

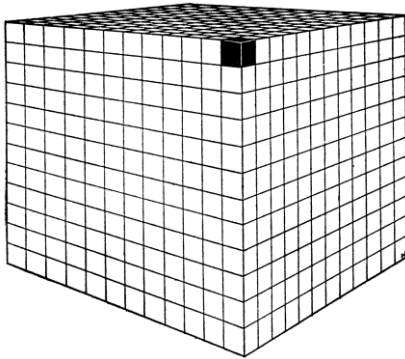
Transitioning to the Common Core State Standards

Robert Kaplinsky
August 30, 2013



COMMON CORE STATE STANDARDS FAQ

- What are the Common Core State Standards?
 - English
 - Mathematics
 - Literacy in History/Social Studies, Science, and Technical Subjects
 - Released in June 2010
 - Shifts



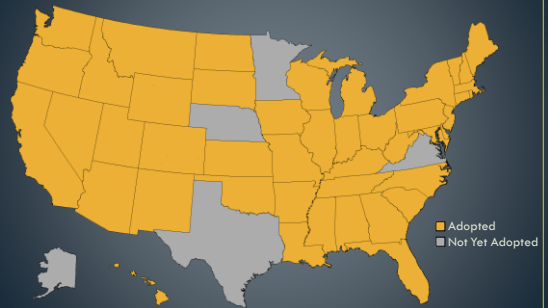
Solving Real-World Geometry Problems

High School	Middle School	Elementary School
<ul style="list-style-type: none"> • G-MG.1 – Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). • G-GMD.3 – Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. 	<ul style="list-style-type: none"> • 8.G.9 Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. • 7.G.6 – Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects. • 6.G.2 – Apply the formulas $V = lwh$ and $V = bh$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems. 	<ul style="list-style-type: none"> • 5.MD.3 – Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. • 4.MD.3 – Apply the area and perimeter formulas for rectangles in real world and mathematical problems • 3.MD.7d – Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems. • 2.MD.1 – Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes. • 1.MD.2 – Express the length of an object as a whole number of length units. • K.MD.1 – Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.

COMMON CORE STATE STANDARDS FAQ

- What are the Common Core State Standards?
- Where did they come from?
 - National Governors Association (NGA) and the Council of Chief State School Officers (CCSSO).
 - Race to the Top funding
 - “internationally benchmarked standards and assessments that prepare students for success in college and the work place.”
- Who has adopted them?

Common Core State of the States (Math)

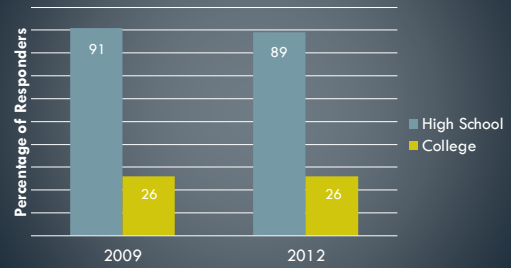


• Source: corestandards.org (as of August 22, 2013)

COMMON CORE STATE STANDARDS FAQ

- What are the Common Core State Standards?
- Where did they come from?
- Who has adopted them?
- Why do we need them?
 - What is the purpose of K-12 Ed?
 - College readiness
 - ACT National Curriculum Survey
 - Surveyed 9,937 educators

“Well” or “Very Well” Prepared for College



Source: <http://www.act.org/research/policymakers/pdf/NCS-PolicySummary2012.pdf>

COMMON CORE STATE STANDARDS FAQ

- What are the Common Core State Standards?
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- Why do we need them?
 - What is the purpose of K-12 Ed?
 - College readiness
 - Career readiness
 - Association of American Colleges and Universities survey
 - Survey over 300 employers with at least 25 employees and many new hires.

