells

Students who went on a field trip chose an apple, a banana, or an orange for a snack. The number of students who chose each fruit is shown below.

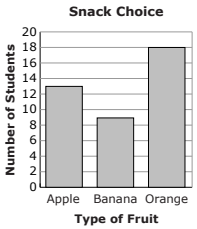
- Apple: 13 students
- Banana: 9 students
- Orange: 18 students

Which graph correctly displays this information?

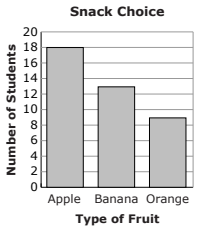
A.



B.



C.



Correct Answer: B

Grade 8

EIGHTH GRADE

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 1: Number Sense – The student demonstrates number sense for real numbers and simple algebraic expressions in a variety of situations.

Assessable Indicator	Item Specification Notes
M.8.1.1.K5a-c ▲ knows and explains what happens to the product or quotient when (2.4.K1a): a. a positive number is multiplied or divided by a rational number greater than zero and less than one, e.g., if 24 is divided by 1/3, will the answer be larger than 24 or smaller than 24? Explain. b. a positive number is multiplied or divided by a rational number greater than one. (For purposes of assessment, an explanation of division by zero will not be expected.) c. a nonzero real number is multiplied or divided by zero.	• MC • *Item Specification Notes:* When writing items to this indicator (M.8.1.1.K5a) for Math Skill Category 2b, give an example of a number between 0 and 1. For the purpose of assessment, division by zero will not be assessed. **Category 2: Perform Procedures: 2b.** Do computational procedures or algorithms **Category 3: Demonstrate Understanding of Mathematical Ideas: 3a.** Communicate mathematical ideas or rules and/or explain the process
Sample Item Shells	
The number 75 is multiplied by $\frac{1}{5}$. The product of these two numbers is **A.** less than 75. **B.** equal to 1. **C.** greater than 75. **Correct Answer:** A	

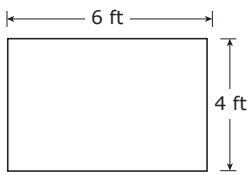
Grade 8 (cont'd)

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 2: Number Systems and Their Properties – The student demonstrates an understanding of the real number system; recognizes, applies, and explains their properties; and extends these properties to algebraic expressions.

Assessable Indicator	Item Specification Notes
M.8.1.2.A1a-b generates and/or solves real-world problems with rational numbers using the concepts of these properties to explain reasoning (2.4.A1a) **($)**: a. ▲ commutative, associative, distributive, and substitution properties; e.g., we need to place trim around the outside edges of a bulletin board with dimensions of 3ft by 5 ft. Explain two different methods of solving this problem and why they are equivalent. b. ▲ identity and inverse properties of addition and multiplication; e.g., I had $50. I went to the mall and spent $20 in one store, $25 at a second store and then $5 at the food court. To solve: [$50 – ($20 + $25 + $5) = $50 - $50 = 0]. Explain your reasoning.	• MC **Category 3: Demonstrate Understanding of Mathematical Ideas:** **3a.** Communicate mathematical ideas or rules and/or explain the process **Category 5: Solve Non-routine Problems/Make Connections:** **5b.** Apply mathematics in contexts outside of mathematics (whenever possible, include diagrams/visuals)

Sample Item Shells

John is adding a border to the top of a table. The dimensions of the top of the table are shown below.



John wrote the expression $2\times(4+6)$ to find the number of feet of border he needs. Which expression has the **same** value as the expression John wrote?

A. $(2\times4)+(2\times6)$

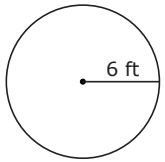
B. $2\times(4\times6)$

C. $(2\times4)+6$

Correct Answer: A

Grade 8 (cont'd)

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 4: Computation – The student models, performs, and explains computation with rational numbers, the irrational number pi, and algebraic expressions in a variety of situations.

