High School Math (Combined Version)
Claim, Target, Standard Matrix (33 CAT Item & 6 PT Items)
Compiled by Sandy Sanford 2-11-15

This Combined Matrix Covers ALL Math Claims, Targets, & Standards shown as "Tested" in 11th Gd based on Smarter Balanced Item Specifications dtd 2-4-14 & Blueprint dtd 4-21-14. It makes no effort to pace those standards year-by-year for 9th, 10th and 11th Gds. "Paced" versions are available if I'm supplied with pacing documentation.

About the CTS Matrix

Background: Smarter Balanced publishes mountains of specification information regarding Summative Assessment (SA) Claims, Targets, Standards, DOK, & Item Types/Numbers. The problem is that no published document welds together all this information in a format friendly to educators. The CTS Matrix solves that problem by populating the rows and columns in a table that emulates the design configuration of the SA.

Matrix Guide: Use the Matrix as a resource document to acquire greater understanding of the organization and composition of the Summative Assessment (SA), which is more complicated in design than previous high-stakes assessments. The four Claims are general descriptions regarding learning expectations for each grade level. In the Matrix, each Claim is displayed in a separate table with a description in the top row followed by multiple Targets underneath the parent Claim. The Targets are more specific with regard to expected learning and usually vary in description at each grade level. The SA will report results overall and for each of the four Claims.

For any Claim/Target combination, cells to the right show the tested standards, the assessed DOK level(s), the number of items tested (both Computer Adaptive Test (CAT) & Performance Task (PT), and the Item Types that may be used. Note that each Target will normally involve testing multiple standards, and any particular standard may be tested in multiple Claims and/or Targets. A section titled "Valuable Facts" follows the conclusion of the Matrix with additional pertinent information about the SA. The final pages of this document contain examples of the different Item Types.

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Table of Contents

Disclaimer: I have tried hard to make this Matrix as accurate as possible, but I'm not infallible and the information is constantly changing. I will continuously review the available sources and make corrections/updates as required and distribute the same with new Matrix dates.

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High School Math Standards Domain Abbreviations

Real Number System	
N-RN	The Real Number System
N-Q	Quantities
N-CN	The Complex Number System
N-VM	Vector and Matrix Quantities
Algebra	
A-SSE	Seeing Structure in Equations
A-APR	Arithmetic with Polynomials & Rational Expressions
A-CED	Creating Equations
A-REI	Reasoning with Equations & Inequalities
Functions	
F-IF	Interpreting Functions
F-BF	Building Functions
F-LE	Linear, Quadratic, & Exponential Models
F-TF	Trigonometric Functions
Geometry	
G-GO	Congruence
G-SRT	Similarity, Right Triangles, & Trig
G-C	Circles
G-GPE	Expressing Geometric Properties with Equations
G-GMD	Geometric Measurement & Dimension
G-MG	Modeling with Geometry
Statistics & Probability	
S-ID	Interpreting Categorical & Quantitative Data
S-IC	Making Inferences & Justifying Conclusions
S-CP	Conditional Probability
S-MD	Using Probability to Make Decisions

Item Response Type Abbreviations

(HS level examples of each item type are given in the final pages of this CTS Matrix)

MC = multiple-choice, single correct response
MS = multiple-choice, multiple choice responses
EQ = equation/numeric
TM = matching table
TI = fill-in table
DD = drag & drop
HS = hot spot
GR = graphing
ST = short text
PT = performance task