- Critical thinking and analytical reasoning skills
- Analyzing and solving complex problems
- Communicating effectively orally and in writing
- Applying knowledge and skills to real-world setting
- Working w/ numbers and understanding statistics

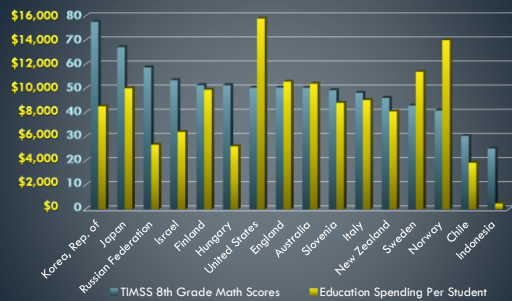
■ More ■ Less ■ Same

Source: http://www.aacu.org/leap/documents/2013_EmployerSurvey.pdf

COMMON CORE STATE STANDARDS FAQ

- What are the Common Core State Standards?
- Where did they come from?
- Who has adopted them?
- Why do we need them?
 - What is the purpose of K-12 Ed?
 - International comparison
 - Trends in International Mathematics and Science Study (TIMSS)
 - Surveyed more than 60 countries / city-states
 - Surveyed more than 20,000 US students in over 1,000 schools.

TIMSS Math Scores vs. Spending Per Student



Sources: http://timssandpirls.bce.edu/timss2011/downloads/T11_IR_M_AppendixE.pdf
http://www.oecd.org/edu/EAG%202012_e-book_EN_200912.pdf

COMMON CORE STATE STANDARDS FAQ

- What are the Common Core State Standards?
- Where did they come from?
- Who has adopted them?
- Why do we need them?
 - What is the purpose of K-12 Ed?
 - International comparison
 - Standardized across the nation
 - Resources
 - Students

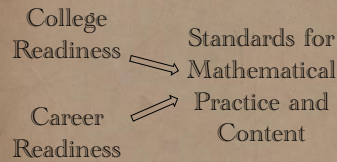
COMMON CORE STATE STANDARDS FAQ

- What are the Common Core State Standards?
- Where did they come from?
- Who has adopted them?
- Why do we need them?
- What does the research say?
 - A World of Difference article

COMMON CORE STATE STANDARDS FAQ

- What are the Common Core State Standards?
- Where did they come from?
- Who has adopted them?
- Why do we need them?
- What does the research say?
- What make up the Common Core State Standards?
 - Practice Standards
 - Content Standards

How Is It All Connected?



Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Model	Interior Dimensions										Exterior...	
	Max seating capacity	Front shoulder room (in.)	Front leg room (in.)	Front head room (in.)	Rear shoulder room (in.)	Rear leg room (in.)	Rear head room (in.)	Third shoulder room (in.)	Third leg room (in.)	Third head room (in.)	Length (in.)	Width (in.)
Acura ILX	5	55	41	2.5	50	27.5	1.5	NA	NA	NA	179	71
Acura RLX	5	59.5	NA	NA	57	NA	NA	NA	NA	NA	190	74
Acura TL	5	58	42	3.5	55.5	28.5	3	NA	NA	NA	194	74
Acura TSX	5	56.5	40.5	3.5	54.5	26.5	3	NA	NA	NA	186	73
Audi A4	5	55	41.5	3.5	54	25.5	3	NA	NA	NA	185	72
Audi A6	5	56	44	4	53	29	3	NA	NA	NA	194	74

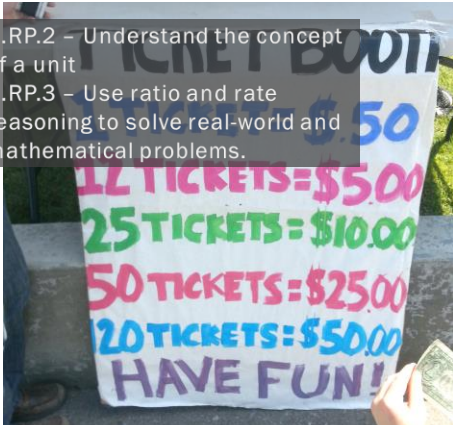
BREAKING DOWN THE STANDARDS FOR MATHEMATICAL PRACTICE



Connection to CCSS ELA

- Reading 7 - Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
- Writing 1 - Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.
- Speaking & Listening 4 - Present information, findings, and supporting evidence such that listeners can follow the line of reasoning.

