March 2007

Information Booklet

MATHEMATICS
Grade 7

Revised Based on TEKS Refinements

Texas Education Agency • Student Assessment Division

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INTRODUCTION

The Texas Assessment of Knowledge and Skills (TAKS) is a completely reconceived testing program. It assesses more of the Texas Essential Knowledge and Skills (TEKS) than the Texas Assessment of Academic Skills (TAAS) did and asks questions in more authentic ways. TAKS has been developed to better reflect good instructional practice and more accurately measure student learning. We hope that every teacher will see the connection between what we test on this state assessment and what our students should know and be able to do to be academically successful. To provide you with a better understanding of TAKS and its connection to the TEKS and to classroom teaching, the Texas Education Agency (TEA) has developed this newly revised version of the TAKS information booklet based on the TEKS refinements. The information booklets were originally published in January 2002, before the first TAKS field test. After several years of field tests and live administrations, the information booklets were revised in August 2004 to provide an even more comprehensive picture of the testing program. Since that time the TEKS for secondary mathematics have been refined. These TEKS refinements were approved by the State Board of Education in February 2005. In December 2005, the Student Assessment Division produced an online survey to obtain input as to whether the new TEKS content should be eligible for assessment on TAKS mathematics tests at grades 6–10 and exit level. The results of the survey from 1,487 groups composed of 17,221 individuals were compiled and analyzed. Then the TEA math team from the Curriculum and Student Assessment Divisions, with input from educational service center math specialists, used the survey data to guide decisions on what new content should be assessed on the secondary TAKS math tests. This new content, as well as the original content, can be found in this newly revised information booklet. We hope this revised version of the TAKS information booklet will serve as a user-friendly resource to help you understand that the best preparation for TAKS is a coherent, TEKS-based instructional program that provides the level of support necessary for all students to reach their academic potential.

BACKGROUND INFORMATION

The development of the TAKS program included extensive public scrutiny and input from Texas teachers, administrators, parents, members of the business community, professional education organizations, faculty and staff at Texas colleges and universities, and national content-area experts. The agency involved as many stakeholders as possible because we believed that the development of TAKS was a responsibility that had to be shared if this assessment was to be an equitable and accurate measure of learning for all Texas public school students.

The three-year test-development process, which began in summer 1999, included a series of carefully conceived activities. First, committees of Texas educators identified those TEKS student expectations for each grade and subject area assessed that should be tested on a statewide assessment. Then a committee of TEA Student Assessment and Curriculum staff incorporated these selected TEKS student expectations, along with draft objectives for each subject area, into exit level surveys. These surveys were sent to Texas educators at the middle school and secondary levels for their review. Based on input we received from more than 27,000 survey responses, we developed a second draft of the objectives and TEKS student expectations. In addition, we used this input during the development of draft objectives and student expectations for grades 3 through 10 to ensure that the TAKS program, like the TEKS curriculum, would be vertically aligned. This vertical alignment was a critical step in ensuring that the TAKS tests would become more rigorous as students moved from grade to grade.

For example, the fifth grade tests would be more rigorous than the fourth grade tests, which would be more rigorous than the third grade tests. Texas educators felt that this increase in rigor from grade to grade was both appropriate and logical since each subject-area test was closely aligned to the TEKS curriculum at that grade level.

In fall 2000 TEA distributed the second draft of the objectives and TEKS student expectations for eleventh grade exit level and the first draft of the objectives and student expectations for grades 3 through 10 for review at the campus level. These documents were also posted on the Student Assessment Division's website to encourage input from the public. Each draft document focused on two central issues: first, whether the objectives included in the draft were essential to measure on a statewide assessment; and, second, whether students would have received enough instruction on the TEKS student expectations included under each objective to be adequately prepared to demonstrate mastery of that objective in the spring of the school year. We received more than 57,000 campus-consensus survey responses. We used these responses, along with feedback from national experts, to finalize the TAKS objectives and student expectations. Because the state assessment was necessarily limited to a "snapshot" of student performance, broad-based input was important to ensure that TAKS assessed the parts of the TEKS curriculum most critical to students' academic learning and progress.

In the thorough test-development process that we use for the TAKS program, we rely on educator input to develop items that are appropriate and valid measures of the objectives and TEKS student expectations the items are designed to assess. This input includes an annual educator review and revision of all proposed test items before field-testing and a second annual educator review of data and items after field-testing. In addition, each year panels of recognized experts in the fields of English language arts (ELA), mathematics, science, and social studies meet in Austin to critically review the content of each of the high school level TAKS assessments to be administered that year. This critical review is referred to as a content validation review and is one of the final activities in a series of quality-control steps designed to ensure that each high school test is of the highest quality possible. A content validation review is considered necessary at the high school grades (9, 10, and exit level) because of the advanced level of content being assessed.

ORGANIZATION OF THE TAKS TESTS

TAKS is divided into test objectives. It is important to remember that the objective statements are not found in the TEKS curriculum. Rather, the objectives are "umbrella statements" that serve as headings under which student expectations from the TEKS can be meaningfully grouped. Objectives are broad statements that "break up" knowledge and skills to be tested into meaningful subsets around which a test can be organized into reporting units. These reporting units help campuses, districts, parents, and the general public understand the performance of our students and schools. Test objectives are not intended to be "translations" or "rewordings" of the TEKS. Instead, the objectives are designed to be identical across grade levels rather than grade specific. Generally, the objectives are the same for third grade through eighth grade (an elementary/middle school system) and for ninth grade through exit level (a high school system). In addition, certain TEKS student expectations may logically be grouped under more than one test objective; however, it is important for you to understand that this is not meaningless repetition—sometimes the organization of the objectives requires such groupings. For example, on the TAKS writing tests for fourth and seventh grades, some of the same student expectations addressing the conventions of standard English usage are listed

under both Objective 2 and Objective 6. In this case, the expectations listed under Objective 2 are assessed through the overall strength of a student's use of language conventions on the written composition portion of the test; these same expectations under Objective 6 are assessed through multiple-choice items attached to a series of revising and editing passages.

ORGANIZATION OF THE INFORMATION BOOKLETS

The purpose of the information booklets is to help Texas educators, students, parents, and other stakeholders understand more about the TAKS tests. These booklets are not intended to replace the teaching of the TEKS curriculum, provide the basis for the isolated teaching of skills in the form of narrow test preparation, or serve as the single information source about every aspect of the TAKS program. However, we believe that the booklets provide helpful explanations as well as show enough sample items, reading and writing selections, and prompts to give educators a good sense of the assessment.

Each grade within a subject area is presented as a separate booklet. However, it is still important that teachers review the information booklets for the grades both above and below the grade they teach. For example, eighth grade mathematics teachers who review the seventh grade information booklet as well as the ninth grade information booklet are able to develop a broader perspective of the mathematics assessment than if they study only the eighth grade information booklet.

