ISAT

Idaho Standards Achievement Tests

Spring 2010

Study Guide

Grade 10 Mathematics

Table of Contents

Introduction

Purpose of this Document

This document is being made available to Idaho School Districts for the purpose of assisting in the preparation of students for the Grade 10 Mathematics ISAT. In Fall 2009, high school course-specific standards were completed, superseding the former grade-level specific standards. However, Grade 10 Standards remain in place to determine the content for the Mathematics ISAT, which is also part of the graduation requirement for students in Idaho. This document will address questions regarding the Grade 10 ISAT, and it also includes a document that aligns the Grade 10 standards to the Algebra I and Geometry standards. Practice test items and tips for helping students succeed are also included in this study guide. Parts of this document are meant to be shared with students and parents.

Mathematics Assessment

The Grade 10 mathematics assessment of the ISAT is composed of items that address standards, goals, and objectives. The goals and objectives for each grade are distributed among five reporting categories: Number and Operation; Concepts and Principles of Measurement; Concepts and Language of Algebra and Functions; Concepts and Principles of Geometry; and Data Analysis, Probability, and Statistics.

Assessment Responsibilities

The responsibility of assessment has been moved to the State Department of Education as of July 1, 2009. In the past it has been housed at the State Board of Education. Please note this change and direct any ISAT questions to Scott Cook at scook@sde.idaho.gov.

If there are any math-specific questions, please direct those to Cindy Johnstone at cmjohnstone@sde.idaho.gov.

Idaho Content Standards
Grade 10 Mathematics
Alignment Document and Test Blueprint

The 10th Grade ISAT will remain unchanged as the new course-specific standards are implemented. Therefore, this document serves as a resource for teachers to make a smooth transition to the use of course-specific standards. The Grade 10 Standards determine the assessed content for the 10th Grade ISAT. The Grade 10 Standards with the content limits can be found at www.sde.idaho.gov/contentstandards/mathstandards.asp.

The Grade 10 Standards are addressed in the Grade 8, Algebra I, and Geometry standards. This guide correlates the objectives being tested on the 10th Grade ISAT to the Grade 8 (8.M), Algebra I (AI), and Geometry (G) standards. The percentages shown in the left column indicate the distribution of questions as indicated on the ISAT Grade 10 Test Blueprint.

Standard	Goal	10th Grade Objective	Corresponding Objectives
1. Number and Operation (13-18% of 10th Grade ISAT questions address this standard.)	1.1 Understand and use numbers.	10.M.1.1.1 Apply properties of rational numbers.	8.M.3.2.1 AI.1.3.1
		10.M.1.1.2 Use positive and negative numbers, absolute value, fractions, decimals, percentages, and scientific notation, including application in real-world situations.	8.M.1.1.2 8.M.1.1.4 AI.1.1.1 AI.1.1.2
		10.M.1.1.3 Apply properties of exponents.	8.M.1.2.3 AI.1.3.1
		10.M.1.1.4 Identify exact and approximate roots without simplification.	8.M.1.2.4 AI.1.1.1 AI.1.2.1
		10.M.1.1.5 Solve problems using number theory concepts (factors, multiples, primes).	8.M.1.1.5
		10.M.1.1.6 Use appropriate vocabulary.	Not assessed on ISAT.
	1.2 Perform computations accurately.	10.M.1.2.1 Use the order of operations and perform operations with rational numbers.	8.M.1.2.4 AI.1.3.1
	1.3 Estimate and judge reasonableness of results.	10.M.1.3.1 Apply number sense to everyday situations and judge reasonableness of results.	Not assessed on ISAT.
		10.M.1.3.2 Identify that error accumulates in a computation when there is rounding.	Not assessed on ISAT.

Standard	Goal	10th Grade Objective	Corresponding Objectives
2. Concepts and Principles of Measurement (13-16% of 10th Grade ISAT questions address this standard.)	2.1 Understand and use customary and metric measurements.	10.M.2.1.1 Given the formulas, find the circumference, perimeter, or area of triangles, circles, and quadrilaterals, the volume of spheres, non-oblique prisms, cylinders, and cones, and the surface area of spheres, non-oblique prisms, cylinders, and right square-based pyramids.	8.M.2.1.4 G.2.2.1
		10.M.2.1.2 Solve problems involving circumference, perimeter, or area of triangles, circles, and rectangles.	8.M.2.1.4 8.M.2.1.6 G.2.2.1
	2.2 Apply the concepts of rates, ratios, and proportions.	10.M.2.2.1 Use rates, ratios, proportions, map scales, and scale factors (one- and two-dimensional) in problem-solving situations.	8.M.2.2.1 8.M.2.2.2 AI.2.2.1 AI.3.3.1 G.4.1.2
		10.M.2.2.2 Apply concepts of rates and direct and indirect measurements.	Not assessed on ISAT.
		10.M.2.2.3 Construct equivalent units, comparable units, and conversions.	8.M.2.3.1 AI.2.2.1
	2.3 Apply dimensional analysis.	10.M.2.3.1 Use customary and metric units and their relationship to one another and to real world applications involving length, area, capacity, weight, time, and temperature.	8.M.2.3.1 AI.2.2.1
	2.4 Apply appropriate techniques and tools to determine measurements.	10.M.2.4.1 Determine and use appropriate units.	8.M.2.2.2 G.2.1.1
		10.M.2.4.2 Approximate error in measurement situations.	Not assessed on ISAT.
3. Concepts and Language of Algebra and Functions (27-31% of 10th Grade ISAT questions address this standard.)	3.1 Use algebraic symbolism as a tool to represent mathematical relationships.	10.M.3.1.1 Represent mathematical relationships using variables, expressions, linear equations and inequalities.	8.M.3.1.2 AI.3.2.1
	3.2 Evaluate algebraic expressions.	10.M.3.2.1 Use appropriate procedures for manipulating and simplifying algebraic expressions involving variables, integers, and rational numbers.	8.M.3.1.1 8.M.3.2.2 8.M.3.2.3 AI.1.3.1
	3.3 Solve algebraic equations and inequalities.	10.M.3.3.1 Use appropriate procedures to solve multi-step, first-degree equations and inequalities; such as $3(2x - 5) = 5x + 7$ or $3(2x - 5) > 5x + 7$.	8.M.3.3.1 AI.3.2.2
		10.M.3.3.2 Differentiate between linear and non-linear equations and graphs.	AI.3.1.2