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Claim 1: CONCEPTS and PROCEDURES—Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency					
Claim 1 PRIORITY CLUSTER Targets (16 CAT Items)	**Tested Standards**	**DOK**	**# Items CAT**	**# Items PT**	**Item Response Types**
Target D—Interpret the structure of expressions	A-SSE.2	1, 2	2	0	MC, TM, DD
Target E—Write Expressions in equivalent form to solve problems	A-SSE.3, a, b, c				MC, HS, EQ
Target F—Perform arithmetic operations on polynomials	A-APR.1	2	1		EQ
Target G—Create equations that describe numbers or relationships.	A-CED.1, 2	1, 2	5		EQ, GR
Target H—Understand solving equations as a process of reasoning and explain the reasoning.	A-REI.2				MC, EQ, TM
Target I—Solve equations and inequalities in one variable.	A-REI.3, 4, a, b				MC, EQ, DD, HS, GR, TM
Target J— Represent and solve equations and inequalities graphically.	A-REI.10, 11, 12	1, 2	2		MC, MS, HS, GR, DD, EQ
Target K— Understand the concept of a function and use function notation.	F-IF.1, 3	1, 2	2		MC, MS, TM, GR
Target L— Interpret functions that arise in applications in terms of a context.	F-IF.4, 5, 6	1, 2	4		MC, MS, EQ, HS, GR
Target M— Analyze functions using different representations.	F-IF.7, a, b, c, e, 8, a, b, 9	1, 2, 3			MS, EQ, HS, TM, GR
Target N— Build a function that models a relationship between two quantities.	F-BF.1, a, 2	2			MC, EQ, TM, TI

NOTE 1: Standards are shown in abbreviated form. Detailed descriptions are available in the Common Core State Standards.

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Claim 1 SUPPORTING CLUSTER Targets (6 Items)	Tested Standards	DOK	# Items CAT	# Items PT	Item Response Types
Target O—Define trigonometric ratios and solve problems involving right triangles.	G-SRT.6, 7, 8	1, 2	2		MC, MS, EQ, TM
Target P— Summarize, represent, and interpret data on a single count or measurement variable.	S-ID.1, 2, 3	2	2		MC, HS, TM, DD
Target A—Extend the properties of exponents to rational exponents.	N-RN.2				MC, EQ
Target B—Use properties of rational and irrational numbers.	N-RN.3	1, 2	1	0	MS, TM
Target C— Reason quantitatively and use units to solve problems.	N-Q.1		1		MC, MS, DD, TM

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Claim 2: PROBLEM SOLVING—Students can solve a range of well-posed problems in pure and applied mathematics, making productive use of knowledge and problem-solving strategies.
Claim 4: MODELING AND DATA ANALYSIS—Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.

NOTE: Claims 2 & 4 are combined for the purpose of reporting and item development.

(5 CAT Items & 4 PT Items for Claims 2 & 4 Together)

Claim 2: PROBLEM SOLVING (2 Items CAT & 1 or 2 Items PT)	**Tested Standards**	**DOK**	**# Items CAT**	**# Items PT**	**Item Response Types**
Target A—Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace.	N-Q.1, 2, 3 A-SSE.1, 2, 3, 4 A-CED.1, 2, 3, 4 A-REI.2, 3, 4. 5, 6, 7,10, 11, 12 F-IF.1, 2, 3, 4, 5, 6, 7, 8, 9 F-BF.1, 2 G-SRT.6, 7, 8 S-ID.7, 8, 9 S-CP.1, 2, 3, 4, 5	2, 3	1	1 or 2	MC, MS, EQ, DD, HS, GR, TM, TI **ST (PTs only)**
Target B—Select and use appropriate tools strategically.		1, 2, 3	1		
Target C—Interpret results in the context of a situation.					
Target D—Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas).					

NOTE 1: Standards are shown in abbreviated form. Detailed descriptions are available in the Common Core State Standards.
NOTE 2: The standards & item types listed for Claims 2, 3, & 4 can apply to ANY of the Targets (except as noted)