The information booklets for each subject area contain some information unique to that subject. For example, the mathematics chart that students use on TAKS is included for each grade at which mathematics is assessed. However, all booklets include the following information, which we consider critical for every subject-area TAKS test:

- an overview of the subject within the context of TAKS
- a blueprint of the test—the number of items under each objective and the number of items on the test as a whole
- information that clarifies how to read the TEKS
- the reasons each objective and its TEKS student expectations are critical to student learning and success
- the objectives and TEKS student expectations that are included on TAKS
- additional information about each objective that helps educators understand how it is assessed on TAKS
- sample items that show some of the ways objectives are assessed

TAKS MATHEMATICS
INFORMATION BOOKLET
GENERAL INTRODUCTION

Learning mathematics is essential to finding answers to real-life questions. The study of mathematics helps students think logically, solve problems, and understand spatial relationships. The concepts learned in mathematics courses help students communicate clearly and use logical reasoning to make sense of their world. TEKS instruction in mathematics throughout elementary, middle, and high school will build the foundation necessary for students to succeed in advanced math and science courses and later in their careers.

The mathematics concepts of algebra and geometry are important for life outside the classroom. The six strands identified in the mathematics curriculum for kindergarten through eighth grade contain the foundation skills necessary for high school mathematics courses. In third through eighth grade, the six TAKS assessment objectives are closely aligned with the six strands identified in the TEKS curriculum. For example, in third through eighth grade mathematics Objective 1, students are to "demonstrate an understanding of numbers, operations, and quantitative reasoning"; in the TEKS curriculum the first strand identified is "numbers, operations, and quantitative reasoning." In ninth, tenth, and eleventh grades, students take specific math courses, including Algebra I and Geometry, rather than grade-level math courses. For the TAKS high school mathematics assessments, there are ten objectives. At these grade levels, Objectives 1–5 contain student expectations from the Algebra I curriculum. Objectives 6–8 are composed of knowledge and skills from the geometry and measurement strands of the curriculum. Objective 9 consists of percents, proportional relationships, probability, and statistics. The final objective, Objective 10, pertains to students' understanding of mathematical processes. For the ninth, tenth, and eleventh grades in TAKS mathematics Objective 1, students are asked to "describe functional relationships in a variety of ways"; in the TEKS curriculum the first strand of Algebra I is identified as "foundations for functions." This close alignment reflects the important link between TAKS and the TEKS curriculum. In fact, the TAKS mathematics tests are based on those TEKS student expectations Texas educators have identified as the most critical to student achievement and progress in mathematics.

Because the high school TEKS are based on courses and because there is no state-mandated course sequence, some of the high school TAKS mathematics objectives contain student expectations from eighth grade. This was done so that students would have an opportunity to learn the concepts before being tested on them. For example, no student expectations from the Geometry curriculum are included in the TAKS objectives until the eleventh grade exit level test because it is not certain that every Texas student would be exposed to these concepts before the eleventh grade. For the ninth and tenth grade assessments, only those eighth grade student expectations that closely align with the Geometry TEKS will be tested. Close inspection should reveal a natural progression as students advance from the eighth grade to the exit level assessment.

The TEKS were developed to provide educators with instructional goals at each grade level. Although some student expectations are not tested, they are nonetheless critical for student understanding and

must be included in classroom instruction. For each strand of learning, the mathematics TEKS provide more rigorous expectations as students master skills and progress through the curriculum. It is important for educators to vertically align their instructional programs to reinforce the unifying strands of learning each year through grade-level-appropriate instruction. To understand how student learning progresses, educators are encouraged to become familiar with the curriculum at all grade levels. Educators may find it helpful to examine sample items at each grade level to gain a greater understanding of what students need to know and be able to do in mathematics as they move from grade to grade.

A system of support has been designed to ensure that all students master the TEKS. The Student Success Initiative (SSI) requires that students meet the standard on TAKS to be eligible for promotion to the next grade level as specified below:

- the reading test at grade 3, beginning in the 2002–2003 school year;
- the reading and mathematics tests at grade 5, beginning in the 2004–2005 school year; and
- the reading and mathematics tests at grade 8, beginning in the 2007–2008 school year.

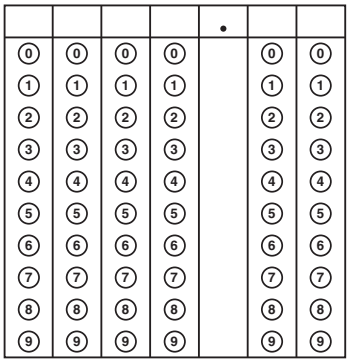
To prepare students for the SSI requirements and to promote vertical alignment, it is essential that teachers collaborate and coordinate across grade levels.

TAKS MATHEMATICS
INFORMATION BOOKLET
GRADE 7

The seventh grade mathematics TEKS describe what students should know and be able to do in seventh grade. However, teachers need to be aware of the "big picture"—an understanding of the TEKS curriculum for both the lower and the higher grades. This awareness of what comes before and after seventh grade will enable teachers to more effectively help their students develop mathematics knowledge and skills.

TEST FORMAT

- The seventh grade test includes a test booklet and a separate machine-scorable answer document. Enough room is left around each item in the booklet for students to work each problem. However, student responses must be recorded on the separate answer document.
- Any item may include application context and extraneous information.
- Most items will be in a multiple-choice format with four answer choices.
- *Not here* or a variation of this phrase may be used as the fourth answer choice when appropriate.
- There will be a limited number of open-ended griddable items. For these items, a seven-column grid (with one column designated as a fixed decimal point) will be provided on the answer document for students to record and bubble in their answers. Digits must be in the correct column(s) with respect to the fixed decimal point. This griddable format is intended to allow students to work a problem and determine the correct answer without being influenced by answer choices. An example of a blank grid is shown below.



MATHEMATICS CHART

- For seventh grade the Mathematics Chart (found on pages 9 and 10) will have measurement conversions and formulas.
- A metric ruler and a customary ruler will be provided on the separate Mathematics Chart.
- Items that require students to measure with a ruler from the Mathematics Chart may be found in any objective as appropriate.

Texas Assessment of Knowledge and Skills (TAKS)
Blueprint for Grade 7 Mathematics

TAKS Objectives	Number of Items
Objective 1: Numbers, Operations, and Quantitive Reasoning	10
Objective 2: Patterns, Relationships, and Algebraic Reasoning	10
Objective 3: Geometry and Spatial Reasoning	7
Objective 4: Measurement	5
Objective 5: Probability and Statistics	7
Objective 6: Mathematical Processes and Tools	9
Total number of items	**48**

Grade 7
Mathematics Chart

LENGTH

Metric	Customary
1 kilometer = 1000 meters	1 mile = 1760 yards
1 meter = 100 centimeters	1 mile = 5280 feet
1 centimeter = 10 millimeters	1 yard = 3 feet
	1 foot = 12 inches

CAPACITY AND VOLUME

Metric	Customary
1 liter = 1000 milliliters	1 gallon = 4 quarts
	1 gallon = 128 fluid ounces
	1 quart = 2 pints
	1 pint = 2 cups
	1 cup = 8 fluid ounces

