Standard #: MAFS.912.A-CED.1.2

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Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. ★

Subject Area: Mathematics

Grade: 912

Domain-Subdomain: Algebra: Creating Equations

Cluster: Level 2: Basic Application of Skills & Concepts

Cluster: Create equations that describe numbers or relationships. (Algebra 1 - Major Cluster) (Algebra 2 - Supporting Cluster) -
Clusters should not be sorted from Major to Supporting and then taught in that order. To do so would strip the coherence of the mathematical ideas and miss the opportunity to enhance the major work of the grade with the supporting clusters.

Date Adopted or Revised: 02/14

Content Complexity Rating: Level 2: Basic Application of Skills & Concepts - More Information

Date of Last Rating: 02/14

Status: State Board Approved

Assessed: Yes

TEST ITEM SPECIFICATIONS

Item Type(s): This benchmark may be assessed using: EE item(s)

Also assesses:
MAFS.912.A-REI.3.5

MAFS.912.A-REI.3.6

MAFS.912.A-REI.4.12

Assessment Limits :
Items that require the student to write a system of equations using a real-world context are limited to a system of 2 x 2 linear equations.
Items that require the student to solve a system of equations are limited to a system of 2 x 2 linear equations.

Items that require the student to graph a system of equations or inequalities to find the solution are limited to a 2 x 2 system.

Calculator :
Neutral

Clarification :
Students will identify the quantities in a real-world situation that should be represented by distinct variables.
Students will write a system of equations given a real-world situation.

Students will graph a system of equations that represents a realworld context using appropriate axis labels and scale.

Students will solve systems of linear equations.

Students will provide steps in an algebraic proof that shows one equation being replaced with another to find a solution for a system of equations.

Students will identify systems whose solutions would be the same through examination of the coefficients.

Students will identify the graph that represents a linear inequality. Students will graph a linear inequality.

Students will identify the solution set to a system of inequalities.

Students will identify ordered pairs that are in the solution set of a system of inequalities.

Students will graph the solution set to a system of inequalities

Stimulus Attributes :
Items assessing A-CED.1.2 must be placed in a real-world context.
Items assessing A-REI.3.5 must be placed in a mathematical context.

Items assessing A-REI.3.6 and A-REI.4.12 may be set in a real-world or mathematical context.

Items may result in infinitely many solutions or no solution

Response Attributes :
Items may require the student to choose an appropriate level of accuracy.
Items may require the student to choose and interpret the scale in a graph.

Items may require the student to choose and interpret units.

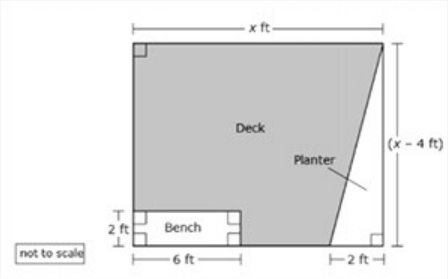
For A-CED.1.2, items may require the student to apply the basic modeling cycle.

SAMPLE TEST ITEMS (1)

Test Item #: Sample Item 1

Question:

Phillip is designing a deck, where the length of the deck, x, is at least 8 feet (ft). He wants the width to be 4 ft less than the length. The deck will have a bench and a planter, and the remaining area of the deck will be painted. The dimensions for each are shown in the diagram.



Let A represent the painted area, in square feet, of the deck.

Click on the blank to enter an expression in terms of x that completes the equation for A.

Difficulty: N/A

Type: EE: Equation Editor

Related Courses

Course Number	Course Title
1200310:	Algebra 1 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1200320:	Algebra 1 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1200330:	Algebra 2 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1200340:	Algebra 2 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1200370:	Algebra 1-A (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1200380:	Algebra 1-B (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1200400:	Intensive Mathematics (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1206330:	Analytic Geometry (Specifically in versions: 2014 - 2015 (course terminated))
1200500:	Advanced Algebra with Financial Applications (Specifically in versions: 2014 - 2015 (course terminated))
1200410:	Mathematics for College Success (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1200700:	Mathematics for College Readiness (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
7912070:	Access Liberal Arts Mathematics (Specifically in versions: 2014 - 2015, 2015 - 2018, 2018 - 2019, 2019 and beyond (current))
7912080:	Access Algebra 1A (Specifically in versions: 2014 - 2015, 2015 - 2018, 2018 - 2019, 2019 and beyond (current))
7912090:	Access Algebra 1B (Specifically in versions: 2014 - 2015, 2015 - 2018, 2018 - 2019, 2019 and beyond (current))
1200315:	Algebra 1 for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1200335:	Algebra 2 for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 - 2019 (course terminated))
1200375:	Algebra 1-A for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1200385:	Algebra 1-B for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
7912100:	Fundamental Algebraic Skills (Specifically in versions: 2013 - 2015, 2015 - 2017 (course terminated))
1207300:	Liberal Arts Mathematics 1 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
7912075:	Access Algebra 1 (Specifically in versions: 2014 - 2015, 2015 - 2018, 2018 - 2019, 2019 and beyond (current))
7912095:	Access Algebra 2 (Specifically in versions: 2016 - 2018, 2018 - 2019, 2019 and beyond (current))
1200387:	Financial Algebra (Specifically in versions: 2016 and beyond (current))

Related Access Points

Access Point

Access Points Number	Access Points Title
MAFS.912.A-CED.1.AP.2a:	Graph equations in two or more variables on coordinate axes with labels and scales.