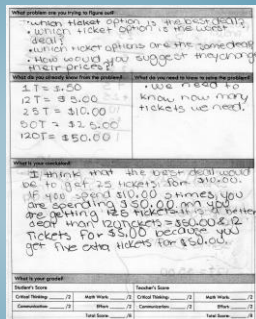
- 6.RP.2 – Understand the concept of a unit
- 6.RP.3 – Use ratio and rate reasoning to solve real-world and mathematical problems.



The Reality

- What does “best” mean?
 - 120 tickets for \$50 is “best” because you get the most tickets
 - 1 ticket for \$0.50 is “best” because you spend the least amount of money
- “What do you need to know to solve the problem?”
 - How many tickets will we use?
 - How long will we be staying there?
 - How many people are we going with?
 - How many tickets do the rides cost?
- Once they started working, they had no idea what to do.
 - They didn't realize that they could buy multiple sets of tickets.

STUDENT WORK SAMPLES



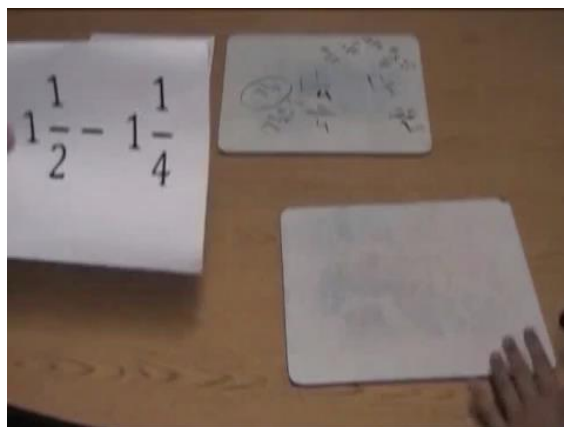
WHAT DOES IT LOOK LIKE...

- when students can work with numbers but cannot:
 - critically think
 - applying knowledge and skills to real-world settings
 - analyze and solve complex problems
- when students have procedural skill but not conceptual understanding or the ability to apply mathematics?

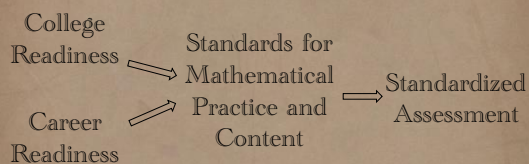
How far apart are the exits on this freeway: Jct 90 and Jefferson Blvd?

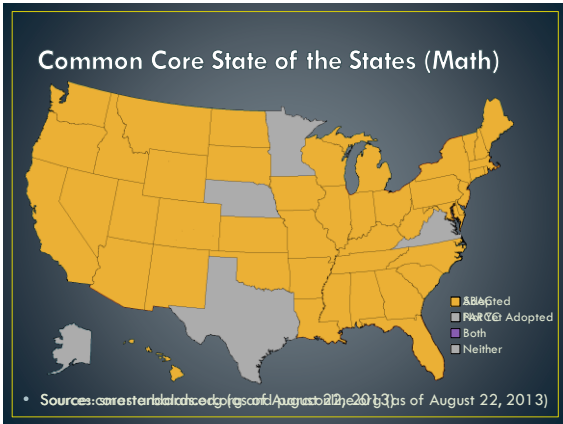


$$1\frac{1}{2} - 1\frac{1}{4}$$



How Is It All Connected?





SMARTER BALANCED ASSESSMENT

- Students in grades 3 through 8 and grade 11 will be assessed.
- Computer adaptive
- Both electronic and human scoring.
- Interim assessments
- Practice tests released on May 29th.

SMARTER BALANCED PROBLEM TYPES

- Selected-response items
 - Prompt students to select one or more responses from a set of options.