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Claim 4: MODELING AND DATA ANALYSIS (3 Items CAT & 2 or 3 Items PT)	**Tested Standards**	**DOK**	**# Items CAT**	**# Items PT**	**Item Response Types**
Target A—Apply mathematics to solve problems arising in everyday life, society, and the workplace.	N-Q.1, 2, 3 A-SSE.3, 4 A-CED.1, 2, 3, 4 A-REI.1, 2, 3, 4, 5, 6, 7, 8, 9 F-IF.4, 5, 6, 7, 8, 9 F-BF.1, 2 F-TF.5 G-GMD.3 G-MG.1, 2, 3 S-ID.1, 2, 3, 4, 5, 6 S-IC.1, 3, 4, 5, 6	2, 3	1	2 or 3	MC, MS, EQ, DD, HS, GR, TM, TI **ST (PTs & Tgt B in CAT only)**
Target D— Interpret results in the context of a situation.					
Target B— Construct, autonomously, chains of reasoning to justify mathematical models used, interpretations made, and solutions proposed for a complex problem.		2, 3, 4	1		
Target E— Analyze the adequacy of and make improvements to an existing model or develop a mathematical model of a real phenomenon.					
Target C— State logical assumptions being used.		1, 2	1		
Target F— Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas).					
Target G— Identify, analyze and synthesize relevant external resources to pose or solve problems. **(Measured in PT Only)**		3, 4	0		

NOTE 1: Standards are shown in abbreviated form. Detailed descriptions are available in the Common Core State Standards.

NOTE 2: The standards & item types listed for Claims 2, 3, & 4 can apply to ANY of the Targets (except as noted)

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Claim 3—COMMUNICATING REASONING—Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others. **(6 items CAT, 2 Items PT)**					
Claim 3: COMMUNICATING REASONING	**Tested Standards**	**DOK**	**# Items CAT 6 Items**	**# Items PT 2 Items**	**Item Response Types**
Target A—Test propositions or conjectures with specific examples.	N-RN.3 A-SSE.2 A-APR.1, 4, 6 A-REI.1, 2, 10, 11 F-IF.1, 5, 9 F-BF.3, 4 F-TF.1, 2, 8 G-CO.9, 10, 11 G-SRT.1, 2, 3, 4, 5	2	2 or 3	2	MC, MS, EQ, DD, HS, GR, TM, TI **ST (PTs & Tgt B on CAT only)**
Target D—Use the technique of breaking an argument into cases.					
Target B—Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures.		2, 3, 4	1 or 2		
Target E—Distinguish correct logic or reasoning from that which is flawed and—if there is a flaw in the argument—explain what it is.					
Target C—State logical assumptions being used.		2, 3, 4	2 or 3		
Target F—Base arguments on concrete referents such as objects, drawings, diagrams, and actions.					
Target G—At later grades, determine conditions under which an argument does and does not apply. (For example, area increases with perimeter for squares, but not for all plane figures.)					

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Valuable Facts

(From SBAC Blueprint dtd 4-21-14)

1. Number of items per Claim is not necessarily proportional to Claim weight for scoring
2. For the CAT portion...
    - For Claim 1, each student will receive at least 7 CAT items at DOK 2 or higher
    - For combined Claims 2 & 4, each student will receive at least 2 CAT items at DOK 3 or higher
    - For Claim 3, each student will receive at least 2 CAT items at DOK 3 or higher
3. In Grade 11 just one ST (Short Text) item on CAT (from either Claim 3 Target B or Claim 4 Target B)
4. Other ST items may be (and almost certainly will be) on the PT

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MC (Multiple Choice Item)

Which statement is correct about the values of x and y in the following equation?

$7x + xy = xy + 21$

(A) The equation is true for all ordered pairs (x, y).

(B) There are no (x, y) pairs for which this equation is true.

(C) For each value of x, there is one and only one value of y that makes the equation true.

(D) For each value of y, there is one and only one value of x that makes the equation true.

MS (Multiple Select Item)

Select **all** equations that have at least one integer solution.