Related Resources

Problem-Solving Task

Name	Description
	This task presents a simple but mathematically interesting game whose solution is a challenging exercise in creating

Bernardo and Sylvia Play a Game:	and reasoning with algebraic inequalities. The core of the task involves converting a verbal statement into a mathematical inequality in a context in which the inequality is not obviously presented, and then repeatedly using the inequality to deduce information about the structure of the game.
Cash Box:	The given solutions for this task involve the creation and solving of a system of two equations and two unknowns, with the caveat that the context of the problem implies that we are interested only in non-negative integer solutions. Indeed, in the first solution, we must also restrict our attention to the case that one of the variables is further even. This aspect of the task is illustrative of mathematical practice standard MP4 (Model with mathematics), and crucial as the system has an integer solution for both situations, that is, whether or not we include the dollar on the floor in the cash box or not.
Global Positioning System I:	This question examines the algebraic equations for three different spheres. The intersections of each pair of spheres are then studied, both using the equations and thinking about the geometry of the spheres.
Regular Tessellations of the Plane:	This task examines the ways in which the plane can be covered by regular polygons in a very strict arrangement called a regular tessellation. These tessellations are studied here using algebra, which enters the picture via the formula for the measure of the interior angles of a regular polygon (which should therefore be introduced or reviewed before beginning the task). The goal of the task is to use algebra in order to understand which tessellations of the plane with regular polygons are possible.

Lesson Plan

Name	Description
Compacting Cardboard:	Students with investigate the amount of space that could be saved by flattening cardboard boxes. The analysis includes linear graphs and regression analysis along with discussions of slope and a direct variation phenomenon.
Cup-Activity: writing equations from data:	This is a great lab activity that allows students to develop a true understanding of slope as a rate of change. Students are active and involved and must use higher order thinking skills in order to answer questions. Students work through an activity, measuring heights of cups that are stacked. Students them determine a "rate of change - slope". Students are then asked to put this into slope-intercept form. The important part here is in their determining the y-intercept of the equation. Students then take this further and finally attempt to create a linear inequality to determine how many cups, stacked vertically, will fit under a table.
Equations of Circles 1:	This lesson unit is intended to help you assess how well students are able to use the Pythagorean theorem to derive the equation of a circle and translate between the geometric features of circles and their equations.
Exploring Slope Intercept Form with Graphs and Physical Activity:	Students will work in pairs and compose three different linear equations in slope intercept form. They will discover and describe how different values for m and b correspond to specific characteristics of the graph. After graphing lines on graph paper, they will do a physical activity involving graphing.
Home Lines:	Students will create an outline of a room and write equations of the lines that contain the sides of the room. This lesson provides an opportunity to review and reinforce writing equations of lines (including horizontal and vertical lines) and to apply the relationship between the slopes of parallel and perpendicular lines.
Movie Theater MEA:	This MEA deals with creating a business plan for a movie theater, based on provided data. Students will first determine the best film to show, and then based on that decision, will create a model of ideal sales. Students will need to create equations and graph them to visually represent relationships.
Optimization Problems: Boomerangs:	This lesson is designed to help students develop strategies for solving optimization problems. Such problems typically involve scenarios where limited resources must be used to greatest effect, as in, for example, the allocation of time and materials to maximize profit.
Picture This!:	This is a short unit plan that covers position/time and velocity/time graphs. Students are provided with new material on both topics, will have practice worksheets, and group activities to develop an understanding of motion graphs.
Solving Linear Equations in Two Variables:	This lesson unit is intended to help you assess how well students are able to formulate and solve problems using algebra and, in particular, to identify and help students who have the following difficulties solving a problem using two linear equations with two variables and interpreting the meaning of algebraic expressions.
The Gumball Roll Lab:	This lesson is on motion of objects. Students will learn what factors affect the speed of an object through experimentation with gumballs rolling down an incline. The students will collect data through experimenting, create graphs from the data, interpret the slope of the graphs and create equations of lines from data points and the graph. They will understand the relationship of speed and velocity and be able to relate the velocity formula to the slope intercept form of the equation of a line.

Tutorial

Name	Description
Constructing an Equations with Two Variables - Yoga Plan:	This video provides a real-world scenario and step-by-step instructions to constructing equations using two variables. Possible follow-up videos include *Plotting System of Equations - Yoga Plan, Solving System of Equations with Substitution - Yoga Plan, and Solving System of Equations with Elimination - Yoga Plan.*
Example: Evaluating expressions with 2 variables:	Evaluating Expressions with Two Variables
Graphing Quadratic Equations:	This tutorial will help the learners to graph the equation of the quadratic function using the coordinates of the vertex of a parabola adn its x- intercepts.