3 Look at the figure.

Each square in the figure is 1 square unit.

Which equation shows the area of this figure in square units?

A $8 + 6 + 8 + 6 = 28$ square units
 B $8 + 8 + 8 + 8 + 8 = 40$ square units
 C $6 + 6 + 6 + 6 + 6 + 6 = 42$ square units
 D $6 + 6 + 6 + 6 + 6 + 6 + 6 = 48$ square units

Source: <https://sbacpt.tds.airast.org/student/>

7 Choose all the shapes that are quadrilaterals.

Source: <https://sbacpt.tds.airast.org/student/>

21 For questions 1a-1d, choose Yes or No to show if the number 7 will make each equation true.

1a. $6 \times \square = 36$ Yes No
 1b. $8 \times \square = 64$ Yes No
 1c. $49 \div \square = 7$ Yes No
 1d. $54 \div \square = 6$ Yes No

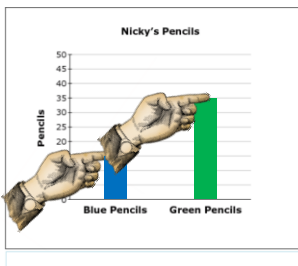
Source: <https://sbacpt.tds.airast.org/student/>

20

Nicky has 4 packs of pencils. Each pack contains 15 pencils. In each pack, 5 pencils are blue and the rest green.

Create a bar graph to show how many of each color pencil Nicky has.

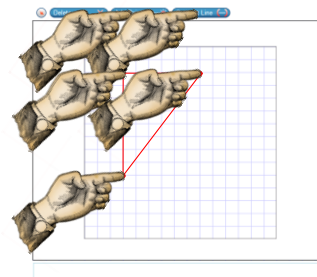
Click the graph to show where the top of the bar should go.



Source: <https://sbacpt.tds.airast.org/student/>

1

On the grid provided, draw a right triangle with whole number side lengths and a hypotenuse of 10 units. The length of the side of each square is one unit.

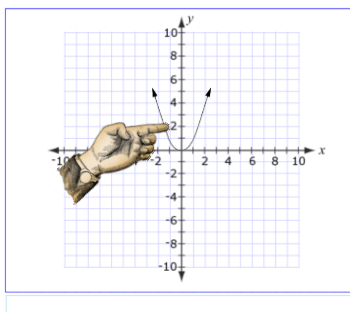


Source: <https://sbacpt.tds.airast.org/student/>

1

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

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



Source: <https://sbacpt.tds.airast.org/student/>

**SMARTER
BALANCED
PROBLEM
TYPES**

- Selected-response items
- Technology-enhanced items
- Constructed-response items
 - Students produce a text and/or numerical response in order to collect evidence about their knowledge or understanding.

Source: <http://sampleitems.smarterbalanced.org/itempreview/sbac/>

Look

For full credit (2 points):

- Student reaches the correct conclusion.
- AND
- Student provides sufficient reasoning to support this conclusion.

For partial credit (1 point):

- Student reaches the correct conclusion but does not provide sufficient reasoning to support this conclusion.
- OR
- Student does not reach the correct conclusion but provides reasoning to support this conclusion that contains a minor conceptual or computation error.

Source: <https://sbacpt.tds.airast.org/student/>

For full credit (2 points):

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Source: <https://sbacpt.tds.airast.org/student/>

**SMARTER
BALANCED
PROBLEM
TYPES**

- Selected-response items
- Technology-enhanced items
- Constructed-response items
- Performance tasks
 - Measure a student's ability to integrate knowledge and skills across multiple standards.