Assessable Indicator	Item Specification Notes
M.8.1.4.A1a-c ▲ generates and/or solves one- and two-step real-world problems using computational procedures and mathematical concepts (2.4.A1a) with **($)**: a. ■ rational numbers, e.g., find the height of a triangular garden given that the area to be covered is 400 square feet with a base of 12 1/2 feet; b. the irrational number pi as an approximation, e.g., before planting, a farmer plows a circular region that has an approximate area of 7,300 square feet. What is the radius of the circular region to the nearest tenth of a foot? c. applications of percents, e.g., sales tax or discounts.	• MC • *Item Specification Note:* For the purpose of assessment, percents greater than or equal to 100% will NOT be used. • For KAMM, provide labeled measurement formulas and define value of pi. • For KAMM, provide graphics when appropriate. • **Explanation of Indicator:** Solve real-world problems that involve one and two steps using computation of addition, subtraction, multiplication, and/or division of numbers that are positive and negative [decimals (that repeat or terminate), fractions, percents] or use pi (3.14).
Sample Item Shells	**Category 2: Perform Procedures: 2d.** Solve equations, formulas, or routine word problems **Category 5: Solve Non-routine Problems/Make Connections: 5b.** Apply mathematics in contexts outside of mathematics (whenever possible, include diagrams/visuals)
Wendy has a circular blanket with a radius of 6 feet (ft), as shown below.  Wendy would like to sew fringe to the circumference of the blanket. Approximately how many feet of fringe does Wendy need to buy to go around the circumference of the blanket one time? Circumference of a Circle: $(C = \pi \bullet d)$ Use $\pi = 3.14$ **A.** 18.84 ft **B.** 37.68 ft **C.** 75.36 ft **Correct Answer:** B	

Grade 8 (cont'd)

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 4: Computation – The student models, performs, and explains computation with rational numbers, the irrational number pi, and algebraic expressions in a variety of situations.

Assessable Indicator	Item Specification Notes
M.8.1.4.K2a-b performs and explains these computational procedures with rational numbers (2.4.K1a) **($)**: a. ▲ **N** addition, subtraction, multiplication, and division of integers; b. ▲ **N** order of operations (evaluates within grouping symbols, evaluates powers to the second or third power, multiplies or divides in order from left to right, then adds or subtracts in order from left to right).	• MC • For KAMM, limit computation to integers. **Category 2: Perform Procedures: 2b.** Do computational procedures or algorithms **Category 3: Demonstrate Understanding of Mathematical Ideas: 3a.** Communicate mathematical ideas or rules and/or explain the process
Sample Item Shells	
Simplify: (-7) • (-3). **A.** -21 **B.** $\frac{7}{3}$ **C.** 21 **Correct Answer:** C	

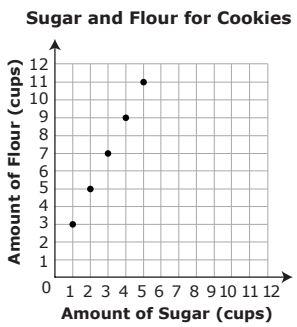
Grade 8 (cont'd)

Standard 2: Algebra – The student uses algebraic concepts and procedures in a variety of situations.
Benchmark 2: Variable, Equations, and Inequalities – The student uses variables, symbols, real numbers, and algebraic expressions to solve equations and inequalities in a variety of situations.

Assessable Indicator	Item Specification Notes
M.8.2.2.K3a solves (2.4.K1a,e) **($)**: a. ▲ one- and two-step linear equations in one variable with rational number coefficients and constants intuitively and/or analytically.	• MC • For KAMM, all equations should be formatted as expression = answer. **Category 2: Perform Procedures: 2d.** Solve equations, formulas, or routine word problems
Sample Item Shells	
An equation is shown below. $4.5h + 1.8 = 17.1$ What value of *h* makes the equation true? **A.** $h = 2.0$ **B.** $h = 3.4$ **C.** $h = 4.2$ **Correct Answer:** B	

Grade 8 (cont'd)

Standard 2: Algebra – The student uses algebraic concepts and procedures in a variety of situations.
Benchmark 3: Functions – The student recognizes, describes, and analyzes constant, linear, and nonlinear relationships in a variety of situations.