MASS AND WEIGHT

Metric	Customary
1 kilogram = 1000 grams	1 ton = 2000 pounds
1 gram = 1000 milligrams	1 pound = 16 ounces

TIME

1 year = 365 days

1 year = 12 months

1 year = 52 weeks

1 week = 7 days

1 day = 24 hours

1 hour = 60 minutes

1 minute = 60 seconds

Grade 7 Mathematics Chart

Perimeter	square	$P = 4s$
	rectangle	$P = 2l + 2w$ or $P = 2(l + w)$
Circumference	circle	$C = 2\pi r$ or $C = \pi d$
Area	square	$A = s^2$
	rectangle	$A = lw$ or $A = bh$
	triangle	$A = \frac{1}{2}bh$ or $A = \frac{bh}{2}$
	trapezoid	$A = \frac{1}{2}(b_1 + b_2)h$ or $A = \frac{(b_1 + b_2)h}{2}$
	circle	$A = \pi r^2$
B represents the Area of the Base of a three-dimensional figure.		
Volume	cube	$V = s^3$
	rectangular prism	$V = lwh$ or $V = Bh$
	triangular prism	$V = Bh$
	cylinder	$V = \pi r^2 h$ or $V = Bh$
Pi	π	$\pi \approx 3.14$ or $\pi \approx \frac{22}{7}$

A Key to Understanding the TEKS Included on TAKS

Example from Objective 1

A

(7.2) **Number, operation, and quantitative reasoning.** The student adds, subtracts, multiplies, or divides to solve problems and justify solutions. The student is expected to

B

(A) represent multiplication and division situations involving fractions and decimals with models, including [concrete objects,] pictures, words, and numbers.

C

KEY

A. Knowledge and Skills Statement

This broad statement describes what students should know and be able to do for seventh grade mathematics. The number preceding the statement identifies the instructional level and the number of the knowledge and skills statement.

B. Student Expectation

This specific statement describes what students should be able to do to demonstrate proficiency in what is described in the knowledge and skills statement. Students will be tested on skills outlined in the student expectation statement.

C. [bracketed text]

Although the entire student expectation has been provided for reference, text in brackets indicates that this portion of the student expectation will not specifically be tested on TAKS.

NOTE: The full TEKS curriculum can be found at http://www.tea.state.tx.us/teks/.

TEKS STUDENT EXPECTATIONS—IMPORTANT VOCABULARY

For every subject area and grade level, two terms—*such as* and *including*—are used to help make the TEKS student expectations more concrete for teachers. However, these terms function in different ways. To help you understand the effect each of the terms has on specific student expectations, we are providing the following:

- a short definition of each term;
- an example from a specific student expectation for this subject area; and
- a short explanation of how this term affects this student expectation.

Such as

The term *such as* is used when the specific examples that follow it function only as representative illustrations that help define the expectation for teachers. These examples are just that—examples. Teachers may choose to use them when teaching the student expectation, but there is no requirement to use them. Other examples can be used in addition to those listed or as replacements for those listed.

Example from Objective 2

(7.3) (B) estimate and find solutions to application problems involving proportional relationships, such as similarity, scaling, unit costs, and related measurement units.

This student expectation lists *proportional relationships such as similarity, scaling, unit costs, and related measurement units*. Many other applications exist involving proportional relationships.

Including

The term *including* is used when the specific examples that follow it must be taught. However, other examples may also be used in conjunction with those listed.

Example from Objective 3

(7.6) (C) use properties to classify three-dimensional figures, including pyramids, cones, prisms, and cylinders.

This student expectation lists several three-dimensional figures. Other three-dimensional figures may be taught in addition to those listed.

Remember

- Any example preceded by the term *such as* in a particular student expectation may or may not provide the basis for an item assessing that expectation. Because these examples do not necessarily have to be used to teach the student expectation, it is equally likely that other examples may be used in assessment items. The rule here is that an example will be used only if it is central to the knowledge, concept, or skill the item assesses.
- It is more likely that some of the examples preceded by the term *including* in a particular student expectation will provide the basis for items assessing that expectation, since these examples must be taught. However, it is important to remember that the examples that follow the term *including* do not represent all the examples possible, so other examples may also provide the basis for an assessment item. Again, the rule here is that an example will be used only if it is central to the knowledge, concept, or skill the item assesses.

Grade 7 TAKS Mathematics—Objective 1

Knowledge of **numbers, operations, and quantitative reasoning** is critical for the development of mathematical skills. Students need to understand the value of digits based on their positions in numbers, including rational numbers, in order to read and work with numbers. Students should know how to use both negative and positive rational numbers in real-life problems. Understanding squares and square roots becomes important as students learn to work with more abstract algebraic expressions and equations. Numbers that are more abstract and complicated will be used as students work with and distinguish among the four basic operations and the order in which they are used to solve equations. Students should also be developing a sense of the reasonableness of an expected answer. Quantitative reasoning is knowing when an answer makes sense and is one purpose for rounding numbers to estimate. Students should be prepared to apply the basic concepts included in Objective 1 to other topics in seventh grade mathematics. In addition, the knowledge and skills in Objective 1 at seventh grade provide the foundation for mastering the knowledge and skills in Objective 1 at eighth grade.

Objective 1 groups together the basic building blocks within the TEKS—**numbers, operations, and quantitative reasoning**—from which mathematical understanding stems.

TAKS Objectives and TEKS Student Expectations

Objective 1

The student will demonstrate an understanding of numbers, operations, and quantitative reasoning.

(7.1) **Number, operation, and quantitative reasoning.** The student represents and uses numbers in a variety of equivalent forms. The student is expected to

(A) compare and order integers and positive rational numbers;

(B) convert between fractions, decimals, whole numbers, and percents mentally, on paper, [or with a calculator]; and

(C) represent squares and square roots using geometric models.

(7.2) **Number, operation, and quantitative reasoning.** The student adds, subtracts, multiplies, or divides to solve problems and justify solutions. The student is expected to

(A) represent multiplication and division situations involving fractions and decimals with models, including [concrete objects,] pictures, words, and numbers;

(B) use addition, subtraction, multiplication, and division to solve problems involving fractions and decimals;

(C) use models, such as [concrete objects,] pictorial models, and number lines, to add, subtract, multiply, and divide integers and connect the actions to algorithms;

(D) use division to find unit rates and ratios in proportional relationships such as speed, density, price, recipes, and student-teacher ratio;

(E) simplify numerical expressions involving order of operations and exponents;

(F) select and use appropriate operations to solve problems and justify the selections; and

(G) determine the reasonableness of a solution to a problem.

Objective 1—For Your Information

The following list provides additional information for some of the student expectations tested in Objective 1. At seventh grade, students should be able to

- sequence numbers or the words associated with numbers;
- work with problems that include information expressed as numbers or ranges of numbers; and
- round numbers before performing any computations when estimating. The use of compatible numbers (numbers that are easy to compute mentally) may be helpful.