Source: <http://sampleitems.smarterbalanced.org/ItemPreview/sbac/>

Performance Tasks

- Elementary School: Planting Tulips
- Middle School: Taking a Field Trip
- High School: Thermometer Crickets

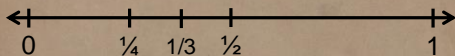
Smarter Balanced Pilot Test

- To take the SBAC pilot test, go to:
<https://sbacpt.tds.airast.org/student>

Questioning Scenarios

- The activity begins with teachers in groups of three taking the roles of teacher, student, or observer.
- The individuals playing the role of teacher and student each receive a slip of paper describing their scenario.
- The individual playing the role of observer waits to record all of the teacher's questions to the student.
- Once the activity begins, the teacher will talk to the student in the context of the scenario they read about on the slips of paper.

Where does $\frac{1}{3}$ go on the number line below?

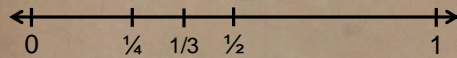


Here

Great. Do you have any questions?

No

Where does $\frac{1}{3}$ go on the number line below?



Here

Great. How did you get your answer?

Three is right in the middle of 2 and 4 so $\frac{1}{3}$ is right in the middle of $\frac{1}{2}$ and $\frac{1}{4}$.

BREAKING DOWN THE CONTENT STANDARDS

- Domain and Conceptual Categories

Domain and Conceptual Categories

K	1	2	3	4	5	6	7	8	HS
Counting & Cardinality									
Number and Operations in Base Ten						Ratios and Proportional Relationships		Number and Quantity	
	Number and Operations – Fractions				The Number System				
Operations and Algebraic Thinking						Expressions and Equations		Algebra	
							Functions	Functions	
Geometry									Geometry
Measurement and Data						Statistics and Probability		Statistics & Probability	

Source: <http://www.doe.in.gov/achievement/curriculum/resources/implementing-indianas-common-core-standards>

BREAKING DOWN THE CONTENT STANDARDS

- Domain and Conceptual Categories
- Reading the Content Standards

Domain

↓

Operations and Algebraic Thinking	4.OA
--	-------------

Use the four operations with whole numbers to solve problems.

Standards →

1. Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.
2. Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.¹
3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

Cluster


Gain familiarity with factors and multiples.

4. Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.

Generate and analyze patterns.

BREAKING DOWN THE CONTENT STANDARDS

- Domain and Conceptual Categories
- Understanding the standards




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- ILLUSTRATIONS
- K-8 STANDARDS
- HIGH SCHOOL STANDARDS
- PRACTICE STANDARDS
- FRACTIONS PROGRESSION
- FREQUENTLY ASKED QUESTIONS
- COMMUNITY
- ABOUT US
- TERMS OF USE

K-8 Standards

High School Standards

Practice Standards



Illustrative Mathematics provides guidance to states, assessment consortia, testing companies, and curriculum developers by illustrating the range and types of mathematical work that students experience in a faithful implementation of the Common Core State Standards, and by publishing other tools that support implementation of the standards.

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K	1	2	3	4	5	6	7	8
Geometry								
Measurement and Data					Statistics and Probability			
Number and Operations in Base Ten					The Number System			
Operations and Algebraic Thinking					Expressions and Equations			
Counting and Cardinality	Number and Operations—Fractions			Ratio and Proportional Relationships	Functions			



Show only illustrated standards (?)
 Reveal standards automatically (?)

K	1	2	3	4	5	6	7	8
Geometry								
Measurement and Data					Statistics and Probability			
Number and Operations in Base Ten					The Number System			
Operations and Algebraic Thinking					Expressions and Equations			
Counting and Cardinality	Number and Operations—Fractions			Ratio and Proportional Relationships	Functions			

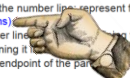
Number and Operations—Fractions

Show only illustrated standards (?)
 Reveal standards automatically (?)

Grade 3	3 NF	View all
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A. Develop understanding of fractions as numbers.