Assessable Indicator	Item Specification Notes
M.8.2.3.A3 ▲ translates between the numerical, tabular, graphical, and symbolic representations of linear relationships with integer coefficients and constants (2.4.A1 a,j), e.g., a fish tank is being filled with water with a 2-liter jug. There are already 5 liters of water in the fish tank. Therefore, you are showing how full the tank is as you empty 2-liter jugs of water into it. y = 2x + 5 (symbolic) can be represented in a table (tabular) – and as a graph (graphical).	• MC • **Explanation of Indicator:** Change (translate) between numerical, tabular, graphical, and symbolic representations of a set of integer data that is linear. • For KAMM, linear equations should be shown in the format $y = mx + b$.
Sample Item Shells	**Category 2: Perform Procedures: 2f.** Read or produce graphs and tables **Category 3: Demonstrate Understanding of Mathematical Ideas: 3e.** Show and/or explain relationships between models, diagrams, and/or other representations **Category 5: Solve Non-routine Problems/Make Connections: 5b.** Apply mathematics in contexts outside of mathematics (whenever possible, include diagrams/visuals)
When making different-sized batches of cookies, Keisha noticed a relationship between the amount of sugar and the amount of flour in each batch. She created the graph below to show this relationship.  Which equation represents the relationship between the amount of sugar (*s*) and the amount of flour (*f*) shown in the graph? **A.** $f = s + 3$ **B.** $f = s + 6$ **C.** $f = 2s + 1$ **Correct Answer:** C	

Grade 8 (cont'd)

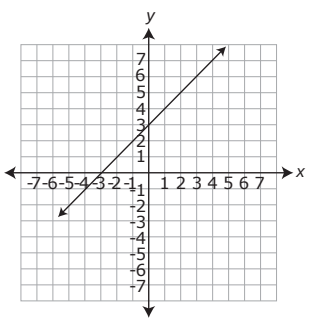
EIGHTH GRADE

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.
Benchmark 1: Geometric Figures and Their Properties – The student recognizes geometric figures and compares their properties in a variety of situations.

Assessable Indicator	Item Specification Notes
M.8.3.1.A1a solves real-world problems by (2.4.A1a): ▲ ■ using the properties of corresponding parts of similar and congruent figures, e.g., scale drawings, map reading, proportions, or indirect measurements.	• MC • For KAMM, provide graphics when appropriate (to add meaning and clarity). • **Explanation of Indicator:** Solve real-world problems using knowledge that similar figures are the same shape and their corresponding sides are proportional in length, and that congruent figures are the same shape and size, their corresponding sides are the same length, and their areas are the same.
Sample Item Shells	
The scale on a floor plan of a house is 1 inch = 4 feet. The length of the hallway on the floor plan is 4.25 inches. What is the length of the hallway in the **actual** house? **A.** 8.25 feet **B.** 17.00 feet **C.** 21.00 feet **Correct Answer:** B	**Category 2: Perform Procedures: 2d.** Solve equations, formulas, or routine word problems **Category 5: Solve Non-routine Problems/Make Connections: 5b.** Apply mathematics in contexts outside of mathematics (whenever possible, include diagrams/visuals)

Grade 8 (cont'd)

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.
Benchmark 4: Geometry from an Algebraic Perspective – The student uses an algebraic perspective to examine the geometry of two-dimensional figures in a variety of situations.

Assessable Indicator	Item Specification Notes
M.8.3.4.K1a-d uses the coordinate plane to (2.4.K1a): a. ▲ list several ordered pairs on the graph of a line and find the slope of the line; b. ▲ recognize that ordered pairs that lie on the graph of an equation are solutions to that equation; c. ▲ recognize that points that do not lie on the graph of an equation are not solutions to that equation; d. ▲ determine the length of a side of a figure drawn on a coordinate plane with vertices having the same x- or y-coordinates.	• MC **Category 1: Memorize Facts/Definitions/Formulas: 1b.** Recall or recognize mathematical terms, definitions, or concepts **Category 2: Perform Procedures: 2b.** Do computational procedures or algorithms
Sample Item Shells	
The graph below represents the equation $y = x + 3$.  Which ordered pair is a solution of the equation? **A.** (-3, 0) **B.** (-2, -1) **C.** (1, 3) **Correct Answer:** A	

Grade 8 (cont'd)

Standard 4: Data – The student uses concepts and procedures of data analysis in a variety of situations.
Benchmark 1: Probability – The student applies the concepts of probability to draw conclusions, generate convincing arguments, and make predictions and decisions including the use of concrete objects in a variety of situations.