Objective 1 Sample Items

1 Identify the group that does NOT contain equivalent fractions, decimals, and percents.

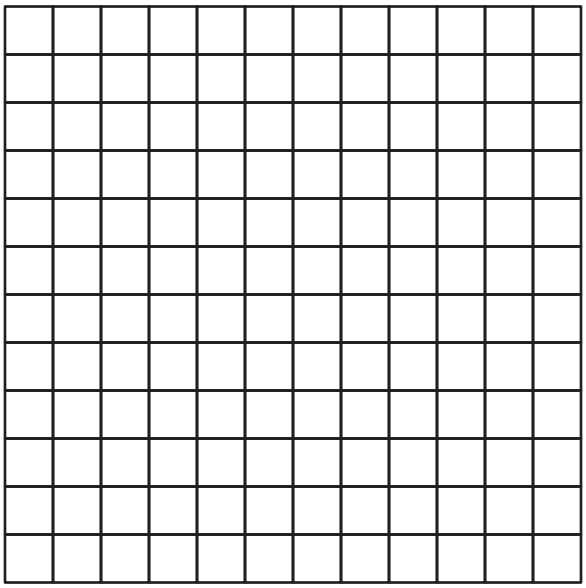
A $\frac{1}{20}$, 0.05, 5%

B $\frac{7}{10}$, 0.7, 70%

C $\frac{1}{8}$, 0.125, 12.5%

D* $\frac{3}{100}$, 0.3, 3%

2 The model shown below has 144 small squares in it.



Which best represents the number of small squares along each side of the model?

A $\sqrt{12}$

B* $\sqrt{144}$

C 12^2

D 144^2

Objective 1 Sample Items

3 During a winter storm a city received $5\frac{1}{4}$ inches of snow in $3\frac{1}{2}$ hours. How much snow fell in 1 hour?

A $1\frac{3}{4}$ inches

B $2\frac{1}{2}$ inches

C* $1\frac{1}{2}$ inches

D $2\frac{1}{4}$ inches

4 What is the value of the expression shown below?

$$12 - 16 \div 2^4 + 5$$

A 5

B 6

C 15

D* 16

5 During a 4-month period the water level at a lake decreased by 15 feet 8 inches. Doug wants to determine how much the water level at the lake decreased each month. If the water level decreased the same amount each month, which of the following methods should Doug use to determine the number of inches it decreased each month?

A* He should multiply 15 by 12, add 8, and divide by 4.

B He should multiply 15 by 8 and divide by 4.

C He should add 15 and 12, subtract 8, and divide by 4.

D He should add 15 and 8, multiply by 4, and add 12.

Grade 7 TAKS Mathematics—Objective 2

Understanding **patterns, relationships, and algebraic thinking** is an integral component for the foundation of basic algebra. In seventh grade, students will estimate, find solutions, describe relationships, and graph data. These skills will enable students to express relationships in academic areas such as geometry and science. Using proportional relationships is helpful in calculating percents in everyday situations such as shopping. Understanding how terms in a sequence are related is important in fields such as marketing and real estate. Students should be able to use models, expressions with variables, and simple equations to solve problems and communicate results effectively. The concepts in Objective 2 should prepare students to continue their learning of more-advanced algebraic ideas. In addition, mastering the knowledge and skills in Objective 2 at seventh grade will help students master the knowledge and skills in Objective 2 at eighth grade.

Objective 2 combines the basic algebra concepts within the TEKS—**patterns, relationships, and algebraic thinking**.

TAKS Objectives and TEKS Student Expectations

Objective 2

The student will demonstrate an understanding of patterns, relationships, and algebraic reasoning.

(7.3) **Patterns, relationships, and algebraic thinking.** The student solves problems involving direct proportional relationships. The student is expected to

(A) estimate and find solutions to application problems involving percent; and

(B) estimate and find solutions to application problems involving proportional relationships such as similarity, scaling, unit costs, and related measurement units.

(7.4) **Patterns, relationships, and algebraic thinking.** The student represents a relationship in numerical, geometric, verbal, and symbolic form. The student is expected to

(A) generate formulas involving unit conversions, perimeter, area, circumference, volume, and scaling;

(B) graph data to demonstrate relationships in familiar concepts such as conversions, perimeter, area, circumference, volume, and scaling; and

(C) use words and symbols to describe the relationship between the terms in an arithmetic sequence (with a constant rate of change) and their positions in the sequence.

(7.5) **Patterns, relationships, and algebraic thinking.** The student uses equations to solve problems. The student is expected to

(A) use [concrete and] pictorial models to solve equations and use symbols to record the actions; and

(B) formulate problem situations when given a simple equation and formulate an equation when given a problem situation.

Objective 2—For Your Information

The following list provides additional information for some of the student expectations tested in Objective 2. At seventh grade, students should be able to

- write an expression to find the *n*th term where *n* represents the position of the term in the arithmetic sequence; and
- identify the expression when given terms in an arithmetic sequence, and vice versa.

Objective 2 Sample Items

1 Mr. Francis bought a pair of shoes on sale for 40% off. The regular price was $55, not including tax. How much did Mr. Francis pay for the shoes, not including tax?

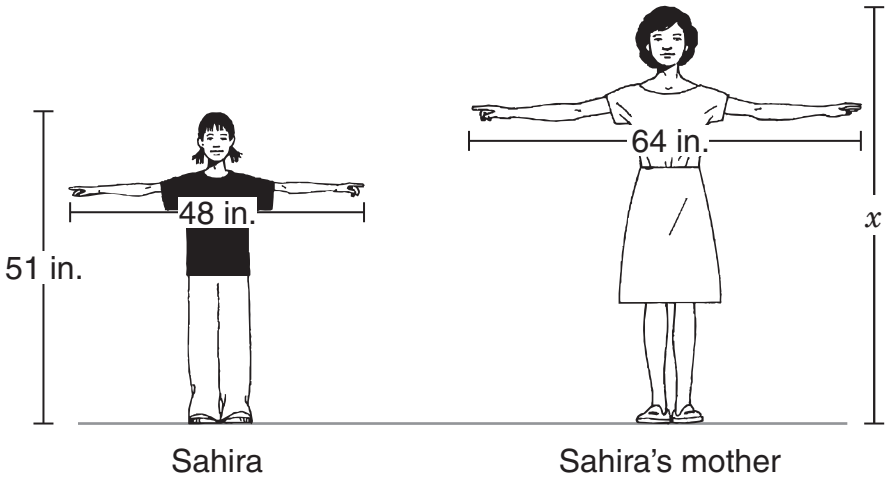
A $77

B $22

C $15

D* $33

2 The ratio of Sahira's height to her arm span is equivalent to the ratio of her mother's height to arm span.



Which of the following is the height of Sahira's mother?

A 38 in.

B 60 in.

C* 68 in.

D 67 in.

Objective 2 Sample Items

3 A sequence follows the rule $4(n - 5)$, in which n represents the position of a term in the sequence. Which of these tables represents this sequence?