- Understand a fraction $1/b$ as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size $1/b$. (see illustrations)
- Understand a fraction as a number on the number line; represent fractions on a number line diagram. (see illustrations)
 - Represent a fraction $1/b$ on a number line diagram by marking off the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size $1/b$ and that the endpoint of the part starting at 0 locates the number $1/b$ on the number line.
 - Represent a fraction a/b on a number line diagram by marking off a lengths $1/b$ from 0. Recognize that the resulting interval has size a/b and that its



Content Standards Review

- Read your course standards
- Reference standards on illustrativemathematics.org
- Review standards for one or more grade levels above and below

Why Choose Us? Lessons

Math content expert: Robert graduated from University of California, Los Angeles (UCLA) with a Bachelor's degree in Mathematics. He has taught mathematics to students at the elementary, middle, and high school levels. As an instructor for UCLA, he also teaches math content courses to teachers.

How Can We Water All Of The Grass? How Much Money IS That?

Home Lessons Blog Speaking Services Beliefs About Contact

All 1st 2nd 3rd 4th 5th 6th 7th 8th Algebra Functions Geometry Modeling Numb & Quant Stats & Prob

How Can We Water All Of The Grass? How Much Money IS That?

Robert Kaplinsky's Problem-Based Lessons

Task Name	Concept / Skill	Standard 1	Standard 2	Standard 3	Standard 4	Std
How Can We Water All Of The Grass?	Circles, Pythagorean Theorem, trigonometric ratios	7.G.4	8.G.7	G-RT.8	G-M.1	GA
How Much Money IS That?	Volume of rectangular prism	5.M.3	5.M.4	5.M.5	5.M.5b	5A
How Much Money Should You Earn?	Exponential Growth	4.NF.2	A-SE.1	A-SE.3c	A-SE.4	AR
How Can We Water All Of The Grass?	Scale and Drawing	5.G.4	5.MF.4	5.MF.5	5.MF.5	5A
How Can We Water All Of The Grass?	Transformations (Rotations, Reflections, and Translations)	8.G.1	8.G.2	8.G.3	8.G.4	8A
How Can We Water All Of The Grass?	Unit Rates and Ratios	6.RP.2	6.RP.3	6.RP.3a	6.RP.3b	6A
How Can We Water All Of The Grass?	Fractions on a Number Line and Subtracting Fractions	3.NF.2	3.NF.3b	4.NF.2	4.NF.3a	4N
How Can We Water All Of The Grass?	Area	3.M.5	3.M.5	3.M.5	3.M.5	3A
How Many Sheets Do You Need To Break Out Of Prison?	Scientific Notation	8.EE.3	8.EE.4	8.EE.4	8.EE.4	8A
How Many Sheets Do You Need To Break Out Of Prison?	Inequalities and Measurement	3.MS.1	3.MS.1	3.MS.1	3.MS.1	3A
How Many Sheets Do You Need To Break Out Of Prison?	Money	2.MD.8	2.MD.8	2.MD.8	2.MD.8	2A
How Many Sheets Do You Need To Break Out Of Prison?	Percent Discount	7.PP.3	7.PP.3	7.PP.3	7.PP.3	7A
How Many Sheets Do You Need To Break Out Of Prison?	Percent Discount	7.PP.3	7.PP.3	7.PP.3	7.PP.3	7A
How Many Sheets Do You Need To Break Out Of Prison?	Pythagorean Theorem (Distance in coordinate systems)	8.G.8	G-SRT.8	G-SRT.8	G-SRT.8	8A
How Many Sheets Do You Need To Break Out Of Prison?	Pythagorean Theorem (Length of a side)	8.G.7	G-SRT.7	G-SRT.7	G-SRT.7	8A