Educational Software / Tool

Name	Description
Free Graph Paper:	A variety of graph paper types for printing, including Cartesian, polar, engineering, isometric, logarithmic, hexagonal, probability, and Smith chart.

Video/Audio/Animation

Name	Description
Graphing Lines 1:	Khan Academy video tutorial on graphing linear equations: "Algebra: Graphing Lines 1"
Point-Slope Form:	Th point-slope form of the equation for a line can describe any non-vertical line in the Cartesian plane, given the slope and the coordinates of a single point which lies on the line.
Systems of Linear Equations in Two Variables:	The points of intersection of two graphs represent common solutions to both equations. Finding these intersection points is an important tool in analyzing physical and mathematical systems.
Two Point Form:	The two point form of the equation for a line can describe any non-vertical line in the Cartesian plane, given the coordinates of two points which lie on the line.
Using Systems of Equations Versus One Equation:	When should a system of equations with multiple variables be used to solve an Algebra problem, instead of using a single equation with a single variable?

Formative Assessment

Name	Description
Hotel Swimming Pool:	Students are asked to write an equation in two variables given a verbal description of the relationship among the variables.
Loss of Fir Trees:	Students are asked to sketch a graph that depicts the exponential decline in the population of fir trees in a forest.
Model Rocket:	Students are asked to graph a function in two variables given in context.
Tech Repairs:	Students are asked to write an equation in two variables from a verbal description.
Tech Repairs Graph:	Students are asked to graph an equation in two variables given in context.
Tee It Up:	Students are asked to write an equation in three variables from a verbal description.
Trees in Trouble:	Students are asked to write a function that represents an annual loss of 3% per year.

Virtual Manipulative

Name	Description
Linear Equations:	This resource provides guided practice for writing and graphing linear functions.

Unit/Lesson Sequence

Name	Description
Linear Functions and Slope:	This session on linear function and slope contains five parts, multiple problems and videos, and interactive activities geared to help students recognize and understand linear relationships, explore slope and dependent and independent variables in graphs of linear relationships, and develop an understanding of rates and how they are related to slopes and equations. Throughout the session, students use spreadsheets to complete the work, and are encouraged to think about the ways technology can aid in teaching and understanding. The solutions for all problems are given, and many allow students to have a hint or tip as they solve. There is even a homework assignment with four problems for students after they have finished all five parts of the session.
Sample Algebra 1 Curriculum Plan Using CMAP:	This sample Algebra 1 CMAP is a fully customizable resource and curriculum-planning tool that provides a framework for the Algebra 1 Course. The units and standards are customizable and the CMAP allows instructors to add lessons, worksheets, and other resources as needed. This CMAP also includes rows that automatically filter and display Math Formative Assessments System tasks, E-Learning Original Student Tutorials and Perspectives Videos that are aligned to the standards, available on CPALMS. Learn more about the sample Algebra 1 CMAP, its features and customizability by watching the following video: Using this CMAP To view an introduction on the CMAP tool, please click here. To view the CMAP, click on the "Open Resource Page" button above; be sure you are logged in to your iCPALMS account.

To use this CMAP, click on the "Clone" button once the CMAP opens in the "Open Resource Page." Once the CMAP is cloned, you will be able to see it as a class inside your iCPALMS My Planner (CMAPs) app.

To access your My Planner App and the cloned CMAP, click on the iCPALMS tab in the top menu.

All CMAP tutorials can be found within the iCPALMS Planner App or at the following URL: http://www.cpalms.org/support/tutorials_and_informational_videos.aspx

Lesson Study Resource Kit

Name	Description
Motion and Forces:	This Lesson Study Resource Kit was adapted from a 2013 BioScopes physical science summer institute. It features a STEM-integrated unit plan that consists of resources and activities aligned to a unit of instruction on that employs Vernier LabQuest probeware in an investigation of Newton's Laws that complies with the Florida Standards for mathematics and the NGSSS for science for grades 9-12.

Perspectives Video: Professional/Enthusiast

Name	Description
Revolutionize Wing Design with Equations and Statistics:	Brandon Reese, a PhD candidate in the FAMU-FSU College of Engineering, discusses the significance of both Bernoulli's equation and statistical analysis for the design of a "smart wing."

Perspectives Video: Teaching Idea

Name	Description
Robot Mathematics: Gearing Ratio Calculations for Performance:	A science teacher demonstrates stepwise calculations involving multiple variables for designing robots with desired characteristics.

Assessment

Name	Description
Sample 1 - High School Algebra 1 State Interim Assessment:	This is the State Interim Assessment for high school.
Sample 3 - High School Algebra 1 State Interim Assessment:	This is a State Interim Assessment for 9th-12th grades.

Teaching Idea

Name	Description
Writing Linear Functions with Tickets:	This classroom activity allows students to use teacher made and assigned traffic tickets to create linear functions. Students may also use a graphing calculator to use the table and graph features.

Student Resources

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Parent Resources

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