Assessable Indicator	Item Specification Notes
M.8.4.1.A4a makes predictions based on the theoretical probability of (2.4.A1a,i): a. ▲ ■ a simple event in an experiment or simulation.	• MC **Category 3: Demonstrate Understanding of Mathematical Ideas: 3c.** Explain findings and/or results from data analysis strategies or experiments/simulations **Category 4: Conjecture/Generalize/Prove: 4a.** Determine the truth of a mathematical pattern, a mathematical statement, and/or proposition or make predictions **Category 5: Solve Non-routine Problems/Make Connections: 5b.** Apply mathematics in contexts outside of mathematics (whenever possible, include diagrams/visuals)
Sample Item Shells	
The faces of a cube are numbered 1 through 6. The cube will be rolled 60 times. Which is the **best** prediction of the number of times the cube will land with the number 4 facing up? **A.** 5 times **B.** 10 times **C.** 15 times **Correct Answer:** B	

Grade 8 (cont'd)

Standard 4: Data – The student uses concepts and procedures of data analysis in a variety of situations.
Benchmark 2: Statistics – The student collects, organizes, displays, explains, and interprets numerical (rational) and non-numerical data sets in a variety of situations.

Assessable Indicator	Item Specification Notes
M.8.4.2.K3 ▲ determines and explains the measures of central tendency (mode, median, mean) for a rational number data set (2.4.K1a).	• MC • For KAMM, provide data set in increasing order. **Category 2: Perform Procedures: 2b.** Do computational procedures or algorithms **Category 3: Demonstrate Understanding of Mathematical Ideas: 3c.** Explain findings and/or results from data analysis strategies or experiments/simulations
Sample Item Shells	
Ivan bought 8 short story books. The number of pages in each book is listed below. 45 50 54 55 59 62 62 77 What is the **median** number of pages in the short story books? **A.** 55 pages **B.** 57 pages **C.** 62 pages **Correct Answer:** B	

Grade HS

NINTH AND TENTH GRADES

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 3: Estimation – The student uses computational estimation with real numbers in a variety of situations.

Assessable Indicator	Item Specification Notes
M.HS.1.3.A1 ▲ adjusts original rational number estimate of a real-world problem based on additional information (a frame of reference) (2.4.A1a) **($)**, e.g., estimate how long it takes to walk from here to there; time how long it takes to take five steps and adjust your estimate.	• MC • **Explanation of Indicator:** Use known information to adjust an estimate. **Category 3: Demonstrate Understanding of Mathematical Ideas:** **3c.** Explain findings and/or results from data analysis strategies or experiments/simulations **Category 5: Solve Non-routine Problems/Make Connections:** **5b.** Apply mathematics in contexts outside of mathematics (whenever possible, include diagrams/visuals)
Sample Item Shells	
Before leaving on a trip, Mark ESTIMATED that he would drive 60 miles in 100 minutes. Mark has driven 20 miles in 25 minutes. Mark continues to drive at the same average rate. Which should be Mark's new ESTIMATE of the total number of minutes it will take him to drive 60 miles? **A.** Mark's new estimate should be less than 100 minutes, because the average rate of travel is faster than he thought it would be. **B.** Mark's new estimate should be 100 minutes, because the average rate of travel is the same as he thought it would be. **C.** Mark's new estimate should be greater than 100 minutes, because the average rate of travel is slower than he thought it would be. **Correct Answer:** A	

Grade HS (cont'd)

Standard 2: Algebra – The student uses algebraic concepts and procedures in a variety of situations.
Benchmark 2: Variables, Equations, and Inequalities – The student uses variables, symbols, real numbers, and algebraic expressions to solve equations and inequalities in a variety of situations.