Standard	Goal	10th Grade Objective	Corresponding Objectives
3. Concepts and Language of Algebra and Functions (continued)	3.4 Solve simple linear systems of equations.	10.M.3.4.1 Use appropriate procedures to solve linear systems of equations involving two variables; such as x + y = 7 and 2x + 3y = 21.	AI.3.2.2
	3.5 Understand the concept of functions.	10.M.3.5.1 Given graphs, charts, ordered pairs, mappings, or equations, determine whether a relation is a function.	Not assessed on ISAT.
		10.M.3.5.2 Evaluate functions written in functional notation.	Not assessed on ISAT.
		10.M.3.5.3 Given a function, identify domain and range.	Not assessed on ISAT.
	3.6 Use patterns to represent problems.	10.M.3.6.1 Model and solve real-world phenomena using multi-step, first degree, single variable equations and inequalities, linear equations, and two-variable linear systems of equations.	8.M.3.1.2 AI.3.2.1 AI.3.2.2
		10.M.3.6.2 Use graphs and sequences to represent and solve problems.	8.M.3.5.1 8.M.3.6.1 AI.3.1.1 AI.5.2.2
4. Concepts and Principles of Geometry (18-22% of 10th Grade ISAT questions address this standard.)	4.1 Apply concepts of size, shape, and spatial relationships.	10.M.4.1.1 Recognize and apply congruency and similarity of two-dimensional figures.	8.M.4.1.5 G.4.1.3
		10.M.4.1.2 Recognize and use similarity as it relates to size variations in two- and three-dimensional objects.	8.M.4.1.5 G.4.1.1 G.4.1.2 (Include three-dimensional figures to align with 10M.4.1.2.)
	4.2 Apply the geometry of right triangles.	10.M.4.2.1 Given the Pythagorean Theorem, calculate missing side lengths of right triangles without simplifying radicals.	G.2.2.2
	4.3 Apply graphing in two dimensions.	10.M.4.3.1 Identify attributes of the Cartesian Coordinate System, such as quadrants, origin, and axes.	8.M.4.3.1 AI.3.1.1
		10.M.4.3.2 Graph scatter plots and identify informal trend lines (e.g., eyeball fit lines).	8.M.5.2.1 AI.5.2.2
		10.M.4.3.3 Identify positive and negative correlations.	Not assessed on ISAT.

Standard	Goal	10th Grade Objective	Corresponding Objectives
4. Concepts and Principles of Geometry (continued)	4.4 Represent and graph linear relationships.	10.M.4.4.1 Create graphs and equations for linear relationships.	Not assessed on ISAT.
		10.M.4.4.2 Represent linear relationships using tables, graphs, and mathematical symbols.	8.M.3.3.2 8.M.5.2.1 AI.3.1.1 AI.3.2.1
		10.M.4.4.3 Interpret attributes of linear relationships such as slope, rate of change, and intercepts.	8.M.3.3.2 AI.3.4.1 G.3.1.1
	4.5 Using reasoning skills.	10.M.4.5.1 Use logic to make and evaluate mathematical arguments.	AI.5.2.2 G.4.1.3
5. Data Analysis, Probability, and Statistics (18-22% of 10th Grade ISAT questions address this standard.)	5.1 Understand data analysis.	10.M.5.1.1 Analyze and interpret tables, charts, and graphs, including scatter plots, multiple broken line graphs, and box-and-whisker plots.	8.M.5.1.1 AI.5.2.1 (Include box-and-whisker plots to align with 10M.5.1.1.)
	5.2 Collect, organize, and display data.	10.M.5.2.1 Collect, organize, and display data in tables, charts, and graphs.	8.M.5.2.1 AI Standard 5 Introductory Paragraph.
	5.3 Apply simple statistical measurements.	10.M.5.3.1 Interpret and use basic statistical concepts, including mean, median, mode, range, and distribution of data, including outliers.	8.M.5.3.1 8.M.5.3.2
		10.M.5.3.2 Make predictions and draw conclusions based on statistical measures.	AI.5.2.1
	5.4 Understand basic concepts of probability.	10.M.5.4.1 Find probabilities based on dependent, independent, and compound events.	8.M.5.4.2 8.M.5.5.1 Dependent compound events are not assessed on the ISAT.
		10.M.5.4.2 Contrast experimental and theoretical probability.	8.M.5.5.1
	5.5 Make predictions or decisions based on data.	10.M.5.5.1 Make predictions based on randomness, chance, equally likely events, and probability.	8.M.5.4.2 8.M.5.5.1
		10.M.5.5.2 Use appropriate tools/technology to conduct simulations and employ graphical models to make predictions or decisions based on data.	Not assessed on ISAT.
		10.M.5.5.3 Design, conduct, and interpret results of statistical experiments.	Not assessed on ISAT.