A

Position	Value of Term
1	–1
2	3
3	7
4	11
5	15
n	

C

Position	Value of Term
1	–19
2	–18
3	–17
4	–16
5	–15
n	

B*

Position	Value of Term
1	–16
2	–12
3	–8
4	–4
5	0
n	

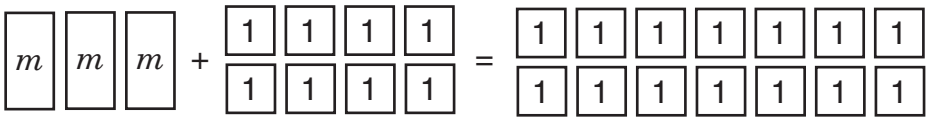
D

Position	Value of Term
1	4
2	8
3	12
4	16
5	20
n	

Note: Students should understand that in the first position, when $n = 1$, the value of the term is -16 because $4(n - 5) = 4(1 - 5) = 4(-4) = -16$. In the second position, when $n = 2$, the value of the term is -12 because $4(n - 5) = 4(2 - 5) = 4(-3) = -12$.

Objective 2 Sample Items

4 A model of an equation is shown below.



Which value of m makes the equation true?

A* $m = 2$

B $m = 22$

C $m = 6$

D $m = 14$

Note: When working with models of equations, one way students might start is by removing equivalent values from each side of the equation. For this item the student could remove eight 1's from each side and then divide the remaining 1's into 3 equal groups.

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5 Which situation could best be represented by the equation below?

$$12x = 30$$

A Kristen earned \$12 repairing a computer. If she charges \$30 per hour, what is x, the number of hours she spent repairing this computer?

B Neil drove 12 miles to school and back for 30 days. What is x, the total number of miles he drove those days?

C Claudia had 30 free minutes left on her cell-phone plan. If she used 12 of the minutes, what is x, the number of free minutes she has remaining?

D* Josh had braces on his teeth for 30 months. What is x, the number of years he wore braces?

Grade 7 TAKS Mathematics—Objective 3

Knowledge of **geometry and spatial reasoning** is important because the structure of the world is based on geometric properties. With this knowledge, students should be able to classify two-dimensional figures, three-dimensional figures, and pairs of angles based on their properties. Students should also be able to use these properties to define similarity. Students must learn to plot points on a coordinate grid using ordered pairs of integers. Students also need to become familiar with perspective views and nets of three-dimensional figures. All these concepts build spatial reasoning skills that help develop an understanding of distance, location, area, and volume. The knowledge and skills contained in Objective 3 will allow students to understand the basic concepts of geometry as related to the real world. In addition, the knowledge and skills in Objective 3 at seventh grade are closely aligned with the knowledge and skills in Objective 3 at eighth grade.

Objective 3 combines the fundamental concepts of size and shape found within the TEKS—**geometry and spatial reasoning**—from which geometric understanding is built.

TAKS Objectives and TEKS Student Expectations

Objective 3

The student will demonstrate an understanding of geometry and spatial reasoning.

(7.6) **Geometry and spatial reasoning.** The student compares and classifies two- and three-dimensional figures using geometric vocabulary and properties. The student is expected to

(A) use angle measurements to classify pairs of angles as complementary or supplementary;

(B) use properties to classify triangles and quadrilaterals;

(C) use properties to classify three-dimensional figures, including pyramids, cones, prisms, and cylinders; and

(D) use critical attributes to define similarity.

(7.7) **Geometry and spatial reasoning.** The student uses coordinate geometry to describe location on a plane. The student is expected to

(A) locate and name points on a coordinate plane using ordered pairs of integers; and

(B) graph reflections across the horizontal or vertical axis and graph translations on a coordinate plane.

(7.8) **Geometry and spatial reasoning.** The student uses geometry to model and describe the physical world. The student is expected to

(A) sketch three-dimensional figures when given the top, side, and front views;

(B) make a net (two-dimensional model) of the surface area of a three-dimensional figure; and

(C) use geometric concepts and properties to solve problems in fields such as art and architecture.

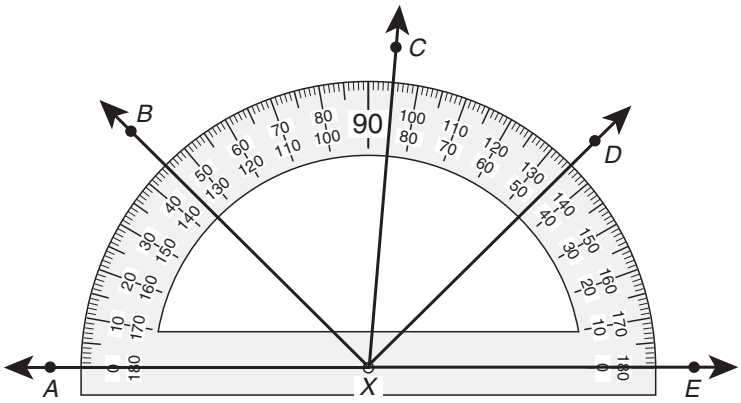
Objective 3—For Your Information

The following list provides additional information for some of the student expectations tested in Objective 3. At seventh grade, students should be able to

- use geometric models shown individually or as part of a more complex figure (for example, supplementary angles may be shown as part of a parallelogram); and
- graph ordered pairs on coordinate grids using all four quadrants.

Objective 3 Sample Items

1 Use the protractor in the diagram to read the measure of each angle.



One pair of complementary angles is —

A $\angle DXE$ and $\angle BXC$

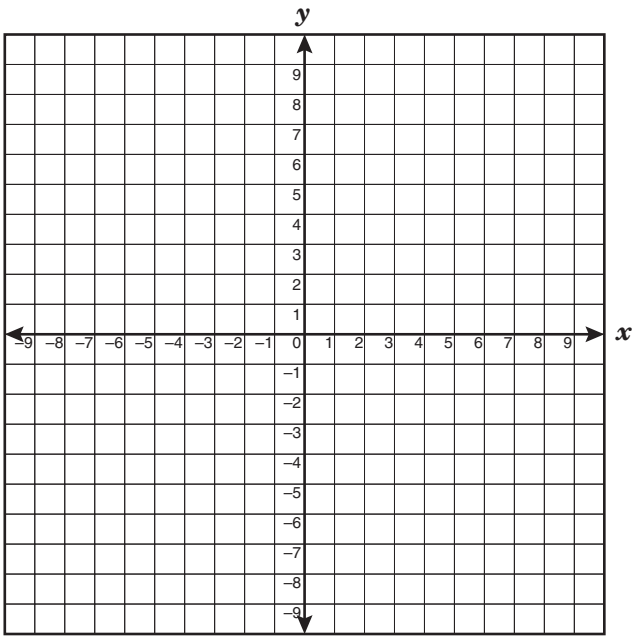
B $\angle AXC$ and $\angle CXE$

C* $\angle DXE$ and $\angle AXB$

D $\angle CXD$ and $\angle AXB$

Objective 3 Sample Items

2 Angela wants to translate polygon *ABCD* so that vertex *D* is moved from coordinates (3, 2) to coordinates (−3, −1). Identify the steps that can be used for the translation.