- ☐ $\sqrt{4x} = 5$
- ☐ $\sqrt{3x} = 75$
- ☐ $\sqrt{x} = \frac{\sqrt{16}}{8}$
- ☐ $\sqrt{x} = x - 12$
- ☐ $\sqrt{10 - x} = x - 2$

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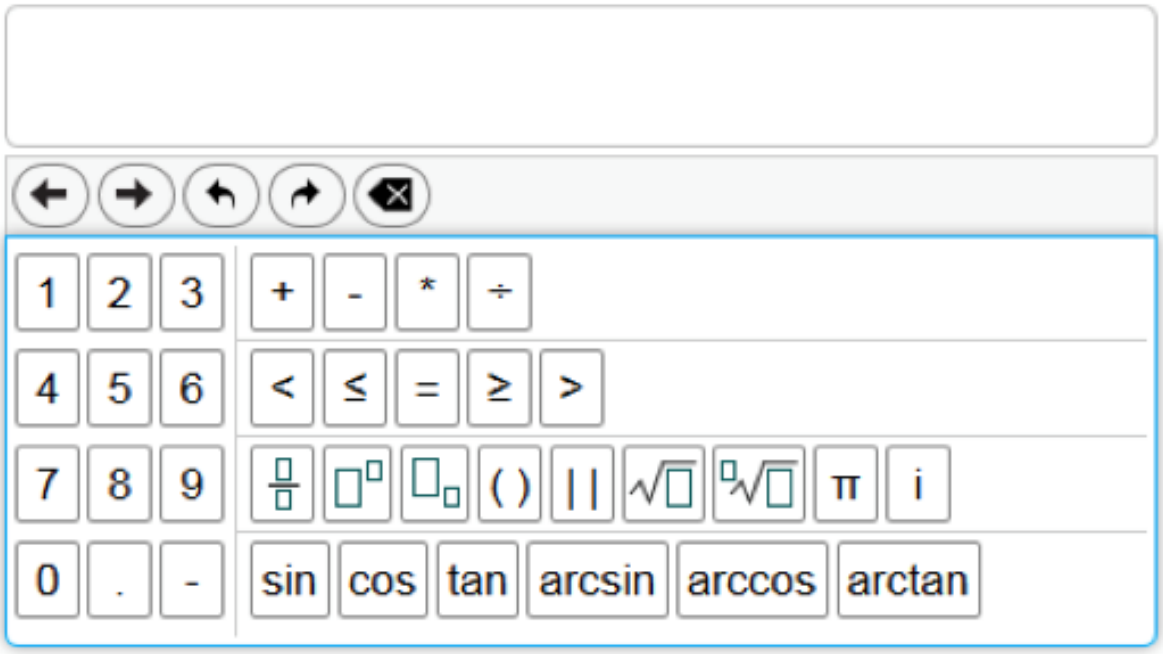
EQ (Equation/Numeric Item)—requiring a "numeric" response

Enter the value of x such that $3^{\frac{4}{5}} \cdot 3^{\frac{3}{x}} = \sqrt[5]{3^7}$ is true.