Grade 10 Mathematics ISAT Proficiency Level Descriptors

Advanced

Tenth grade students typically performing at the Advanced level consistently demonstrate a thorough understanding of grade-level mathematics. They use algebraic properties and the numeration system, measurement concepts related to a variety of two- and three-dimensional figures, rates, proportions, ratios, scale factors, and map scales in challenging situations, logic to make and evaluate more involved mathematical arguments, and probability concepts involving complex situations in order to solve real-world problems. Students model real-world situations using challenging geometric concepts and data displays. Students show the ability to consistently perform challenging calculations, convert units of measurement, solve complex equations, inequalities, and systems of equations, apply the Pythagorean theorem, and make predictions as a way to demonstrate their understanding of the relationships between mathematics and the world around them.

Proficient

Tenth grade students typically performing at the Proficient level demonstrate a general understanding of grade-level mathematics. They use algebraic properties and the numeration system, measurement concepts related to two- and three-dimensional figures, rates, proportions, ratios, scale factors, and map scales, logic to make and evaluate mathematical arguments, and theoretical and experimental probability in order to solve real-world problems. Students model real-world situations using geometric concepts, linear and non-linear relationships, and data displays. Students show the ability to adequately perform calculations, apply dimensional analysis, distinguish between various attributes of the Cartesian coordinate system, represent, simplify, and solve equations, inequalities, and systems of equations, use the Pythagorean theorem, and make predictions as a way to demonstrate their understanding of the relationships between mathematics and the world around them.

Basic

Tenth grade students typically performing at the Basic level demonstrate a limited understanding of grade-level mathematics. They demonstrate limited use of algebraic properties and the numeration system, measurement concepts related to simple two- and three-dimensional figures, rates, proportions, ratios, scale factors, and map scales, and rudimentary concepts of probability involving common situations in an attempt to solve real-world problems. Students model basic real-world situations using some geometric concepts and simple data displays. Students show the ability to perform simple calculations, convert some units of measurement, recognize some attributes of the Cartesian coordinate system, and represent, simplify, and solve some simple equations and inequalities in an attempt to demonstrate their understanding of the relationships between mathematics and the world around them.

Depth of Knowledge

Items are written and then aligned to one of the Depth of Knowledge levels described below. This is done so that each student's knowledge level on various topics can be assessed. There are no level 4 questions in the ISAT because those require extended responses.

Level 1 (Recall) includes the recall of information such as a fact, definition, term, or a simple procedure, as well as performing a simple algorithm or applying a formula. That is, in mathematics, a one-step, well-defined, and straight algorithmic procedure should be included at this lowest level. Other key words that signify Level 1 include "identify," "recall," "recognize," "use," and "measure." Verbs such as "describe" and "explain" could be classified at different levels, depending on what is to be described and explained.

Level 2 (Skill/Concept) includes the engagement of some mental processing beyond a habitual response. A Level 2 assessment item requires students to make some decisions as to how to approach the problem or activity, whereas Level 1 requires students to demonstrate a rote response, perform a well-known algorithm, follow a set procedure (like a recipe), or perform a clearly defined series of steps. Keywords that generally distinguish a Level 2 item include "classify," "organize," "estimate," "make observations," "collect and display data," and "compare data." These actions imply more than one step. For example, to compare data requires first identifying characteristics of objects or phenomena and then grouping or ordering the objects. Some action verbs, such as "explain," "describe," or "interpret," could be classified at different levels depending on the object of the action. For example, interpreting information from a simple graph, or reading information from the graph, also are at Level 2. Interpreting information from a complex graph that requires some decisions on what features of the graph need to be considered and how information from the graph can be aggregated is at Level 3. Level 2 activities are not limited only to number skills, but may involve visualization skills and probability skills. Other Level 2 activities include noticing or describing non-trivial patterns, explaining the purpose and use of experimental procedures; carrying out experimental procedures; making observations and collecting data; classifying, organizing, and comparing data; and organizing and displaying data in tables, graphs, and charts.