A* Move each vertex 6 units to the left and 3 units down

B Move each vertex 6 units down and 3 units to the left

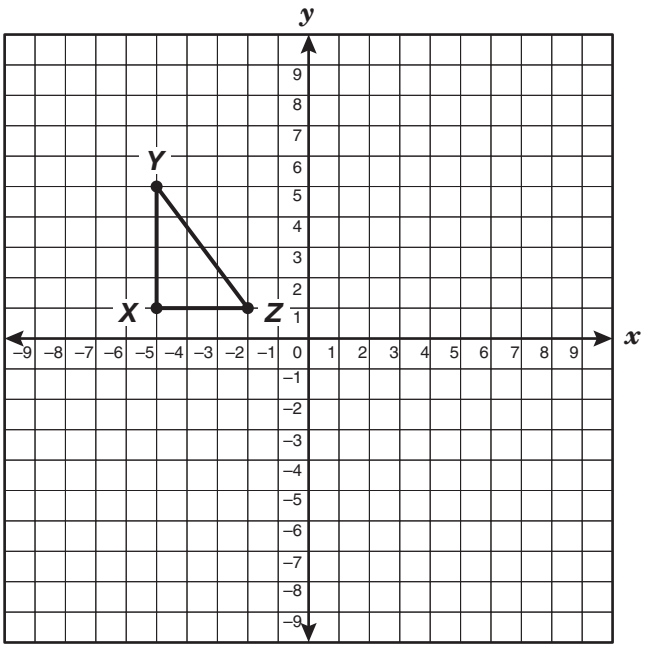
C Move each vertex 3 units down and 1 unit to the left

D Move each vertex 6 units to the left and 1 unit down

Note: Students may solve this problem in multiple ways. In this situation, the student could use the blank grid to draw the figure and perform the translation.

Objective 3 Sample Items

3 ΔXYZ will be reflected across the y-axis.



What will be the coordinates of the vertices of $\Delta X'Y'Z'$?

A (1, 5), (5, 5), (1, 2)

B* (5, 1), (5, 5), (2, 1)

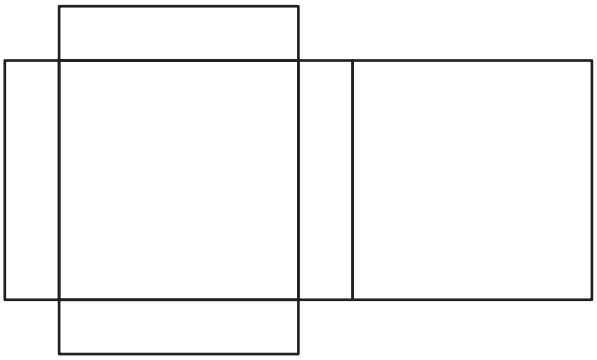
C (–5, –1), (–5, –5), (–2, –1)

D (–1, –5), (–5, –5), (–1, –2)

Note: Students should be able to reflect a figure across either the x-axis or the y-axis.

Objective 3 Sample Items

4 Identify the three-dimensional figure that can be formed from this net.



A Cube

B Rectangular pyramid

C Triangular prism

D* Rectangular prism

5 Which of these statements best describes a triangular prism?

A It has 4 triangular faces.

B* It has a pair of parallel triangular faces.

C It has a pair of parallel rectangular faces.

D It has fewer than 6 vertices.

6 A triangle has 2 angles that measure 60° each. Which of the following best describes this triangle?

A Right isosceles triangle

B* Equilateral triangle

C Obtuse isosceles triangle

D Acute scalene triangle

Grade 7 TAKS Mathematics—Objective 4

Understanding the concepts and uses of **measurement** has many real-world applications and provides a basis for developing skills in geometry. Students will continue to develop measurement skills by solving application problems involving estimation and measurement. Understanding and application of estimation in measurement provide students with the skills necessary to identify reasonableness of answers and help students solve more-difficult problems. These skills are important in real-world applications, such as construction and architecture, and in other academic disciplines, such as engineering and science. Understanding the basic concepts included in Objective 4 will prepare students to apply measurement skills in a multitude of situations inside and outside the classroom. In addition, the knowledge and skills found in Objective 4 at seventh grade provide the foundation on which to build in eighth grade.

Objective 4 includes the concepts within the TEKS from which an understanding of **measurement** is developed.

TAKS Objectives and TEKS Student Expectations

Objective 4

The student will demonstrate an understanding of the concepts and uses of measurement.

(7.9) **Measurement.** The student solves application problems involving estimation and measurement. The student is expected to

(A) estimate measurements and solve application problems involving length (including perimeter and circumference) and area of polygons and other shapes;

(B) connect models for volume of prisms (triangular and rectangular) and cylinders to formulas of prisms (triangular and rectangular) and cylinders; and

(C) estimate measurements and solve application problems involving volume of prisms (rectangular and triangular) and cylinders.

Objective 4—For Your Information

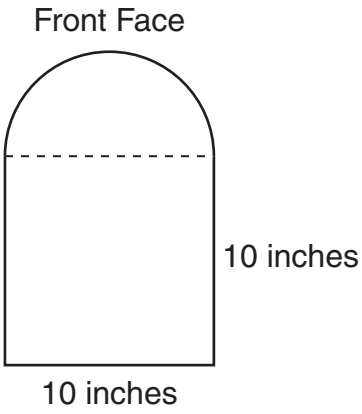
The following list provides additional information for some of the student expectations tested in Objective 4. At seventh grade, students should be able to

- utilize the conversions and formulas on the Mathematics Chart to solve problems;
- measure with the ruler on the Mathematics Chart ***only if*** the item specifically instructs students to use the ruler;

- use the given dimensions of a figure to solve problems; and
- recognize abbreviations of measurement units.

Objective 4 Sample Items

1 The front face of a clock is made up of a square and a semicircle, as shown below.



If a clock maker is making the front face out of glass, which is closest to the total area of the front face?

A 31.4 square inches

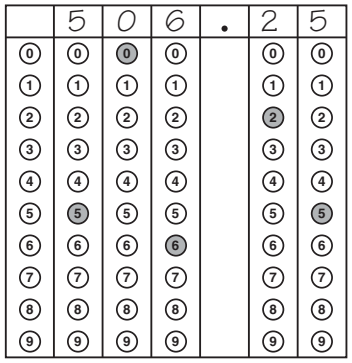
B 131.4 square inches

C 39.25 square inches

D* 139.25 square inches

2 Lucinda is building a patio with a floor shaped like a square. The perimeter of the floor is 90 feet. What is the area of the patio floor in square feet?

Record your answer and fill in the bubbles on your answer document. Be sure to use the correct place value.