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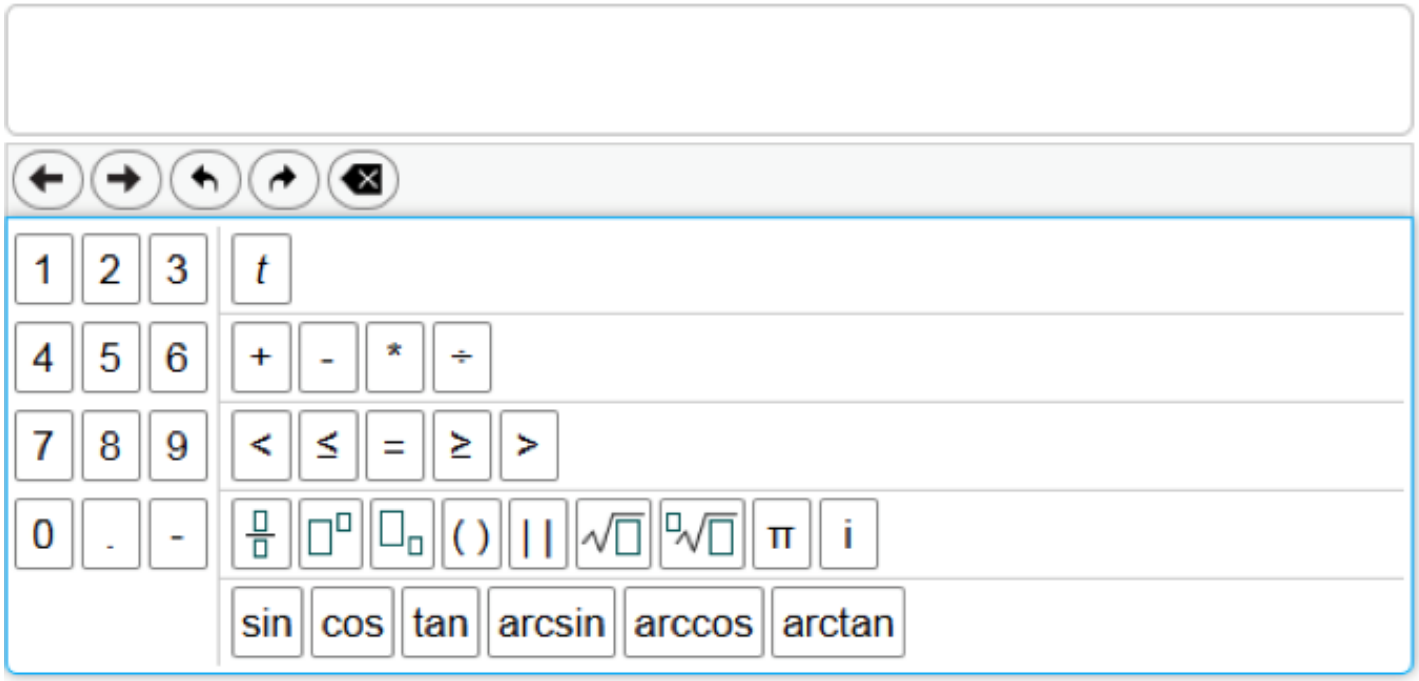
EQ (Equation/Numeric Item)—requiring an "equation" response

Jim can paint a house in 12 hours. Alex can paint the same house in 8 hours.

Enter an equation that can be used to find the time in hours, *t*, it would take Jim and Alex to paint the house together.



TM (Matching Table)

Determine whether each expression is equivalent to $(x^3 + 8)$. Select Yes or No for each expression.

	Yes	No
$(x + 8)^3$	☐	☐
$(x - 2)(x^2 + 2x + 4)$	☐	☐
$(x + 2)(x^2 - 2x + 4)$	☐	☐

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DD (Drag & Drop Item)

2029

The radius of sphere Y is twice the radius of sphere X. A student claims that the volume of sphere Y must be exactly twice the volume of sphere X.

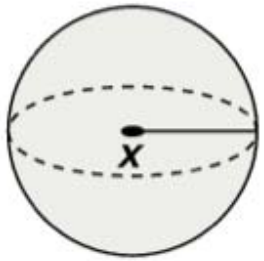
Part A: Drag numbers into the boxes to create one example to evaluate the student's claim.

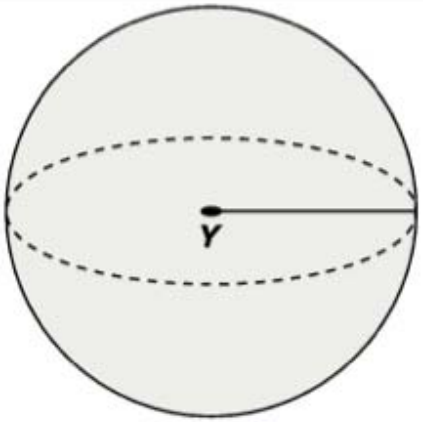
Part B: Decide whether the student's claim is true, false, or cannot be determined. Select the correct option.

0 1 2 3 4 5 6 7 8 9

Delete

Part A:





Radius = ☐ in

Volume = $\frac{4}{3}\pi$ ☐ in^3

Radius = ☐ in

Volume = $\frac{4}{3}\pi$ ☐ in^3

Part B:

True False Cannot be determined

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TI (Fill In Table)

At a local fair, the price of admission includes the opportunity for a person to spin a wheel for free ride tickets.