Level 3 (Strategic Thinking) requires reasoning, planning, using evidence, and a higher level of thinking than the previous two levels. In most instances, requiring students to explain their thinking is at Level 3. Activities that require students to make conjectures are also at this level. The cognitive demands at Level 3 are complex and abstract. The complexity does not result from the fact that there are multiple answers, a possibility for both Levels 1 and 2, but because the task requires more demanding reasoning. An activity, however, that has more than one possible answer and requires students to justify the response they give would most likely be at Level 3.

Other Level 3 activities include drawing conclusions from observations; citing evidence and developing a logical argument for concepts; explaining phenomena in terms of concepts; and deciding which concepts to apply in order to solve a complex problem.

Level 4 (Extended Thinking) requires complex reasoning, planning, developing, and thinking, most likely over an extended period of time. The extended time period is not a distinguishing factor if the required work is only repetitive and does not require applying significant conceptual understanding and higher-order thinking. For example, if a student has to take the water temperature from a river each day for a month and then construct a graph, this would be classified as a Level 2. However, if the student is to conduct a river study that requires taking into consideration a number of variables, this would be a Level 4. At Level 4, the cognitive demands of the task should be high and the work should be very complex. Students should be required to make several connections—relate ideas *within* the content area or *among* content areas—and have to select one approach among many alternatives on how the situation should be solved, in order to be at this highest level. Level 4 activities include designing *and* conducting experiments and projects; developing and proving conjectures, making connections between a finding and related concepts and phenomena; combining and synthesizing ideas into new concepts; and critiquing experimental designs.

SOURCE

Webb, N.L. (2002). *Alignment Study in Language Arts, Mathematics, Science, and Social Studies of State Standards and Assessments for Four States*. State Collaborative on Assessment & State Standards (SCASS). Technical Issues in Large-Scale Assessment (TILSA): University of Wisconsin, Wisconsin Center for Education Research.

Tips For Students Taking the Mathematics ISAT

Read Everything and Take Your Time

Read all of the directions, the questions, and the answer options carefully. Skim reading is not appropriate for a mathematics assessment. Look for keywords that help you focus on what the question is asking. Underline or highlight keywords or numbers in order to make them stand out. Draw pictures or diagrams, if you need to, to help yourself see how parts of the question relate to each other. Be sure to look at the Mathematics Reference Sheet if the question requires the use of a formula or conversion. Take your time when answering the questions. Forty percent of errors on math tests are due to errors in reading!

Eliminate Answer Options

Start by eliminating answers that couldn't be correct. Some of the answer options may distract you from the correct answer, as they contain common mathematical mistakes or misconceptions. If you think you know the answer but don't see it as one of the answer options, go back and check your work. After carefully considering the answer options that remain, choose the answer option that best answers the question.

Do the Easy Questions First

Answer any question that you know the answer to first. Skip the harder questions and go back to them later, as you may remember something or see something in another question that may help you. When you go back to the harder questions, you may find that some are easier than others. Do the easier questions before trying the harder ones.

Check Your Work

Once you have completed all of the test questions for each part, go back through and check your work one more time before moving on to the next part or finishing the test. Carefully reread each question to make sure you have understood it correctly, and check each calculation.

Answer All Questions

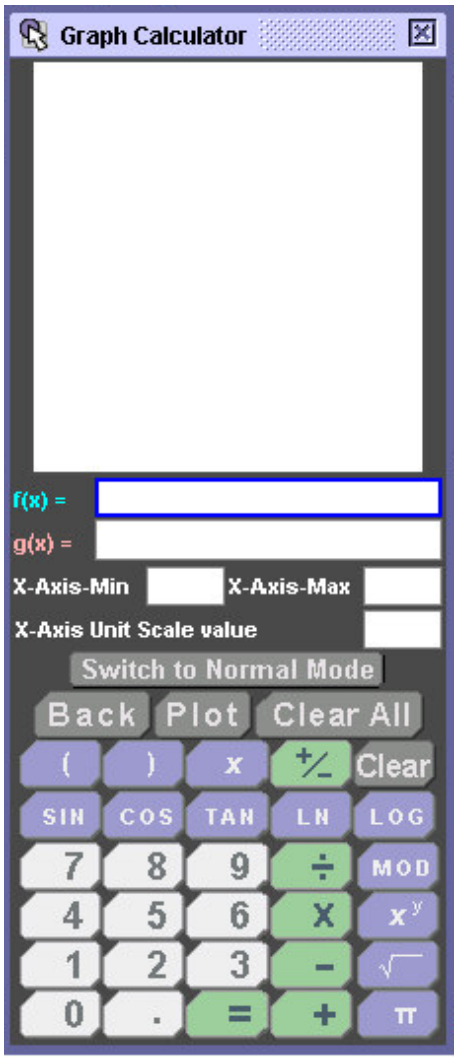
After you have answered as many questions as you can using the first four tips, answer any remaining questions by guessing. There is no penalty for guessing. Make sure you answer all of the questions.