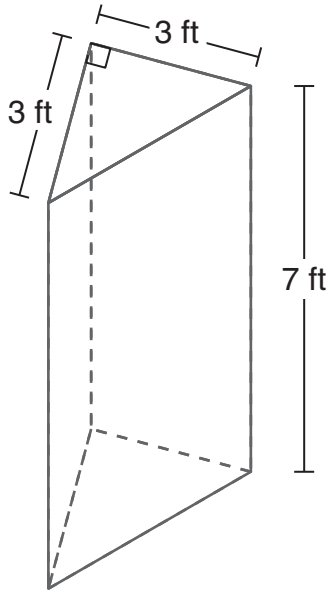


Note: The correct answer is 506.25. It is acceptable, although not necessary, to grid the zero before the correct answer. The zero will not affect the value of the correct answer.

This item specifically asks for the area in *square feet*. On griddable items, students do not grid the units, such as *square feet*.

Objective 4 Sample Items

3 A triangular prism is shown below.



What is the volume in cubic feet of this triangular prism?

A* 31.5 ft^3

B 63 ft^3

C 73.5 ft^3

D 220.5 ft^3

Note: Students should understand that one way to find the volume of a triangular prism is to use the formula $V = Bh$. The B represents the area of the triangular base, or $B = \frac{1}{2}bh$.

4 A trailer carries a cylindrical tank with a diameter of 6 feet and a height of 24 feet. Which is closest to the volume of the tank?

A 2,713 ft^3

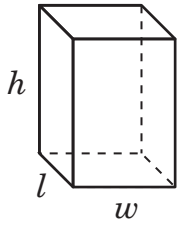
B* 678 ft^3

C 864 ft^3

D 509 ft^3

Objective 4 Sample Items

5 The diagram below shows a rectangular prism.



In the formula for the volume of a rectangular prism, $V = Bh$, which equation best represents B, the area of the base of this rectangular prism?

A $B = \pi r^2$

B* $B = lw$

C $B = 2\pi r$

D $B = lwh$

Grade 7 TAKS Mathematics—Objective 5

Understanding **probability and statistics** will help students become informed consumers of data and information. When describing and predicting the results of a probability experiment, students should begin to recognize and account for all the possibilities of a given situation. Students should be able to compare different graphical representations of the same data and solve problems by analyzing the data presented. Students should be able to recognize appropriate and accurate representations of data in everyday situations and in information related to science and social studies. Calculating measures of central tendency allows students to do many things, such as average grades, figure sports statistics, and determine election results. The knowledge and skills contained in Objective 5 are essential for processing everyday information. In addition, the knowledge and skills in Objective 5 at seventh grade provide the foundation for mastering the knowledge and skills in Objective 5 at eighth grade.

Objective 5 includes the concepts within the TEKS that form the groundwork for an understanding of **probability and statistics**.

TAKS Objectives and TEKS Student Expectations

Objective 5

The student will demonstrate an understanding of probability and statistics.

(7.10) **Probability and statistics.** The student recognizes that a physical or mathematical model can be used to describe the experimental and theoretical probability of real-life events. The student is expected to

(A) construct sample spaces for simple or composite experiments.

(7.11) **Probability and statistics.** The student understands that the way a set of data is displayed influences its interpretation. The student is expected to

(A) select and use an appropriate representation for presenting and displaying relationships among collected data, including line plot, line graph, bar graph, [stem and leaf plot,] circle graph, and Venn diagrams, and justify the selection; and

(B) make inferences and convincing arguments based on an analysis of given or collected data.

(7.12) **Probability and statistics.** The student uses measures of central tendency and range to describe a set of data. The student is expected to

(A) describe a set of data using mean, median, mode, and range; and

(B) choose among mean, median, mode, or range to describe a set of data and justify the choice for a particular situation.

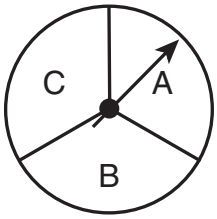
Objective 5—For Your Information

The following list provides additional information for some of the student expectations tested in Objective 5. At seventh grade, students should be able to

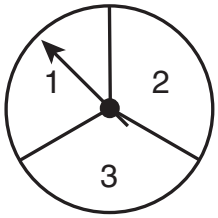
- match a situation with a sample space that lists all possible combinations or select the missing portion of a given sample space;
- determine whether the graphical representation of the given data is appropriate and/or accurate;
- distinguish among mean, median, mode, and range to determine which is most appropriate for a particular situation;
- match the mean, median, mode, and/or range with a given data set, which may be listed in the text of the item or presented in a graphical representation; and
- identify the missing piece of data that will produce a target mean, median, mode, and/or range for a data set.

Objective 5 Sample Items

1 Barbara spun each spinner once.



First Spinner



Second Spinner

Which shows all the possible unique combinations of letters and numbers that could have resulted from Barbara's spins?

A*

All Possible Outcomes

First Spinner	Second Spinner
A	1
B	1
C	1
A	2
B	2
C	2
A	3
B	3
C	3

C

All Possible Outcomes

First Spinner	Second Spinner
A	1
B	2
C	3
A	1
B	2
C	3

B

All Possible Outcomes

First Spinner	Second Spinner
A	1
B	2
C	3

D

All Possible Outcomes

First Spinner	Second Spinner
A	1
B	2
C	3
A	1
B	2
C	3
A	1
B	2
C	3

Objective 5 Sample Items

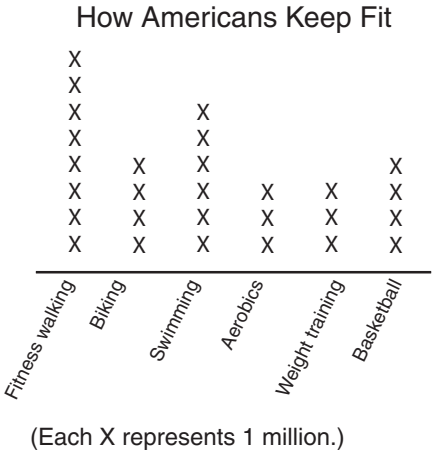
2 The table below shows some of the ways Americans keep fit.

How Americans Keep Fit

Activity	Number of People (millions)
Fitness walking	81
Biking	42
Swimming	59
Aerobics	27
Weight training	43
Basketball	27

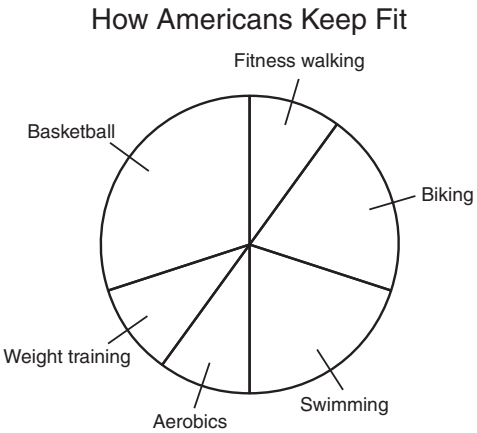
Which graph best represents the information given in the table?