Assessable Indicator	Item Specification Notes
M.HS.2.2.A2a represents and/or solves real-world problems with (2.4.A1c) **($)**: a. ▲**N** linear equations and inequalities both analytically and graphically, e.g., tickets for a school play are $5 for adults and $3 for students. You need to sell at least $65 in tickets. Give an inequality and a graph that represents this situation and three possible solutions.	• MC • For KAMM, limit items to computing a single variable. **Category 2: Perform Procedures: 2d.** Solve equations, formulas, or routine word problems **Category 3: Demonstrate Understanding of Mathematical Ideas: 3b.** Use representations to model mathematical ideas
Sample Item Shells	
Paula is going to paint 6,246 square feet of wall space inside a house. The equation 6246 = 428*h* + 254 can be used to find the number of hours (*h*) Paula will spend painting. What number of hours will Paula spend painting to cover all 6,246 feet of wall space? **A.** 13 hours **B.** 14 hours **C.** 15 hours **Correct Answer:** B	

Grade HS (cont'd)

Standard 2: Algebra – The student uses algebraic concepts and procedures in a variety of situations.
Benchmark 2: Variables, Equations, and Inequalities – The student uses variables, symbols, real numbers, and algebraic expressions to solve equations and inequalities in a variety of situations.

Assessable Indicator	Item Specification Notes
M.HS.2.2.K3c solves (2.4.K1d) **($)**: c. ▲**N** systems of linear equations with two unknowns using integer coefficients and constants.	• MC • For KAMM, provide equations. • **Explanation of Indicator:** Find the solution for a pair of equations that do not have fractions or decimals in the original equations. Students may choose to do this in any way that is successful and makes sense to them. **Category 2: Perform Procedures: 2d.** Solve equations, formulas, or routine word problems
Sample Item Shells	
A system of equations is shown below. $\begin{cases} 2x - 7y = 17 \\ 3x + 4y = 11 \end{cases}$ What is the solution of the system of equations? **A.** (-1, 5) **B.** (1, 2) **C.** (5, -1) **Correct Answer:** C	

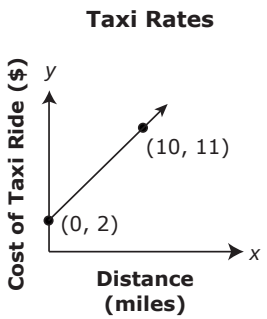
Grade HS (cont'd)

Standard 2: Algebra – The student uses algebraic concepts and procedures in a variety of situations.
Benchmark 3: Functions – The student analyzes functions in a variety of situations.

Assessable Indicator	Item Specification Notes
M.HS.2.3.A2 ▲ interprets the meaning of the x- and y- intercepts, slope, and/or points on and off the line on a graph in the context of a real-world situation (2.4.A1e) **($)**, e.g., The graph below represents a tank full of water being emptied. What does the y-intercept represent? What does the x-intercept represent? What is the rate at which it is emptying? What does the point (2, 25) represent in this situation? What does the point (2, 30) represent in this situation?	• MC **Category 3: Demonstrate Understanding of Mathematical Ideas:** **3e.** Show and/or explain relationships between models, diagrams, and/or other representations **Category 5: Solve Non-routine Problems/Make Connections:** **5b.** Apply mathematics in contexts outside of mathematics (whenever possible, include diagrams/visuals)

Sample Item Shells

The graph below shows the relationship between the distance traveled in a taxi and the cost of the taxi ride.



The *y*-intercept on the graph indicates that

A. the cost is $2.00 before any miles are driven.

B. the taxi drives 2 miles before any money is charged.

C. the cost is $2.00 per mile.

Correct Answer: A

Grade HS (cont'd)

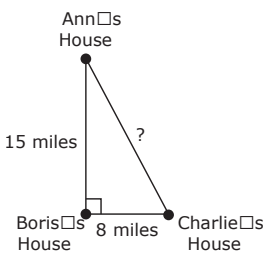
Standard 2: Algebra – The student uses algebraic concepts and procedures in a variety of situations.
Benchmark 3: Functions – The student analyzes functions in a variety of situations.