Calculator Use

Students should be familiar with the procedures for using a graphing calculator prior to the test administration. Practice tests are available so that students can practice using the calculator. Student tutorials can be found at http://isat.caltesting.org/tutorials/index.html.

Various calculators handle raising a negative number to a power in different ways. In order to properly use the online graphing calculator available on the ISAT, the following procedures should be used. If you mean to raise a negative number to a power, place the negative inside the parentheses. For example, negative 3 to the second power would be (−3)^2. The result will be positive 9. If you mean to take the negative of a number raised to a power, place the negative outside the parentheses. For example, the negative of 3 to the second power would be −(3^2). The result will be negative 9.

If you get a calculator error message while taking the ISAT, that only means you have made a calculator error and not necessarily a mathematical error.



Mathematics Reference Sheet – Grade 10

Shape	Area	Circumference
Circle	$A = \pi r^2$	$C = \pi d = 2\pi r$
Triangle	$A = \frac{1}{2}bh$	**Perimeter**
Rectangle	$A = lw$	$P = 2l + 2w$
Trapezoid	$A = \frac{1}{2}h(b_1+b_2)$	
Parallelogram	$A = bh$	

Key	
b = base	w = width
B = area of base	d = diameter
h = height	r = radius
l = length	ℓ = slant height
Use 3.14 for π	

3-dimensional Shape	Volume	Total Surface Area
Rectangular Prism	$V = lwh$	$SA = 2(lw) + 2(hw) + 2(lh)$
Square Pyramid	$V = \frac{1}{3}l^2h$	$SA = 4(\frac{1}{2}l\ell) + l^2 = 2l\ell + l^2$
Sphere	$V = \frac{4}{3}\pi r^3$	$SA = 4\pi r^2$
Right Cylinder	$V = \pi r^2 h$	$SA = 2\pi rh + 2\pi r^2$
Triangular Prism	$V = Bh$	
Right Circular Cone	$V = \frac{1}{3}\pi r^2 h$	
Rectangular Pyramid	$V = \frac{1}{3}lwh$	

Formulas

Distance, rate, and time
d = distance, r = rate, t = time

$d = rt$

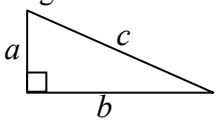
Simple interest
p = principal, r = rate, t = time

$I = prt$

Slope-intercept form of an equation of a line, where m is the slope of the line and b is the y-intercept

$y = mx + b$

Pythagorean Theorem



$a^2 + b^2 = c^2$

Conversions

1 yard (yd) = 3 feet (ft) = 36 inches (in.)

1 mile (mi) = 1,760 yards (yd) = 5,280 feet (ft)

1 cup = 8 fluid ounces (fl oz)

1 pint (pt) = 2 cups

1 quart (qt) = 2 pints (pt)

1 gallon (gal.) = 4 quarts (qt)

1 pound (lb) = 16 ounces (oz)

1 ton = 2,000 pounds (lb)

1 meter (m) = 100 centimeters (cm)

1 meter (m) = 1,000 millimeters (mm)

1 kilometer (km) = 1,000 meters (m)

1 liter (l) = 1,000 milliliters (ml)

1 liter (l) = 1,000 cubic centimeters (cu. cm)

1 gram (g) = 1,000 milligrams (mg)

1 kilogram (kg) = 1,000 grams (g)

Test Item Structure

Use the table below to answer the question. — Introductory Text

Locker Rental Fees — Graphic

Month	Cost
1	$7.00
2	$11.00
3	$15.00
4	$19.00

Dawn rented a storage locker for 6 months. The rate increase remains constant. How much did it cost Dawn to rent the locker? — Stem

Answer Options

A. $23.00 Distractor

B. $27.00 Correct

C. $33.00 Distractor

D. $42.00 Distractor

Sample Test Questions with Annotations

1. The volume of a cube-shaped container is 30 cubic centimeters. The length of one edge of the cube is $\sqrt[3]{30}$. Which is **closest** to the length, in centimeters, of one edge of the cube?

   A. 3

   B. 5

   C. 10

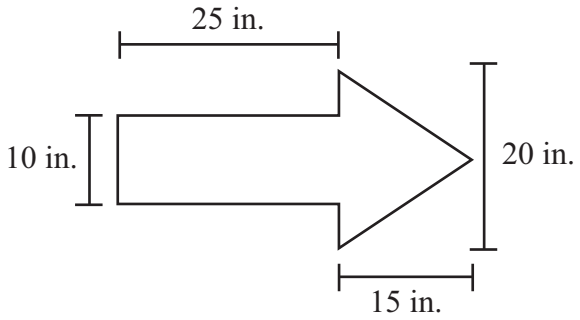
   D. 15

Standard: Number and Operation
Objective: 1.1.4
10.M.1.1.4 Identify exact and approximate roots without simplification.
Content Limit: Perfect and non-perfect square roots limited to those whose exact or approximate root can be found through the use of perfect squares through 15^2. Perfect and non-perfect cube roots limited to those whose exact or approximate root can be found through the use of perfect cubes through 5^3.
Depth of Knowledge: 2

This item requires students to determine the closest integer to the cube root of 30. Instead of finding the cube root, option B is finding the square root closest to 30. Option C has students dividing 30 by 3 instead of finding the cube root. Option D shows two misconceptions, confusing square root and cube root, and dividing by 2 instead of finding the square root of 30. To find the cube root of a number, *n*, a student must determine which number multiplied by itself three times will give the product, *n*. In the case of the number 30, it is not a number that has an integer cube root. Therefore the student must determine two consecutive perfect cubes, one less than 30 and one greater than 30. The numbers 27 and 64 are those two numbers because $3 \times 3 \times 3 = 27$ and $4 \times 4 \times 4 = 64$. Since 30 is much closer to 27 than 64, the cube root of 30 will also be closer to 27 than 64. Thus option A, 3, is the correct answer.