A

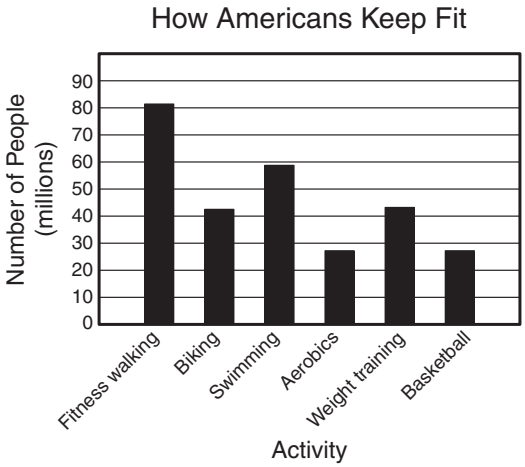


C

B



D*



Objective 5 Sample Items

3 Coach Reyna recorded the times of six of her runners in the 100-meter dash. The results are shown below.

Runner	Time (seconds)
L. Chávez	11.92
M. Hines	11.34
S. Williams	12.01
J. Smith	12.15
P. Madison	11.82
T. Montes	11.34

What is the range of the times and the median time for these six runners?

A Range = 0.58 sec
Median = 12.08 sec

B Range = 0.58 sec
Median = 11.34 sec

C* Range = 0.81 sec
Median = 11.87 sec

D Range = 0.81 sec
Median = 11.76 sec

Grade 7 TAKS Mathematics—Objective 6

Knowledge and understanding of **underlying processes and mathematical tools** are critical for students to be able to apply mathematics in their everyday lives. Problems that occur in the real world often require the use of multiple concepts and skills. Students should be able to recognize mathematics as it occurs in real-life problem situations, generalize from mathematical patterns and sets of examples, select an appropriate approach to solving a problem, solve the problem, and then determine whether the answer is reasonable. Expressing problem situations in mathematical language and symbols is essential to finding solutions to real-life questions. These concepts allow students to communicate clearly and use logical reasoning to make sense of their world. Students can then connect the concepts they have learned in mathematics to other disciplines and to higher mathematics. Through an understanding of the basic ideas found in Objective 6, students will be able to analyze and solve real-world problems. In addition, the knowledge and skills in Objective 6 at seventh grade are closely aligned with the knowledge and skills in Objective 6 at eighth grade.

Objective 6 incorporates the **underlying processes and mathematical tools** within the TEKS that are used in finding mathematical solutions to real-world problems.

TAKS Objectives and TEKS Student Expectations

Objective 6

The student will demonstrate an understanding of the mathematical processes and tools used in problem solving.

(7.13) **Underlying processes and mathematical tools.** The student applies Grade 7 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. The student is expected to

(A) identify and apply mathematics to everyday experiences, to activities in and outside of school, with other disciplines, and with other mathematical topics;

(B) use a problem-solving model that incorporates understanding the problem, making a plan, carrying out the plan, and evaluating the solution for reasonableness; and

(C) select or develop an appropriate problem-solving strategy from a variety of different types, including drawing a picture, looking for a pattern, systematic guessing and checking, acting it out, making a table, working a simpler problem, or working backwards to solve a problem.

(7.14) **Underlying processes and mathematical tools.** The student communicates about Grade 7 mathematics through informal and mathematical language, representations, and models. The student is expected to

(A) communicate mathematical ideas using language, efficient tools, appropriate units, and graphical, numerical, physical, or algebraic mathematical models.

(7.15) **Underlying processes and mathematical tools.** The student uses logical reasoning to make conjectures and verify conclusions. The student is expected to

(A) make conjectures from patterns or sets of examples and nonexamples; and

(B) validate his/her conclusions using mathematical properties and relationships.

Objective 6—For Your Information

The following list provides additional information for some of the student expectations tested in Objective 6. At seventh grade, students should be able to

- select the description of a mathematical situation when provided with a written or pictorial prompt;
- identify the information that is needed to solve a problem;
- select or describe the next step or a missing step in a problem-solving situation;
- match informal language to mathematical language or symbols;
- identify the question that is being asked or answered;
- draw a conclusion by investigating patterns and/or sets of examples and nonexamples. A nonexample, or counterexample, proves a general statement to be false;
- understand that nonsensical words may be used to label sets of examples and/or nonexamples; and
- choose the correct supporting information for a given conclusion.

Objective 6 Sample Items

1 Identify the equation below that models $a^b a^c = a^{b+c}$.

A $3^2 \cdot 3^4 = 9^6$

B $3 + 3 + 3 + 3 + 3 + 3 = 3^6$

C $3 \cdot 3 + 3 \cdot 3 \cdot 3 \cdot 3 = 3^6$

D* $3^2 \cdot 3^4 = 3^6$

2 Manny made a rectangular garden in his backyard. The garden was 24 feet long and 10 feet wide. Manny used $\frac{1}{3}$ of the garden space to grow vegetables. He built a 3-foot-high fence around the garden to keep his dog out of the garden. Determine which of the following questions could NOT be answered with the information provided.

A What was the perimeter of the garden?

B What was the total area of the garden?

C* What was the volume of dirt in the garden?

D What was the area of space used for growing vegetables?

3 $\angle KSD$ and $\angle DSM$ are supplementary angles. If the measure of $\angle KSD$ is 71°, what is the measure of $\angle DSM$?

A* 109°, because the sum of the measures of supplementary angles is 180°

B 71°, because the measures of supplementary angles are equal

C 19°, because the sum of the measures of supplementary angles is 90°

D 289°, because the sum of the measures of supplementary angles is 360°

4 It will cost $15,000 for 40 students in a school band to travel to the state fair. The school has agreed to pay 75% of the cost of this trip. The parents of the band members have planned a fund-raiser to raise the remaining amount. How much money do the parents need to raise for each student?

A $80.00

B* $93.75

C $187.50

D $281.25

Objective 6 Sample Items

5 Mr. Yamamoto plans to have new tile installed in his house. The company that will do the work will charge him the following prices for materials and labor.

Materials and Labor	Cost
Tile per square foot	$3.49 plus 9% tax
Laying tile per square foot	$2.25

If Mr. Yamamoto has 1,400 square feet of tile installed in his house, which table could show his total cost for the work?

A

Materials and Labor	Cost
$1{,}400 \times 3.49$	$4,886.00
$1{,}400 \times 2.25$	$3,150.00
Total cost	$8,036.00

B*

Materials and Labor	Cost
$(1{,}400 \times 3.49) + (1{,}400 \times 3.49 \times 0.09)$	$5,325.74
$1{,}400 \times 2.25$	$3,150.00
Total cost	$8,475.74

C

Materials and Labor	Cost
$1{,}400 \times 3.49 \times 0.09$	$439.74
$1{,}400 \times 3.49$	$4,886.00
Total cost	$5,325.74

D

Materials and Labor	Cost
$(1{,}400 \times 3.49) + (1{,}400 \times 3.49 \times 0.09)$	$5,325.74
$(1{,}400 \times 2.25) + (1{,}400 \times 2.25 \times 0.09)$	$3,433.50
Total cost	$8,759.24

Note: Students should recognize that problems may involve more than one step. For example, this problem involves area and percent.