Assessable Indicator	Item Specification Notes
M.HS.2.3.K6 ▲ recognizes how changes in the constant and/or slope within a linear function changes the appearance of a graph (2.4.K1f) **($)**.	• MC **Category 3: Demonstrate Understanding of Mathematical Ideas:** **3e.** Show and/or explain relationships between models, diagrams, and/or other representations
Sample Item Shells	
Changing the coefficient of x in the equation $y = 3x + 2$ from 3 to $\frac{1}{3}$ has which effect on the graph of the equation? **A.** The line becomes less steep. **B.** The line becomes more steep. **C.** The line shifts down. **Correct Answer:** A	

Grade HS (cont'd)

NINTH AND TENTH GRADES

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.
Benchmark 1: Geometric Figures and Their Properties – The student recognizes geometric figures and compares and justifies their properties of geometric figures in a variety of situations.

Assessable Indicator	Item Specification Notes
M.HS.3.1.A1b solves real-world problems by (2.4.A1a): b. ▲ applying the Pythagorean Theorem, e.g., when checking for square corners on concrete forms for a foundation, determine if a right angle is formed by using the Pythagorean Theorem.	• MC • For KAMM, provide the Pythagorean Theorem. • For KAMM, always provide a graphic. • For KAMM, the hypotenuse should be less than or equal to 17. **Category 5: Solve Non-routine Problems/Make Connections:** **5b.** Apply mathematics in contexts outside of mathematics (whenever possible, include diagrams/visuals)
Sample Item Shells	
Ann's house is directly north of Boris's house, and Boris's house is directly west of Charlie's house, as shown below.  What is the distance, in miles, between Ann's house and Charlie's house? $\left(a^2 + b^2 = c^2\right)$ **A.** 7 miles **B.** 17 miles **C.** 23 miles **Correct Answer:** B	

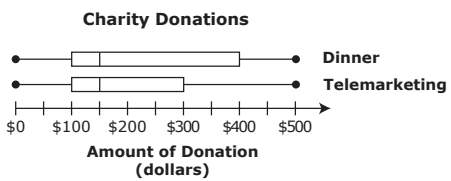
Grade HS (cont'd)

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.
Benchmark 3: Transformational Geometry – The student recognizes and applies transformations on two- and three-dimensional figures in a variety of situations.

Assessable Indicator	Item Specification Notes
M.HS.3.3.A1 ▲ analyzes the impact of transformations on the perimeter and area of circles, rectangles, and triangles and volume of rectangular prisms and cylinders (2.4.A1f), e.g., reducing by a factor of ½ multiplies an area by a factor of ¼ and multiplies the volume by a factor of 1/8, whereas, rotating a geometric figure does not change perimeter or area.	• MC • For KAMM, do not test volume. • For KAMM, provide measurement formulas. **Category 3: Demonstrate Understanding of Mathematical Ideas: 3a.** Communicate mathematical ideas or rules and/or explain the process **Category 4: Conjecture/Generalize/Prove: 4a.** Determine the truth of a mathematical pattern, a mathematical statement, and/or proposition or make predictions
Sample Item Shells	
To enlarge each dimension of his rectangular garden, Jake used a scale factor of 3. As a result of the change, the **area** of the garden will be changed by what scale factor? $(A = lw)$ **A.** 3 **B.** 6 **C.** 9 **Correct Answer:** C	

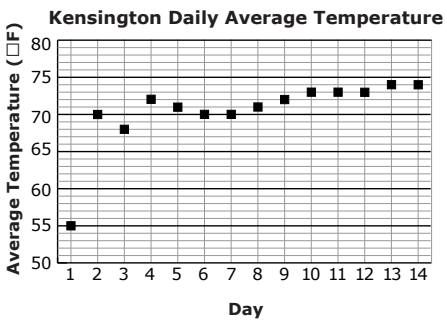
Grade HS (cont'd)

Standard 4: Data – The student uses concepts and procedures of data analysis in a variety of situations.
Benchmark 2: Statistics – The student collects, organizes, displays, explains, and interprets numerical (rational) and non-numerical data sets in a variety of situations.