2. **Use the picture below to answer the question.**

Traffic Lane Arrow



The picture shows a drawing of an arrow painted in the traffic lane of a road. What is the area, in square inches, of the arrow?

A. 275

B. 325

C. 400

D. 550

Standard: Concepts and Principles of Measurement
Objective: 2.1.2
10.M.2.1.2 Solve problems involving circumference, perimeter, or area of triangles, circles, and rectangles.
Content Limit: Items may be set in either real-world or mathematical contexts. Graphics should be used in most of these items. Pi (π) may be left in the answer.
Depth of Knowledge: 3

This item requires students to find the area of a compound shape. The arrow is made up of a rectangle, with dimensions of 10 inches and 25 inches, and a triangle, with a height of 15 inches and a base of 20 inches. The area of the rectangle is $25 \times 10 = 250$ square inches. The area of the triangle is $\frac{1}{2} \times 20 \times 15 = 150$ square inches. The sum of the two areas is the area of the arrow, $250 + 150 = 400$ square inches, which is option C.

3. **Use the system of equations below to answer the question.**

$$5x + 2y = 250$$
$$x + y = 80$$

Which procedure can be used to determine the value of y in the system of equations?

A. Substitute $x = 80 - y$ into the top equation and solve for y.

B. Determine the mean value of the y-intercepts of the equations.

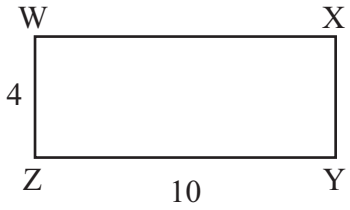
C. Add $-5x - 5y = 80$ to the top equation and solve for y.

D. Determine which equation has the greatest slope.

Standard: Concepts and Language of Algebra and Functions
Objective: 3.4.1
10.M.3.4.1 Use appropriate procedures to solve linear systems of equations involving two variables; such as x + y = 7 and 2x + 3y = 21.
Content Limit: Systems must have only one solution, that solution being an integer solution.
Depth of Knowledge: 2

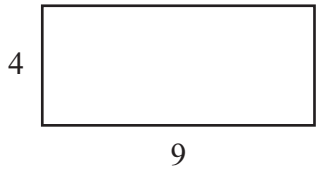
This item requires students to choose the procedure which can be used to solve for one of the variables in a system of equations. Options B and D use other mathematical procedures, finding the mean and the greatest slope, that are not applicable in finding solutions to a system of equations. Multiplying one equation by a number that is the opposite of a coefficient in the other equation, as in option C, is a procedure that could be used to solve a system of equations but all values in the equation must be multiplied by −5, and 80 was not. Option A is the correct answer because the equation $x = 80 - y$ is derived from the second equation, and substituting it into the top equation eliminates the variable x from the equation, making it possible to solve for y.

4. **Use the figure below to answer the question.**



Which rectangle is similar to rectangle WXYZ?

A.



B.

C.

D.

Standard: Concepts and Principles of Geometry
Objective: 4.1.1
10.M.4.1.1 Recognize and apply congruency and similarity of two-dimensional figures.
Content Limit: Items assessing the concept of similarity and congruency should focus on the conditions that cause figures to be similar or congruent. This includes the concept that angles opposite congruent sides of an isosceles triangle are congruent, but does not include formal proofs for ASA, SS, or SAS.
Depth of Knowledge: 1

This item requires students to apply what they know about similarity in two-dimensional figures in order to determine the rectangle that is similar to rectangle WXYZ. In order to be similar, one rectangle's dimensions must be proportional to another rectangle's dimensions. In option A, the width stays the same while the length decreases by 1. In options C and D, the width increases by a factor of 1.25; however, neither length increases by that same factor. Option C adds 1 to both the length and width. Adding to the dimensions is a common misconception for students struggling with their proportional reasoning skills. The rectangles in options A, C, and D are not similar to rectangle WXYZ. In option B, both the length and width increase by a factor of 1.5, $4 \times 1.5 = 6$ and $10 \times 1.5 = 15$. Thus option B is the correct answer.

5. The median age of a group of people was 42. The range of their ages was 25. Which shows a possible minimum and maximum age for the group of people?