How Many Sheets Do You Need To Break Out Of Prison?	Operations with Time Intervals	4.MD.2	4.MD.2	4.MD.2	4.MD.2	4A
How Many Sheets Do You Need To Break Out Of Prison?	Converting Units, Proportions, and Scientific Notation	5.M.1	7.NP.2	7.G.4	8.EE.4	GA
How Many Sheets Do You Need To Break Out Of Prison?	Percent Discount	7.PP.3	7.PP.3	7.PP.3	7.PP.3	7A
How Many Sheets Do You Need To Break Out Of Prison?	Decimal Operations and/or Systems of Equations	5.NBT.7	8.EE.3c	A-CED.3	A-REI.11	8A
How Many Sheets Do You Need To Break Out Of Prison?	Volume of Cylinder	5.M.3	5.M.4	5.M.5	5.M.5	5A
How Many Sheets Do You Need To Break Out Of Prison?	Decomposing Numbers and/or Systems of Equations	2.NBT.7	1.NBT.2	3.NBT.3	8.EE.3c	4A
How Many Sheets Do You Need To Break Out Of Prison?	Probability	7.SP.5	7.SP.5	7.SP.5	7.SP.5	7A
How Many Sheets Do You Need To Break Out Of Prison?	Surface Area	6.G.4	7.G.6	8.G.7	G-M.1	GA
How Many Sheets Do You Need To Break Out Of Prison?	Parent-Interest and Compound Interest	7.PP.3	A-SEP.1	F-8.1	F-8.2a	8A
How Many Sheets Do You Need To Break Out Of Prison?	Surface Area and Unit Rates	6.G.4	6.RP.2	6.RP.3	7.G.5	7A
How Many Sheets Do You Need To Break Out Of Prison?	Perimeter	8.EE.3	8.EE.3	8.EE.3	8.EE.3	8A
How Many Sheets Do You Need To Break Out Of Prison?	Systems of Equations/Inequalities	8.EE.3	A-CED.3	A-REI.11	F-8.1	8A
How Many Sheets Do You Need To Break Out Of Prison?	Linear Equations	A-CED.2	F-8.1	F-8.1	F-8.1	8A
How Many Sheets Do You Need To Break Out Of Prison?	Area of Circle, Square, and Unit Rates	3.M.5	3.M.5	3.M.7	4.MD.3	6A
How Many Sheets Do You Need To Break Out Of Prison?	Area of Square	3.M.5	3.M.5	3.M.7	4.MD.3	6A
How Many Sheets Do You Need To Break Out Of Prison?	Integer Operations	5.NBT.6	5.NBT.6	5.NBT.6	5.NBT.6	5A
How Many Sheets Do You Need To Break Out Of Prison?	Systems of Equations or Rates	6.RP.3	6.RP.3	6.RP.3	6.RP.3	6A
How Many Sheets Do You Need To Break Out Of Prison?	Linear and Quadratic Functions	1.F.2	1.F.4	F-8.1	F-8.2	8A
How Many Sheets Do You Need To Break Out Of Prison?	Perimeter & Circumference	3.M.6	3.M.6	3.M.6	3.M.6	3A
How Many Sheets Do You Need To Break Out Of Prison?	Adding Time	3.M.1	3.M.1	3.M.1	3.M.1	3A
How Many Sheets Do You Need To Break Out Of Prison?	Parent-Discount	7.PP.3	7.PP.3	7.PP.3	7.PP.3	7A
How Many Sheets Do You Need To Break Out Of Prison?	Ratios and Proportions	6.RP.2	6.RP.2	6.RP.2	6.RP.2	6A
How Many Sheets Do You Need To Break Out Of Prison?	Create Equations From Quadratic Graph	A-CED.1	F-8.1	F-8.1	F-8.7a	8A
How Many Sheets Do You Need To Break Out Of Prison?	Adding Time	3.M.1	3.M.1	3.M.1	3.M.1	3A
How Many Sheets Do You Need To Break Out Of Prison?	Unit Rates	6.RP.1	6.RP.2	6.RP.3	6.RP.3	6A
How Many Sheets Do You Need To Break Out Of Prison?	Converting Units and Unit Rates	5.M.1	5.RP.2	5.RP.2	5.RP.2	5A

**NEXT
STEPS**

- Standards for Mathematical Practice
 - Talking and writing about mathematics
- Rigor
 - Application
 - Conceptual understanding
 - Procedural skill and fluency

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