- Each spin of the wheel is a random event.
- The result from each spin of the wheel is independent of the results of previous spins.
- Each spin of the wheel awards tickets according to the probabilities shown below.

Spin the Wheel

1 ticket	35%
2 tickets	25%
3 tickets	20%
5 tickets	15%
10 tickets	5%

Let X be the number of tickets a person wins based on 2 spins. There are 13 possible values for X.

Some values of X are more common than others. For example, winning only 2 tickets in 2 spins is a somewhat common occurrence with probability 0.1225. It means the person wins 1 ticket on the first spin and 1 ticket on the second spin ($0.35 \bullet 0.35$). A list of the possible values of X and the corresponding probabilities for most values of X is shown below.

Fill in the three missing probability values in the table.

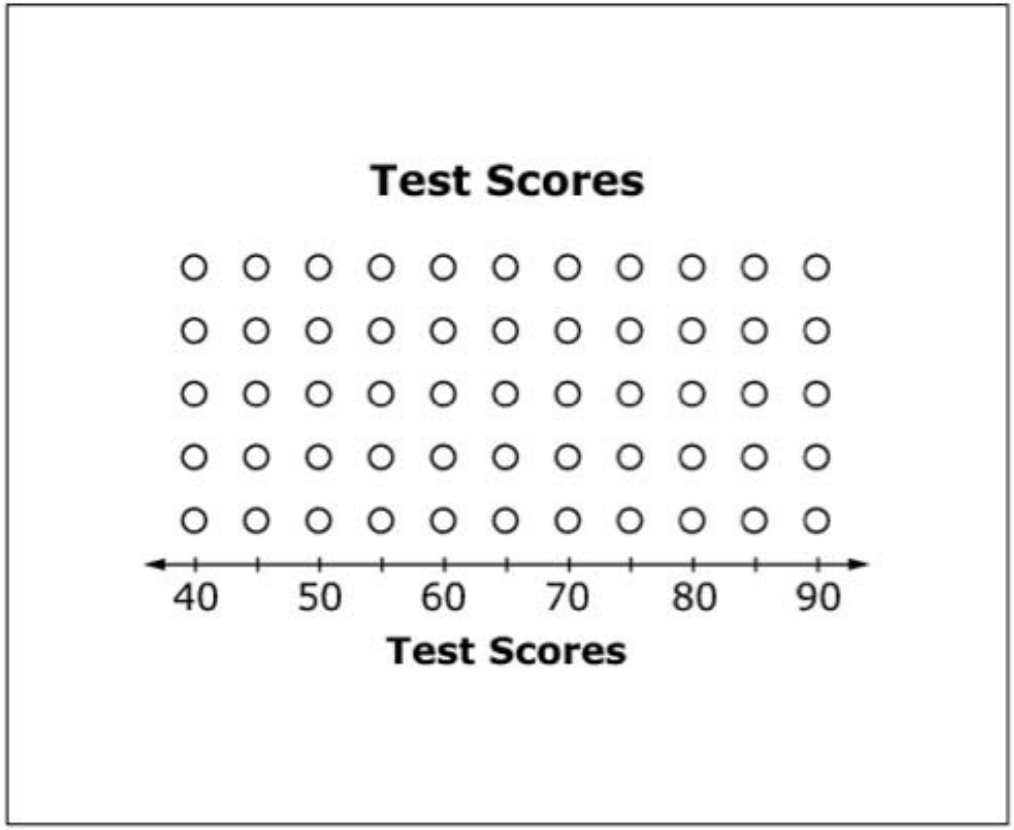
X	Probability
2	0.1225
3	0.1750
4	
5	0.1000
6	0.1450
7	0.0750
8	0.0600
10	
11	0.0350
12	0.0250
13	
15	0.0150
20	0.0025

HS (Hot Spot Item)

1951

Click above the numbers to create a dot plot for the given test scores.