   A. 12 and 37

   B. 22 and 64

   C. 25 and 42

   D. 35 and 60

Standard: Data Analysis, Probability, and Statistics
Objective: 5.3.2
10.M.5.3.2 Make predictions and draw conclusions based on statistical measures.
Content Limit: Items may be set in a real-world or mathematics context.
Depth of Knowledge: 2

This item requires students to apply their knowledge about statistical measures, specifically median and range, to make a prediction about the characteristics of a set of numbers. The median of a set of numbers is the middle number of a set of ordered numbers. The range describes the difference between the highest and lowest number in a set of numbers. Option A can be eliminated since the number 42 is not in the set of numbers. In option B, the range of numbers is 42, making one of the two conditions of the set of numbers not true. The set of numbers in option C uses the two numbers given in the problem and therefore has a range of 17 eliminating this option as well. Option D has a range of 25 and 42 is a number that occurs between 35 and 60, making it possible to be the median number. Thus option D is the correct answer.

Practice Test Questions

Students can work to solve these ten practice questions, two from each standard, and then check their answers on page 28.

1. Air is pumped into a balloon. Its volume changes at a rate of $(b^9)^3$ per minute. Which is another way to write $(b^9)^3$?

   A. b^3

   B. b^6

   C. b^{12}

   D. b^{27}

2. The area of a floor that will be used for storing wood is represented by the expression below.

   $$\frac{3}{4}(4 + 2)^2$$

   What is the value of the expression?

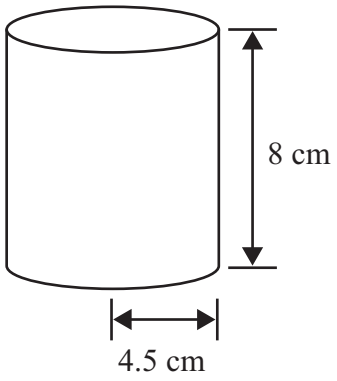
   A. 7

   B. 9

   C. 25

   D. 27

3. **Use the figure below to answer the question.**



A can in the shape of a cylinder is shown. It has a radius of 4.5 centimeters (cm) and height of 8 centimeters. What is the volume, in cubic centimeters, of the can? (Use 3.14 for π.)

A. 113.04

B. 226.08

C. 508.68

D. 904.32

4. A car traveled 10,560 feet in 2 minutes. Which expression can be used to determine the speed of the car in miles per hour?

A. $\frac{10{,}560 \text{ ft}}{2 \text{ min}} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{1 \text{ mi}}{5{,}280 \text{ ft}}$

B. $\frac{10{,}560 \text{ ft}}{2 \text{ min}} \times \frac{1 \text{ hr}}{60 \text{ min}} \times \frac{1 \text{ mi}}{5{,}280 \text{ ft}}$

C. $\frac{10{,}560 \text{ ft}}{2 \text{ min}} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{5{,}280 \text{ ft}}{1 \text{ mi}}$

D. $\frac{10{,}560 \text{ ft}}{2 \text{ min}} \times \frac{1 \text{ hr}}{60 \text{ min}} \times \frac{5{,}280 \text{ ft}}{1 \text{ mi}}$

5. **Use the equation below to answer the question.**

$$x + 2(x - 24) = 78$$

What is the value of x?

A. 10

B. 18

C. 34

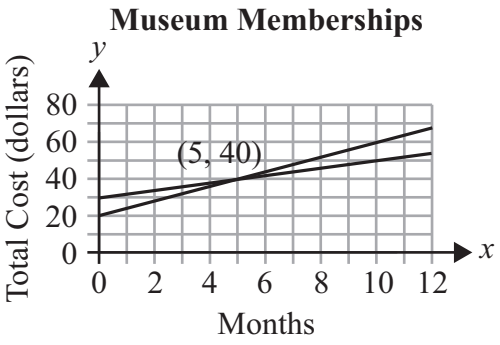
D. 42

6. **Use the system of equations below to answer the question.**

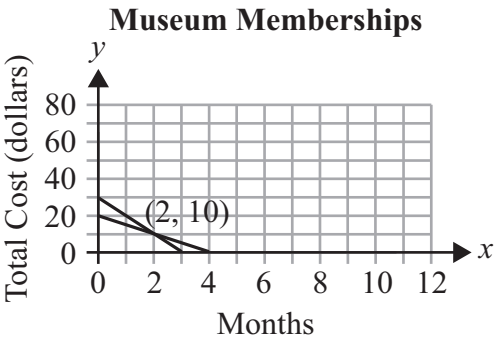
$$y = 4x + 20$$
$$y = 2x + 30$$

The system of equations shows the cost after several months for two different types of museum memberships. Which graph represents the system of equations?

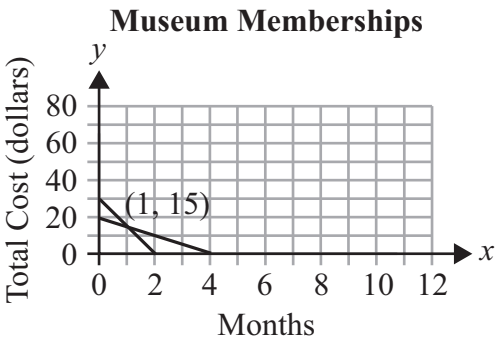
A.