Assessable Indicator	Item Specification Notes
M.HS.4.2.A1a-h ▲ uses data analysis (mean, median, mode, range, quartile, interquartile range) in real-world problems with rational number data sets to compare and contrast two sets of data, to make accurate inferences and predictions, to analyze decisions, and to develop convincing arguments from these data displays (2.4.A1i) **($)**: a. frequency tables; b. bar, line, and circle graphs; c. Venn diagrams or other pictorial displays; d. charts and tables; e. stem-and-leaf plots (single and double); f. scatter plots g. box-and-whiskers plots; h. histograms.	• MC • For KAMM, do not assess circle graphs. • **Explanation of Indicator:** Data displays (tables, graphs, etc.) can be constructed in a variety of ways. Students will need to use these data displays to make inferences, predictions, decisions, and arguments about **two** sets of data using statistical analysis. **Category 5: Solve Non-routine Problems/Make Connections:** **5c.** Analyze data or recognize patterns
Sample Item Shells	
The box-and-whisker plots below represent the amounts of the donations made by 1,000 people attending a charity dinner compared to 1,000 people making donations through telemarketing.  Based on the plots, which statement about the donations is true? **A.** The median of the dinner donations was greater than the median of the telemarketing donations. **B.** The lower quartile value of the dinner donations was the same as the lower quartile value of the telemarketing donations. **C.** The range in the dinner donations was greater than the range in the telemarketing donations. **Correct Answer:** B	

Grade HS (cont'd)

Standard 4: Data – The student uses concepts and procedures of data analysis in a variety of situations.
Benchmark 2: Statistics – The student collects, organizes, displays, explains, and interprets numerical (rational) and non-numerical data sets in a variety of situations.

Assessable Indicator	Item Specification Notes
M.HS.4.2.K4 ▲ explains the effects of outliers on the measures of central tendency (mean, median, mode) and range and interquartile range of a real number data set (2.4.K1a)	• MC • For KAMM, do not test interquartile range. • For KAMM, each answer choice should focus on only one statistical measure. • For KAMM, limit numbers in data set to whole numbers and decimals to the tenths place. **Category 3: Demonstrate Understanding of Mathematical Ideas: 3c.** Explain findings and/or results from data analysis strategies or experiments/simulations
Sample Item Shells	
The graph below shows the daily average temperature in the town of Kensington over a 14-day period.  The average temperature on day 1 is considered an outlier. Which statement best describes how the removal of this outlier will affect the **mean** of the data? **A.** The mean will increase. **B.** The mean will decrease. **C.** The mean will remain the same. **Correct Answer:** A	

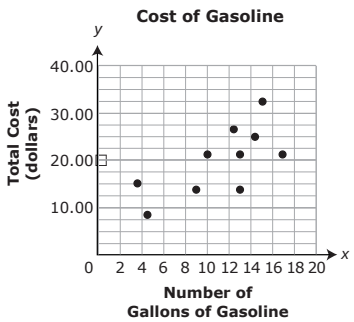
Grade HS (cont'd)

Standard 4: Data – The student uses concepts and procedures of data analysis in a variety of situations.
Benchmark 2: Statistics – The student collects, organizes, displays, explains, and interprets numerical (rational) and non-numerical data sets in a variety of situations.

Assessable Indicator	Item Specification Notes
M.HS.4.2.K5 ▲ approximates a line of best fit given a scatter plot and makes predictions using the equation of that line (2.4.K1k).	• MC • For KAMM, axes on scatter plots need to cover a range large enough to include the correct response. • **Explanation of Indicator:** Students can approximate a line of best fit based on the given data points and then make predictions based on the line of best fit. **Category 1: Memorize Facts/Definitions/Formulas: 1b.** Recall or recognize mathematical terms, definitions, or concepts **Category 3: Demonstrate Understanding of Mathematical Ideas: 3e.** Show and/or explain relationships between models, diagrams, and/or other representations **Category 5: Solve Non-routine Problems/Make Connections: 5c.** Analyze data or recognize patterns

Sample Item Shells

The scatter plot below shows the total cost to customers when purchasing gasoline at different gas stations across a large city.



Based on the data in the scatter plot, what would be the approximate cost of 20 gallons of gasoline?

A. $20.00

B. $30.00

C. $40.00

Correct Answer: B