90, 45, 85, 70, 85, 50, 75, 85, 65, 75, 60, 85, 80, 65, 80

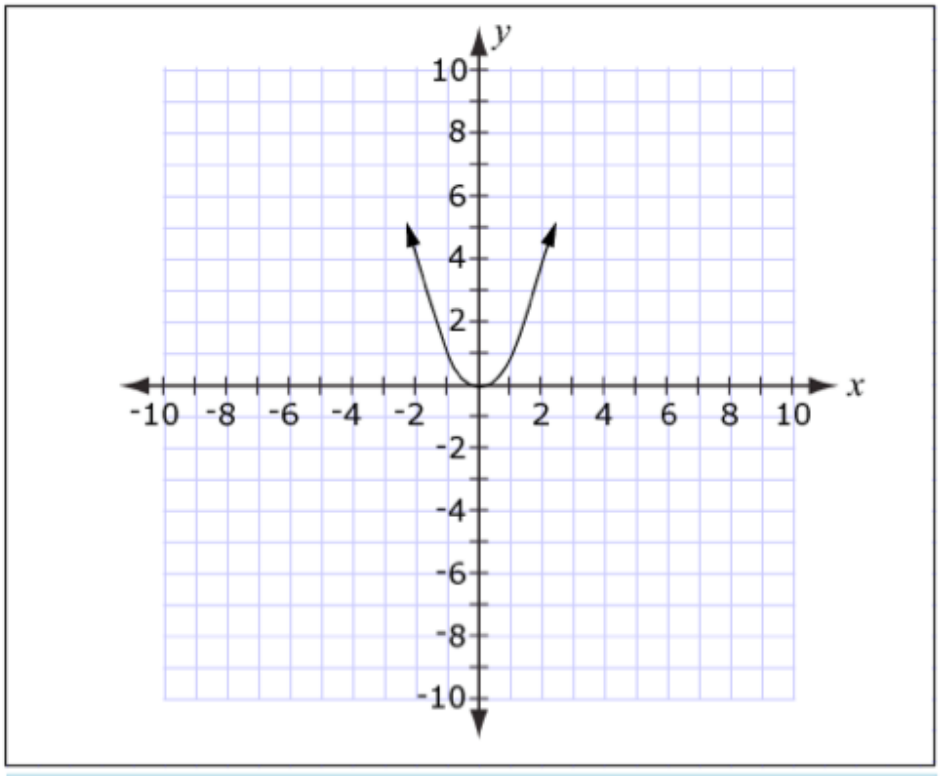


GR (Graphing Item)

1969

The graph of $y = x^2$ is shown on the grid.

Drag the graph to show the graph of $y = (x - 4)^2 + 2$.



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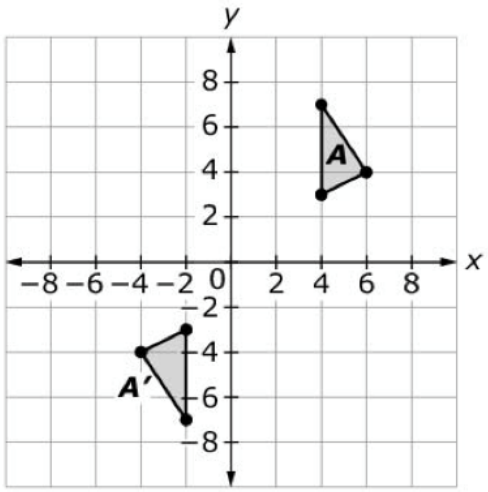
ST (Short Text Item)

José and Tina are studying geometric transformations.



José is able to move triangle A to triangle A' using the following sequence of basic transformations:

1. Reflection across the x-axis
2. Reflection across the y-axis
3. Translation two units to the right

Tina claims that the same three transformations, done in any order, will always produce the same result. Explain why Tina's claim is incorrect.