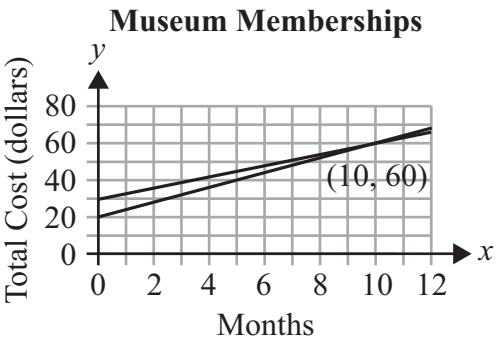
B.



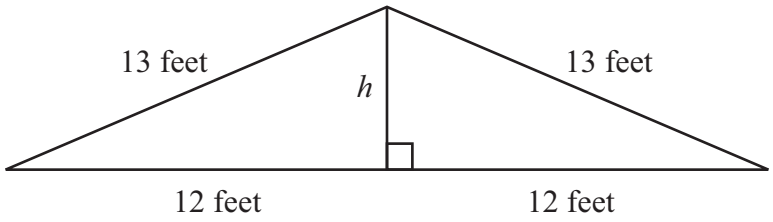
C.



D.



7. **Use the figure below to answer the question.**



The picture shows the dimensions of the roof of a house. What is the height, *h*, to the nearest tenth of a foot?

A. 3.3

B. 5.0

C. 11.0

D. 17.7

8. Charlene earns money clearing driveways with a snowblower. She uses the equation $p = 15d - 30$ to calculate her profit, p, based on how many driveways, d, she clears. Which table represents Charlene's equation?

A. **Charlene's Snow Removal**

Number of Driveways	Profit ($)
0	0
1	15
2	30
3	45
4	60

B. **Charlene's Snow Removal**

Number of Driveways	Profit ($)
0	15
1	30
2	45
3	60
4	75

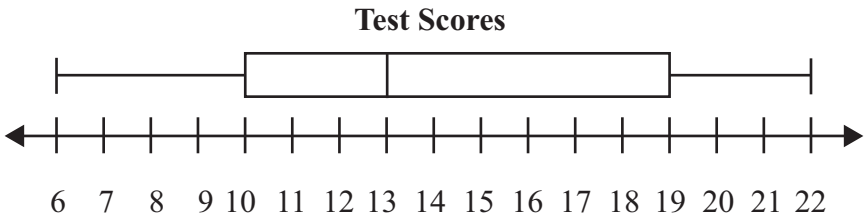
C. **Charlene's Snow Removal**

Number of Driveways	Profit ($)
0	−15
1	0
2	15
3	30
4	45

D. **Charlene's Snow Removal**

Number of Driveways	Profit ($)
0	−30
1	−15
2	0
3	15
4	30

9. **Use the box-and-whisker plot below to answer the question.**



The box-and-whisker plot shows students' scores on a 25-point test. Which statement must be true based on the box-and-whisker plot?

A. The lowest score is 10.

B. The most common score is 13.

C. Half of the students scored higher than 19.

D. The highest score is 22.

10. **Use the table below to answer the question.**

Gerald's Coin Tossing Experiment

Outcome	Number of Occurrences
Dime (Heads); Quarter (Heads)	16
Dime (Heads); Quarter (Tails)	9
Dime (Tails); Quarter (Heads)	15
Dime (Tails); Quarter (Tails)	10

Gerald tossed a dime and a quarter at the same time for 50 trials. He recorded the number of times each coin came up heads or tails in the table shown. What are the theoretical and experimental probabilities of both coins coming up tails?

A. theoretical = $\frac{1}{4}$; experimental = $\frac{1}{10}$

B. theoretical = $\frac{1}{2}$; experimental = $\frac{1}{10}$

C. theoretical = $\frac{1}{4}$; experimental = $\frac{1}{5}$

D. theoretical = $\frac{1}{2}$; experimental = $\frac{1}{5}$

Answer Key for Practice Test Questions

Item Sequence	Key	Standard	Objective	Depth Of Knowledge	Calculator
1	D	Number and Operation	1.1.3	2	Yes
2	D	Number and Operation	1.2.1	2	No
3*	C	Concepts and Principles of Measurement	2.1.1	2	Yes
4	A	Concepts and Principles of Measurement	2.3.1	2	Yes
5	D	Concepts and Language of Algebra and Functions	3.3.1	2	Yes
6	A	Concepts and Language of Algebra and Functions	3.6.1	2	Yes
7*	B	Concepts and Principles of Geometry	4.2.1	2	Yes
8	D	Concepts and Principles of Geometry	4.4.2	2	Yes
9	D	Data Analysis, Probability, and Statistics	5.1.1	2	Yes
10	C	Data Analysis, Probability, and Statistics	5.4.2	2	Yes

*Note: Formulas for practice test questions are provided on the Mathematics Reference Sheet on page 14.

ISAT

Idaho Standards Achievement Tests

Grade 10
Mathematics Study Guide